

Capital

Capital:

An Energy Perspective

By

Noel Chellan

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To my mom Anjalayammal (Angie)–for your unfailing labour-power over the years

CONTENTS

Acknowledgements	x
Chapter One.....	1
Introduction: The Energy Concept and its Relevance to Marx's <i>Capital</i>	
Chapter Two	15
Labour-Power, Muscle-Power or <i>Human-Energy</i> : The Life Force or Vital Force of Man and his <i>Movements</i>	
Chapter Three	26
Commodities: Mass Embodying Human-Energy as <i>Value</i>	
Chapter Four.....	58
The Evolution of Economic Man: <i>Exchange</i>	
Chapter Five	66
Money and its Changing Nature	
Chapter Six	88
The <i>Transformation</i> of Money into Capital	
Chapter Seven.....	106
<i>Nature</i> , Human-Energy and the Changing Nature of Work	
Chapter Eight.....	124
Constant and Variable Capital: The <i>Mass</i> and <i>Energy</i> Forms of Capital	
Chapter Nine.....	130
The <i>Degree</i> of Exploitation of Human-Energy in the Production of Surplus-Value	
Chapter Ten	136
The Working Day: <i>Measured Time</i> for Work and Wages	

Chapter Eleven	153
Limits to Rate and Mass of Surplus-Value Confronted by Capitalism	
Chapter Twelve	158
Capitalism's Relentless Quest to <i>Overcome</i> Limits to Surplus-Value: The Production of <i>Relative</i> Surplus-Value	
Chapter Thirteen.....	165
Co-operation and Collectivisation: Capitalism's Ideological Design in the Workshop	
Chapter Fourteen	173
The <i>Division</i> of Movement and the <i>Efficient</i> Expenditure of Human- Energy in Capitalistic Work	
Chapter Fifteen	192
Machines and the Energy <i>Revolution</i> in the Production of Relative Surplus-Value	
Chapter Sixteen	235
Nature, the <i>Productive</i> Worker and the History of Surplus-value	
Chapter Seventeen.....	245
Wages: <i>Exchange</i> for Human-energy under the Guise of the Time of the Free Worker	
Chapter Eighteen	259
The Production and Reproduction of <i>Capitalism</i> for <i>Limitless</i> Accumulation	
Chapter Nineteen	271
The Conversion of <i>Social</i> Surplus-Value into <i>Private</i> Capital Accumulation	
Chapter Twenty	286
The General Law of Capitalist Accumulation and the <i>Wretchedness</i> of the Working Class	
Chapter Twenty One.....	310
Primitive Accumulation: The <i>Violent</i> History of Capitalism and the Labour Market aided by the Heavy Hand of the <i>State</i>	

Chapter Twenty Two	337
Conclusion: Toward Environmental, Economic and Social Sciences Informed by the <i>Laws of Energy</i>	
Bibliography	351
Index	357

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CHAPTER ONE

INTRODUCTION: THE ENERGY CONCEPT AND ITS RELEVANCE TO MARX'S *CAPITAL*

If you want to find the secrets of the universe, think in terms of energy, frequency and vibration.
—Nikola Tesla

Every new aspect of a science involves a revolution in the technical terms of the science.
—Friedrich Engels

Since this book adopts the energy perspective of *Capital Vol 1-A Critique of Political Economy*, I have set aside the first two chapters to discuss the concept of *energy* in general, and the concept of *human-energy* in particular. I will henceforth refer to Marx's seminal text as simply *Capital*. Different concepts allow us to enter different worlds of meaning, analysis and understanding. Only the concept of energy has the ability to converge all of these worlds to enable a common meaning, analysis and understanding. My aim through this book is to take you on a journey into the world of Marx's thought; more specifically, his thought as contained in *Capital*, and the conceptual vehicle that I wish to use for this journey is that of energy. Like any journey, it is good if one has a fair amount of knowledge of the type of vehicle one is using, and this is most definitely the case for the journey into the world of Marx's thought, as contained in *Capital*. I wish to declare my intention at the outset, and that is to highlight and enhance the scientific nature of Marx's thought, at least through the prism of the energy concept. I therefore have one request to make and that is for the reader to understand the concept and science of energy. It is intended for the first two chapters of this book to contribute to the beginnings of such an understanding of the science of energy, and hence towards understanding Marx's *Capital* from an energy perspective. Before I discuss the energy concept in more detail, and its relevance to

Marx's thought, let us get a glimpse of the world of Marx in relation to the writing of *Capital*.

Marx's *Capital* was published in 1867 and, much to his surprise and disappointment, the book was not readily accepted by the literary component of European society when it was first published. It should be said that *Capital* was first published in German as *Das Kapital*. *Capital* makes for laborious reading—many who have picked it up have complained about the difficulty of making the full journey from beginning to end. In this regard, Brewer (1984: xiii) thinks: “unfortunately it is a rather off-putting book”. Marx himself wrestled with the uncomfortable feedback he was getting regarding the gruelling task readers were experiencing in unpacking his thought in *Capital*. In order to make *Capital* more widely known, it took some of the strategic and creative methods of his life-long friend, comrade, benefactor, and colleague, Friedrich Engels, writing to the press under numerous different pseudonyms, in order to stir up debate and interest in the book. It was an effective marketing tool, bringing to the attention of the public opinion-making stratum the book that secured Marx's place in scholarly history. *Capital* was the work of 30 years of reading, scribbling and writing, mostly in the Library of the British Museum in 19th century London. It was a task that he set out for himself, in the midst of pain and suffering, whilst living in immense poverty, although occasionally having access to the “good life”. *Capital* was meant to be his intellectual weapon against the capitalist system, which Marx believed was the source of most human suffering and unhappiness. He abhorred the capitalist system, and he would give his all in order to drive a stake into its heart. He would gradually learn that capitalism has staying power! He was disappointed by the events that unfolded in Europe in subsequent years, although this did not stop him from continuing his intellectual assault on capitalism. He was also the intellectual guru of the International Working Men's Association—while it lasted. Almost 150 years after Marx wrote *Capital*, the capitalist system that he was so steely in his resolve to destroy is an enduring reality, even in politically communist China. While socialist and communist revolutions have been carried out in Marx's name, he was neither the father of socialism, nor of communism nor revolution—these unpopular titles belong to men and women before Marx's time. *Capital* was a mammoth attempt at a scientific, albeit contested, understanding of the nature of the exploitative capitalist society, so menacing in Marx's time. Marx had taken a decision early on in his life to align himself with the downtrodden. He subsequently identified the working people of the world as a necessary political force against the onslaught of capitalism. He genuinely believed that the full

nature of man, woman and child would only emerge and be fully explored and experienced if the exploitation of the workers of the world were to be made extinct. For Marx, the emancipation of all of humankind was through the emancipation of the working class. To use a biblical analogy; for a person of the Christian faith, the path to God the Father was but through the Son, the Lord Jesus Christ. For Marx, the path to *real* freedom, contentment and happiness was through the abolishment of the class system i.e. when worker exploitation ceased and capitalism was relegated to the dustbin of history. Hence, engraved on Marx's tomb in Highgate Cemetery in London is the following inscription: WORKERS OF ALL LANDS—UNITE. Karl Marx, however, was under no illusion that the struggle for a classless society which he envisioned would be long, hard, bitter, and at times violent—a lesson that history had time and time again failed to keep hidden. But for those whom Marx wrote about—the working class—the thought in the book would not be easily assimilated. This was owing to the book's difficult style and its often highly confusing intellectual concepts. It was and is a difficult and frustrating read, even for the highly literate, scholarly and intellectual. Nevertheless, many editions of *Capital* in many languages were subsequently published—and are still being published in the second decade of the 21st century. Countries in many parts of the world attempted to style their economies on Marx's thought, but such economies would time and time again prove to be incompatible with, and unwelcomed by, the dominant capitalist system. Communist-style economies would not go unchallenged by powerful capitalistic countries. For Marx, though, capitalism is an epoch in history; there was little or no chance of circumventing it. What he did believe, though, was that the demise of capitalism could be hastened through consciousness-raising of the science of how societies in general, and the capitalist system in particular, are held together or disintegrate and give shape and form to ensuing economic, social and political systems. Marx had “no stomach” for idealistic or utopian thinking; he shunned those whom he believed lacked a dialectically materialist and historical perspective of the unfolding events of economic eras. For this outlook, he had many adversaries. For Marx, there was no middle ground, no compromise. He was, however, no anarchist. In fact he did everything in his power to eradicate anarchist influences and tendencies within the International Working Men's Association, the organisation which he believed would be the vehicle to lead the world out of capitalism and into the world of communism. However, the failed revolutions of 19th century Europe convinced him that theory had to be the “guiding light” for the masses. It was then that he put his “heart and soul” into writing *Capital*.

It is about 150 years since Karl Marx was finally laid to rest. The world has changed a lot since Marx's time. The fall of communism in the Soviet Union relegated Marx's thoughts to irrelevant status—at least for a while. However, such economic, social and political transformations do not necessarily rule out a Marxist analysis. On the contrary, a Marxist or Marxian analysis seems more relevant in a world dominated by capitalism and crises. The world of science has also changed considerably since Marx's time. Whilst it is no easy task to separate the theoretical writings of Karl Marx from the way that different governments decide to operationalise such theories, society must forge ahead with its analysis of historical phenomena. In this way, the painful events of the past and present are considerably lessened, if not totally eliminated, when embarking on constructing a happier world for present and future man and woman. This mammoth task can be made easier with the help of nature and the understanding of its laws—through understanding the laws of energy. Marx's thoughts in *Capital* are an amalgamation of the science of worker exploitation, philosophy, history, sociology, political economy, anthropology, etc. His analysis of capitalism is sometimes couched in literature of the metaphorical type. In the final analysis, the knowledge field is a contested one, and rightly so. After all, new knowledge must be produced as well as challenged, so that more new knowledge is produced—and, one would hope, will lead mankind closer to understanding the human condition in the 21st century [Christian time]. It is the dialectical method that Marx embraced and encouraged in his writings. Whilst Marx did not witness world events supporting his theoretical insights during his life time, his views still resonate in the globalised world of the 21st century. The financial and economic crisis of 2008, and the uprisings of masses of people in many parts of the world, are compelling society not only to look to the scholars and philosophers of the past for answers to the world's problems, but also to merge the thoughts of such scholars with the most updated knowledge, and to analyse their relevance to phenomena and events of the 21st century. Many are revisiting Marx's thought. The extent and the enduring importance of Marx's understanding of economic, social and political challenges was encapsulated when Economist magazine's survey amongst the British public revealed Karl Marx to be the "millennium's greatest thinker", followed by Albert Einstein, Isaac Newton and Charles Darwin (Dillon, 2010: 39). Some of the many books on Marx which have made their entry into the scholarly landscape since the 2008 capitalist-financial crisis are: *Capital-An Abridged Edition by Karl Marx and David McLellan* (2008); *Marx by Andrew Collier* (2008); *A Companion to Marx's Capital by David Harvey* (2010); *Das Kapital by*

Karl Marx and Samuel Moore (2011); Why Marx was Right by Terry Eagleton (2012); Complete Works by Karl Marx (2013); Selected Essays by Karl Marx (2013); Marx's Concept of the Alternative to Capitalism by Peter Hudis (2013); Das Kapital-Capital by Karl Marx, Friedrich Engels, Samuel Moore and Edward Aveling (2014) and Marx's Capital—An Illustrated Introduction by David Smith and Phil Evans (2014). There are many more! Such relevant literary productions are testimony to the bearing of Marx's thought in analysing the nature of the social, political, economic, and environmental phenomena of the 21st century. With all of these books out there, why did I write *Capital—An Energy Perspective*? Well, it should be an integral component of a changing society to interpret and re-interpret the thoughts of brilliant and influential scholars, like Karl Marx, Adam Smith, Charles Darwin, etc., and universities must lead society in the knowledge-sphere to find solutions to 21st century problems. Whilst this book is another addition to the attempt at disentangling Marx's gruelling concepts and thought, where it is different is in its undertaking of reading Marx's *Capital* from the perspective of energy in general and human-energy in particular. Although scholars have alluded to the relevance of the energy concept in Marx's thought, I am not aware of any book that attempts an understanding of Marx's *Capital* entirely from energy and human-energy perspectives. Energy is a much neglected concept in many curricula in university disciplines and its traditional home is that of physics. However, with the disciplines at universities and research institutions now being compelled to move beyond their traditional boundaries of understanding social, economic, and natural environmental phenomena, a trans-disciplinary paradigm is proving to be more effective to understanding such phenomena, with the purpose of finding solutions and responding to challenges of various sorts. Seminars, conferences and congresses are mooted for the blurring of disciplinary boundaries and the coming together of specialised disciplines to solve the giant challenges of the 21st century. The 2008 financial crisis and the downturn in the globalised economy from then onwards, together with widespread political and social calamities in many parts of the world, are causing a resurgence in a Marxist analysis of world phenomena. Besides the many books on Marx, which are being produced at a speedier pace than before 2008, many more books that have been gathering dust on book shelves owing to the collapse of Soviet-style communism, are now being dusted-off, read and re-read. Coupled with these are the many seminars and conferences which are held in different parts of the world on Marx and his thought. *Capital* is but one of the many books Marx wrote—although it is the book for which he became famous. Some of Marx's other works are: *Economic*

and Philosophical Manuscripts of 1844 (1844), The German Ideology (1846), Wage Labour and Capital (1847) and The Communist Manifesto (1848). Some of his writings were done in partnership with his life-long friend and benefactor, Friedrich Engels. Marx's *Capital Vol II* and *Vol III*—in the form of scribbled notes—were put together by Engels after Marx's death on 14th March 1883. Marx did not get to see his subsequent two volumes in published form. It is almost impossible to pigeon-hole Marx's thoughts into any one specific discipline. Whilst *Capital* is concentrated on the thoughts of scholars and authors from many disciplines, it is also a book that is hugely informed by Marx's experiences and observations of 19th century Europe in general and England in particular. In the words of David Harvey (2010: 4):

My point is simply that different disciplinary perspectives can usefully open up the multiple dimensions of Marx's thought, precisely because he wrote this text out of such an incredibly diverse and rich tradition of critical thinking.

Through this book, I intend to make Marx's thought more accessible. However, it is recommended that the reader reads *Capital* as written by Karl Marx, so as to understand the different ways in which Marx's thought can be interpreted and understood, as well as to encounter many of Marx's views which are not part of this book. Marx's *Capital*, after all, runs to about 1,000 pages! My book, an interpretation of *Capital*, is about 350 pages. I have used *Capital Vol I—A Critique of Political Economy* (2011), translated by Samuel Moore and Edward Aveling, edited by Friedrich Engels and published by Dover Publications, Inc., New York, as the edition to cite and from which to interpret Marx's thought. By quoting many of his thoughts in this text, I also wish to add to the mainstream, Marx's thought as presented in *Capital*. From here onwards, I will cite the page numbers containing the excerpts that I have used as primary material. These, together with the thoughts of scholars on energy and human-energy, will be used to interpret, substantiate and consolidate my arguments in this book. I concede that I am not an economist by training—a challenge that does not make understanding the many chunks of economic thought in *Capital* any easier. Nevertheless this challenge has not stopped me from assessing mainstream economic science in general, and the capitalist system in particular. Whilst I do attempt an understanding of Marx's intricate economic thought, my main focus is on interpreting *Capital* from an energy perspective. With new understandings of new knowledge fields and concepts, Marx's thought on the commodity, money, production processes, machinery, etc. is updated from that of its historical

context, especially since the concept of energy was still in its developmental stages during Marx's lifetime. For the uninitiated, the notion of understanding energy may seem an arduous task to embark upon—but once its relevance to the economic, social, political and natural environmental spheres is acknowledged, the journey can prove itself to be empowering in its analytical ability not only to understand the world in general, but to understand the world of capitalism according to Marx:

Since the emergence of scientific thought, in particular since the British physicist, Thomas Young introduced the notion of energy at the beginning of the nineteenth century and the advent of thermodynamics, the idea has progressively gained currency that energy is a purely physical phenomenon that can be controlled through technical processes according to a purely economic logic. Thinking on energy has been dominated by steadily more specialised studies on these processes and this logic: machines, capital, work, processes, and exchange networks. Energy has been integrated into this thinking as primary data. It has been considered implicitly as neutral, unlimited and inexhaustible, like water and oxygen, and not only devoid of any particular impact on the future of society, but subordinate to this future, adaptable at will. It does not exist in the social sciences as a specific object of knowledge. The narrowing of the field considered by Marxists since the days of *Capital* is typical in this respect and stands in contrast to the breadth of Marx's initial outlook. Marx had laid out the premises of a systematic reflection on exchanges between humanity and nature, placing energy at the very core of his construct (Debeir et al, 1991: xii).

Since energy has “elusive qualities” (Smil, 2008: ix), let us attempt a deeper understanding of the energy concept. Let us befriend the energy concept. All of life's processes can be understood in terms of energy. The energy concept—unlike concepts such as race, nationality, ethnicity, gender, etc.—unifies as opposes to divides life into a myriad of fragmented and *apparently* disconnected categories. In the main, I will use the concept of “man” as a universal for humankind for the purposes of ease of writing—and not from the premise of a discriminatory understanding of the genders of humankind. Man may be differentiated from other animals by the types and quantity of energy he uses and depends upon for his and his family's survival. Capitalism, on the other hand, depends on energy for the purposes of *surplus-value* creation, *profit maximisation* and *capital accumulation*. Man's lifetime on earth and the history of his different forms of development may be understood by how he has come to use energy external to his, and how this collaboration between his human-energy and that external energy has constructed the type of world that we currently inhabit. All other creatures that inhabit planet earth rely solely on

their own creature-energy in order to survive. However, there are instances amongst primates—one example being chimpanzees—whereby external energy in the form of natural tools is utilised to access food. But only man has evolved the capability to make tools and to use them for survival purposes. Whereas Aristotle referred to man as a “political animal”, and Adam Smith referred to man as an “economic animal”, Benjamin Franklin referred to man as a “tool-making animal”. Man evolved to interact with nature in a whole new way—one that would not only change the natural landscape considerably, but which would change man’s nature as well. Harnessing other forms of energy—together with his own—would be the new way that he engaged with nature. It was the beginning and building of material culture, which would subsequently lead to the building of social and political culture. The organ of the body that started man on this technologically and dialectically evolutionary path was the *hand*. Man is definitely not solely his hand; nor is he solely his brain; he is the sum of all of his organs and more. However, the hand is a much neglected organ in the analysis of man’s role and function in economic society, up to this point in historical time:

With reference to man and his biological potential for social and cultural evolution, two familiar evolutionary universals may be cited, namely the hands and the brain. The human hand is, of course, the primordial general-purpose tool. The combination of four mobile and an opposable thumb enables it to perform an enormous variety of operations—grasping, holding, and manipulating many kinds of objects (Parsons, 1964: 85).

The evolutionary freeing of the hands transformed man into a bipedal animal. The mechanical intelligence of the hand spurred man’s brain on to complex forms of symbolic intelligence-functioning. Over thousands of years, the hands have been at the forefront of building material culture; from the shaping of stone tools to building the Egyptian pyramids, constructing the railways and removing the gold, copper and silver from mines. It was the hands that would pull the bow-string in order to release the arrow for the kill. It was the hands of man that built the iron and steel bridges which connect the river banks of some of the world’s widest rivers. It is the hand that carries the gun and pulls the trigger on battlefields and in urban settings. It is the hand that moves the pen in order to document life, that controls the paintbrush to create art, that plays the piano to create music. It is the hand that wears the ring to denote the nature of a relationship amongst humans. It is the hand that shakes the hand to establish social connections amongst the human species. It is the hands that cook the food, that carry the baby, that steer the car or the horse. It is

the hands that quickly open the wrapping concealing a gift. It is the hands that clean up and clean down. In his hugely influential scholarly work *The Wealth of Nations*, Adam Smith continuously refers to workers as “hands” as in the partial sentence: “the scarcity of hands...” (68). Under capitalism, hands continue to produce commodities at a rate and scale unimaginable in previous epochs. They have come to do this in partnership with the various tools which have been developed and constructed over the energy-ages. The raw material, as well as the tools that man requires for his reproduction, comes from the natural environment. According to Steinhart et al (1974: 66): “life can be viewed as a ceaseless web of energy conversions which follow well-known principles of energy conservation and transformation.” The “concept of energy can be used to link a whole range of observed phenomena” (Foley, 1981: 68). In as far as energy is everything, then its theoretical, intellectual and scientific home should not be exclusively that of physics. It belongs just as much to sociology, economic science, environmental science, psychology and other disciplines. Energy is hence a unifying concept, and the concept itself has reached the epitome of the evolutionary knowledge pyramid. Energy embodies both mass and motion. It is a concept that seeks to understand not only the static, but the dynamic world as well. Whilst the concept of energy has an “elusive”, and sometimes a non-physical dimension to it, my focus in this book will be on the “material” and scientific nature of energy, and the laws which govern it. The word energy itself is derived from the Greek word “energos” which means “active” (Russwurm, 1983: 7), and the concept did not exist until 1807 (Wilson, 1965). The scientific principles which govern energy were not established until 1850 and these scientific principles had to be modified after it was discovered that mass was a form of energy (Cook, 1976: 11). Still, the energy concept seems not to have reached Marx’s study table, at least not in all its glory—although *Capital* does contain the word energy more than once. I interpret Marx’s world view of energy as being two-fold: “concrete” and “abstract”, in a similar manner to Einstein’s thinking of energy as also being able to assume a mass form. Steinhart et al (1974:13) are of the view that “energy and matter are also natural resources”. Different strands of study have attempted to understand man in the way he goes about producing his livelihood, not only in relation to his fellow man, but also in relation to nature. Energy economics is one field of knowledge that attempts to understand this process:

The Greek *oikonomia* meant household management; the original meaning of the English *economy* was identical... If the house is earth; its resources are energy and materials. Even food is energy and materials... That part of the household that deals with the relations among the house, resources, and

man is the *physical economy*. Its units of measurement are those of energy, time, mass, and distance (Cook, 1976: 267).

The shift in historical eras also allows for the investigation of human-nature interaction to be understood from the perspective of the law of energy conservation, thereby pointing out the significance of human-energy in the physical economy. Further elaboration by Cook (1976:109) indicates that:

ultimately what is called economics (but is, rather, pecuniary economics) must take into account the physics of *energy* as well as the behaviour of men. The concepts of energy, power, and work are keys to an understanding of what man can and cannot do with the earth's physical resources.

Energy itself also has different but related spheres of understanding. Within the discipline of physics, kinetic energy is commonly referred to as energy in motion, and potential energy is commonly referred to as stored energy. In a production process involving either simple or complex tools, kinetic and potential energy collaborate with each other in producing the final product. When man rests, his human-energy is stored; it is potential energy. When man works, his human-energy is put into motion, i.e. it is kinetic energy in mechanical form. As to whether man's human-energy can be stored, that is a matter for science to decipher, and a task I have attempted when reading Marx's *Capital* from an energy perspective. I believe the unpacking of the energy concept will also give one a glimpse into the mysterious world of energy, and the laws which govern it. I declare that man should not be reduced to energy, and man is not energy *per se*. What the concept of energy does, however, is enable and empower one to understand man in relation to his social, economic, political and natural worlds. In other words, energy is the ultimate common denominator for equalising the animate and inanimate worlds, as well as for revealing accurately the nature of their relations. Energy is the golden key which unlocks the iron door to understanding life itself. Energy is the piece of the puzzle which make the big picture possible. Though it may assume different forms, energy is everlasting and indestructible. The laws of energy allow humankind to remove the veneers that masks this fact. The laws of energy are the spiral staircases which lead man to an understanding of the complex and complicated world which he has created for himself, at times consciously and at times unconsciously. The laws of energy are the ever-shining light that helps brighten up the world, into which man can then take a peek in order to understand the impacts of his actions and the

implications of his thoughts on the world and its functioning. The complexity of social, political, economic and natural environmental phenomena compels us to simplify such phenomena to the level where understanding and analysis is made simple. It is within this context that the concept of energy is used—viewing phenomena through the concept not as an end in itself, but for the purpose of understanding their holistic and complex nature. It was in the middle of the 20th century that the concept of energy was made accessible to the mainstream knowledge domain in particular, and to society in general. We must seek to understand the world through the lens of the all-embracing concept of energy. That energy is everything is famously captured by Einstein’s equation: $E=mc^2$. The energy concept allows us to deconstruct the world and reconstruct it according to the rules of science and the laws of energy. I continue this challenging task by recognising the importance of the energy concept in our intellectual analysis and acknowledging its “material existence”:

For the past 130 years or so economics has been treated as a social science in which economies are modelled as a circular flow of income between producers and consumers where the most important questions pertain to consumer choice. In this ‘perpetual motion’ of interactions between firms that produce and households that consume, little or no accounting is given of the necessity for the flow of energy and materials from the environment and back again. In the standard economic model energy and matter are ignored or, at best, completely subsumed under the terms ‘land,’ or more recently ‘capital,’ without any explicit treatment other than, occasionally, their price (Hall and Klitgaard, 2012: vii).

We are beginning to understand that “energy, ecology and economics form a single, unified system” (Odum, 1973: 220). Energy provides the means with which to do work (Rosa et al, 1988: 149). Energy is also a precondition for capitalist accumulation (Newell and Paterson, 1998: 695). In *Capital*, Marx alludes to the principle of energy conservation, the fact that “out of nothing, nothing can be created” (Burkett and Foster, 2006: 110). Hence the role of energy in wealth production should not be overlooked by economists (Tyron, 1927 cited in Cleveland et al, 1984: 896). For capitalism to thrive, its single-minded profit motive requires a material basis, and one that has been provided for by ever-increasing quantities of energy in general and human-energy in particular. Ever since, capitalism has had predatory instincts for large quantities of energy:

The de-emphasis on absolute (as opposed to relative) energy conservation is built into the nature and logic of capitalism as a system unreservedly

devoted to the gods of production and profit. As Marx put it: ‘Accumulate, accumulate! That is Moses and the prophets!’ (Bellamy et al, 2010: 10).

In this book, the relevance of the laws of energy is applied to the following examples of Marx’s thought: commodities and exchange, capital and labour-power, the labour process and the production of surplus-value, the division of labour and the factory system, machinery and modern industry, etc. I have drawn from scholars on Marx in order to simplify my understanding of *Capital*. They include: David Harvey, David Brewer, and Ben Fine, amongst others. I owe my understanding of the social, economic and political dimensions of energy to the many scholars in the field—both deceased and alive. It is because of their relentless work in the field of energy, and my engagement with their thoughts, that I am able to attempt an interpretation of Marx’s *Capital* from an energy perspective. I think it is therefore apt that I provide a direct link to some of these scholars’ thoughts—so that the reader can have a “birds’ eye view” of the wonder and marvel of the concept of energy—with the aim of working towards understanding social, political, economic and environmental phenomena. I believe that the best way to deepen and consolidate the reader’s understanding of energy is to present scholars’ actual words on the relevance of energy in the format below—as direct quotes. In this way, their thoughts and meanings do not run the risk of being overly diluted:

...in 1807, the word ‘energy’ first entered the technical vocabulary of science. A word which in Greek originally meant ‘work’, ‘energy’ was proposed to describe many of the same phenomena originally attributed to *vis viva* (Wilson, 1965: 12).

The history of mankind, and of western man in particular, could be written in terms of the conquest of energy... In timeless cultures where tradition rules, there has been until recently either no desire for or no way to obtain the extra energy that makes things happen (Steinhart, 1974: 34).

...energy language is used to consider the pressing problem of survival in our time—the partnership of man in nature. An effort is made to show that energy analysis can help answer many of the questions of economics (Odum, cited in Foley, 1981: 83).

That energy would be important to sociological concerns was recognised from the beginning of the discipline (Spencer, 1862; Weber, 1904); but the subsequent history of the topic was to be punctuated with intellectual discontinuity, cast shifts in focus, and, at times total silence (Rosa et al, 1988: 149-150).

History, for instance, has had a blind spot for energy (Debeir et al, 1991: xii).

Not Copernicus and Galilei [sic], when they abolished the Ptolemaic system; not Newton, when he annihilated the Cartesian vortices; not Young and Fresnel, when they exploded the Corpuscular Theory; nor Faraday and Clerk-Maxwell, in their splendid victory over *Actio in distans*—more thoroughly shattered a malignant and dangerous heresy, than did Joule when he overthrew the baleful giant FORCE, and firmly established, by lawful means, the beneficent rule of the rightful monarch, ENERGY! Then, and not till then, were the marvellous achievements of Sadi Carnot rendered fully available; and Science silently underwent a revolution more swift and more tremendous than ever befell a nation. But this...must be a theme for the Poet of the Future! (Anonymous, 1844 cited in Smith, 1998: 1).

This doctrine [of energy] has not only furnished a standard of industrial values which has enabled mechanical power...to be measured with scientific precision as a commercial asset; it has also, in its other aspects of continual dissipation of mechanical energy, created the doctrine of inorganic evolution and changed our perception of the material universe (Larmor, cited in Smith, 1998: 14).

Energy was critical to the thinking of the earliest economists, although they could not use the language we would use today because the concept of energy was not clear to them or even to physical scientists at that time (Hall and Klitgaard, 2012: 7).

The field [energy] is new because energy questions have until now only enjoyed a sporadic mention in historical analysis, never a comprehensive treatment as an important determinant in the development of human activities and social constructs (Sørensen, 2012: vii).

Engagement with these thoughts reveals that energy is not just matter, molecules, atoms, electrons and protons, etc. Energy is much more. Energy is the much-concealed formula for understanding man's natural, economic, social, political, and psychological worlds. Whilst words help us to describe the world, concepts empower us to understand and make sense of the world we have inherited from previous historical epochs. If Marx's concepts in *Capital* are magnifying glasses into the workings of the world, then the concept of energy is the electron microscope to making sense of that world. But when the concept and its revealing nature have been accessible to only a minority of society, then it is not surprising if its appearance into the mainstream of society is met with some confusion. However, like any encounter with new concepts and new knowledge, once

one engages with it long enough, it is certain to open up one's world view. I hope that the first two chapters of this book will be successful in informing you about the world of energy and its intended relevance to amplifying the meaning of Marx's thought, whilst at the same time simplifying its complexity and intricacy. The energy concept cannot remain behind closed doors any longer. We can no longer negate or ignore the "presence" of the energy concept, and its magnificence in revealing the workings of the world. Whilst religious books promise a better life in heaven, the study of energy can guarantee heaven on earth—if and when society decides to engage with the concept, disciplines and laws of energy with the same passion it does with religion. I also hope that by the end of the book you will have a broader and more in-depth understanding of the world of energy, and how this world shines its light on the thought of Karl Marx—the "millennium's greatest thinker"! It is not my intention to change the fundamental thought of Marx, but instead to allow its meaning to penetrate the stubborn boundaries of difficult concepts. It must be said that I also interpret *Capital* from my lived experiences and an analytical perspective of both strengths and weaknesses. Let us now proceed with discussing a concept even more concealed under capitalism: that of *human-energy*.

CHAPTER TWO

LABOUR-POWER, MUSCLE-POWER OR *HUMAN-ENERGY*: THE LIFE FORCE OR VITAL FORCE OF MAN AND HIS *MOVEMENTS*

You, yourself, are the eternal energy which appears as this Universe. You didn't come into this world; you came out of it. Like a wave from the ocean.

—Alan Watts

I *move*, therefore I am.
—Haruki Murakami

Humans walk, run, talk, sing, dance, have sex, carry babies, go to the gym, stretch, yawn, blink, breathe, clap their hands, shake hands, pray, laugh, cry, cycle, shop, work, work and overwork—at least under capitalism. However, in order to engage in all of these energy-consuming activities and more, man requires a steady supply of energy in the form of food. His body converts the energy from this food into electrical energy, chemical energy and mechanical energy. The human body comprises a human-energy system, made up of “energy structures” of “certain form, anatomy, function and physiology” (Rich, 2004: 1). The cells of the body seem to “follow 24-hour cycles of gene activity, hormone secretion and energy production” (Callender, 2012: 38). In order to sustain itself and to perform external energy-activities such as work, the human body requires about 4.2 Kj/kg of energy in the form of food (Russwurm, 1983: 17). Energy performs electrical work in the brain, osmotic work in the cells, mechanical work in the muscles, etc. (McMurray, 1977: 77). Once in historical time, “man, like other animals, had only his own energy to use in the struggle for life”. His energy came from the food he ate—“about 22,000 kilocalories” per day (Steinhart, 1974: 33). Muscles of the body are the only organs which produce mechanical energy (Winter, 2009: 141)—energy that is vital for the movement of the body in a myriad of ways. It is

because of the versatility of man's hands in producing mechanical energy that man is a sought-after "commodity" in the labour market, at least for a contractual period of time, under the capitalist mode of production. Hence man is a repository of energy, and his body is a site for energy transformations and metabolic work:

Our kin, *Homo sapiens sapiens*, distinguished by their greater ability to use their own energy to fashion tools, appeared during the second part of the Würm Ice age...the new tools all activated exclusively by human-energy, spread over the entire world during this prolonged period...To produce mechanical energy, humans could only turn to their own bodies. The role of the human converter was therefore fundamental. Its versatility was unmatched, its essential function to produce and reproduce the life at hand. Production in this context had two goals: on the one hand, the production of the means of subsistence, of the objects used for food, clothing, shelter and the necessary tools, and, on the other hand, the production of the humans themselves. Engels included in his definition 'a production more essential than any other, that of human-energy' (Debeir et al, 1991: 16).

For hundreds of thousands of years, man extracted and appropriated the "fruits of nature" using his nature-given labour-power or human-energy. Hence man's interaction with the natural environment could be understood in terms of energy in general and human-energy in particular. Labour-power or human-energy has always been the power or force behind man's activities, from sharpening a stone-tool to throwing a spear; from running after a source of food to running away from being a source of food; from wading across a river to climbing a tree; from dancing around the fire to dancing into a trance; from making a clay-pot to writing on papyrus; from bowing to the king to grooming the queen; from picking cotton to running away from the slave-master; from digging a canal to sweeping a chimney; from chopping down a tree to lifting a bag of coal; from rowing a boat to riding a horse; from cranking the engine of a car to flying a plane; from rocking a baby to lowering a coffin. Labour-power or human-energy is the "vis viva", the "life-force", the "vital force", the "pulse", the "soul" of life. In the same way that a flourmill is able to work because of the wind-energy it receives, or a steam engine is able to work because of the heat-energy it receives, or a machine is able to work because of the electrical energy it receives, man is able to work because of the labour-power or human-energy that he accesses, first in the form of food, which is subsequently transformed into different energy forms in his body, then expended in various types of metabolic and muscular work. The common denominator amongst coal, horses, wood, wind, water and man is that they all have the *capacity for work* i.e. they are all repositories

of energy. Like manual and automatic machines, humans have the capacity to “produce” *mechanical energy* (Heilbroner, 1962; Gray, 2006). Ever since man tamed the energy of nature in the form of cereals on the banks of the River Nile (Sørensen, 2012: 117), his labour-power or human-energy has subsequently been tamed. Together with the taming of nature, civilisation as we know it, or call it, mushroomed with the domestication of labour-power or human-energy:

Before coal and oil, civilisation ran on a two-cycle engine: the energy of solar-fed crops and the energy of slaves. Shackled human muscle built, powered, and emboldened empires from Mesopotamia to Mexico... Slaves made efficient energy converters and created healthy surpluses (Nikiforuk, 2012: 3).

For thousands of years, the labour-power or human-energy of the common man was put to work for the benefit of the dominating classes in different social epochs. The slaves of Mesopotamia were branded as the animals were (Meltzer, 1993: 22). Whether as peasants, slaves or wage-workers, the dominant classes have for eons ruthlessly extracted labour-power or human-energy from the common man. Throughout historical time, we observe that the mechanical energy of man has been ordered, organised and disciplined so as to construct giant projects, such as the building of the pyramids in northern Africa (Fowler, 1975: 67). Ancient civilisation, as in the case of Egypt, was able to achieve highly developed forms of material culture on the basis of enlisting masses of labour-power or human-energy for mega private and public works projects:

With regards to Sumer and the Nile, innovations and climate were important but underlying them was an often overlooked yet more central driving force; the discovery of the power of a new type of social organisation. This extraordinary invention turned out to have been the oldest operating model for all the complex machines which came afterwards. In disciplining and assembling humans in a co-ordinated fashion on a scale unknown until then, kinship put together history’s first megamachine, which everywhere it was assembled, multiplied energy efficiency and performed labour on a scale inconceivable until then (Debeir et al, 1991: 23).

Man’s economic development has for a long time relied on the energy derived from domesticated animals and the labour-power or human-energy of man himself. For example, for much of America’s early development, energy was harvested from draft animals and from man (Steinhart, 1974: 36). In fact, man’s labour-power or human-energy is the starting point of

economic history. First and foremost, man must draw on and utilise his own labour-power or human-energy if he is to compete with and survive amongst the other countless species of life which inhabit planet earth. Man's evolutionary break-through may have occurred as a result of him being forced to harness energy forms over and above that of his own labour-power or human-energy. It was a whole new way in which he could interact with the natural environment, to the extent that he would not only go on to transform "objective" nature but his subjective nature as well. While scholarly focus is on inanimate forms of energy such as wood, coal, oil, nuclear, wind, solar, etc. in the material economy, hardly any is on the role of human-energy, both past and present. When and where human-energy is discussed, it is conceptualised as *labour-power* with no or very little understanding of its meaning. Many creatures transform material nature into need-serving entities. Weavers, for example, extract from nature and construct their nests using their own energy. Bees likewise extract from nature and construct their honeycombs, also using their own energy. It is true for most species on earth. The manner of production of countless species has been more or less constant from time immemorial. But man, intelligent man, on the other hand, has utilised and utilises his labour-power or human-energy to produce on a scale and range that confounds even the human imagination. Hence we note that labour or work is first and foremost only possible through labour-power or human-energy.

Man is dependent on his own labour-power or human-energy in order to work for the purposes of survival (Cook, 1976: 23). His material development took off when he began harnessing external forms of energy in order to supplement his labour-power or human-energy. A man's own body is not unlike an engine, and it is man's labour-power or human-energy which is the *prime mover* in relation to his basic tools. His potential energy is converted into kinetic energy. Through the movement of his limbs, energy is passed into sticks and stones in order to harvest from nature for producing and reproducing his livelihood (Eberhart, 2007: 13). Under capitalism, man's labour-power or human-energy is put to work for a large chunk of his lifetime. There is very little time left to direct his labour-power or human-energy to cultural, creative or social activities. Work time usurps creative time and social time like no other labour-power or human-energy activity. There is also very little of his lifetime available for directing his labour-power or human-energy to family time. There is very little personal time or "me time" under capitalism, except for the unemployed and the rich. Man's labour-power or human-energy is under the command and control of capital. His labour-power or human-energy is

in shackles. Capitalism competes with other human activities for man's labour-power or human-energy. Capitalism's choice of activity for man's life-time is *work*. If man's labour-power or human-energy is allowed *movement*, then this movement mostly serves the interest of *capital accumulation*. If the world seems to be moving at greater speeds than in previous historical times, that is because it is. Speed is a function of energy; huge quantities of energy are poured into the capitalist system on a daily basis. Labour-power or human-energy is put to work at a faster *rate* under the capitalist mode of production. Nothing moves like energy. Indeed, life is a "rat-race" under the command and control of capital. It serves the interest of capitalism to have its true exploitative nature concealed. Hence the role of energy in general, and human-energy in particular, in capitalism's development and maintenance has not been as widespread as the knowledge that props up capitalism and has grown it to unsustainable and life-threatening proportions. At this point we take note of Engels's thought in *Capital*:

Political Economy has generally been content to take, just as they were, the terms of commercial and industrial life, and to operate with them, entirely failing to see that by so doing, it confined itself within the narrow circle of ideas expressed by those terms (29).

However, there are scholars who have demonstrated through their writings the centrality of labour-power or human-energy in the history of man and his economy: in the 1500s, "mechanical energy was derived almost entirely from human and animal muscle" (Wrigley, 2010: 97). According to Smelser (1973: 3-4), labour-power or human-energy itself is "conditioned by the circumstances in which men find themselves". Both the human body and the machine are motors that convert "energy into mechanical work" (Rabinbach, 1992: 2). Through his studies, Sørensen (2012: 97) showed that the increasing energy-activities of the Maglemose people of Northern Europe still depended largely on "muscle power and fire". In factories, in Adam Smith's life-time, "muscles provided much of the energy to generate the transformations of raw materials into desired products" (Hall and Klitgaard, 2012: 8). When you turn the pages of this book, it is because the energy in you capacitates you to do so. The chemical energy in your body is converted into mechanical energy, which then allows your hands and fingers to turn the pages. If it is an ebook, then accessibility is also possible via the reader's mechanical energy. The hands are man's natural levers for executing mechanical movements for the purposes of survival. They perform such mechanical executions because of a steady supply of energy, which man accesses from the natural

environment. When large tracts of nature are privatised, the steady supply of energy for man's survival is strained. He is then forced to pay a market price instead of a "natural price" for nature's energy for the survival of himself and his family. The labour-power or human-energy in man allows him to perform an array of movements with his body. A skateboarder sailing through the air performs wonderful twists and turns by virtue of her labour-power or human-energy. Soccer players use their labour-power or human-energy in competitive ways, so as to attempt to land the soccer ball in the opponent's goal. A gymnast's labour-power or human-energy allows her to effect the most graceful of body-movements ever seen. Taking care of little children requires an abundant quantity of labour-power or human-energy. Little children themselves are usually lost in play and happiness as a result of their unchained, unrestrained labour-power or human-energy. A golfer has to utilise an adequate quantity of his labour-power or human-energy in order to land the golf ball some distance from where he drives it. If he has good body mechanics, then his labour-power or human-energy will be used more effectively, preventing the ball from straying off its intended course. Adolf Hitler harnessed mammoth quantities of labour-power or human-energy based on the idea of racial superiority. In their contest for geopolitical power, developed countries induced two world wars by militarising labour-power or human-energy on a macro scale. The Fordist system of producing cars on a mass scale perfected the science of mechanisation of labour-power or human-energy; a far superior form of labour-power mechanisation over that which characterised the Industrial Revolution of 18th and 19th century England. We currently observe the globalisation of labour-power or human-energy, primarily for the purposes of capital accumulation. We also observe capitalist production gravitating to those countries where labour-power or human-energy is cheap. As far as I know, no in-depth analysis has been carried out to understand the nature of labour-power as human-energy in society, except to understand it as the capacity to do work or perform labour:

The language of labour is evolving into a language of labour-power as a quantifiable force of production, localisable in the economies of energy distributed within the body and the psyche (Rabinbach, 1992: 38).

Some of you may recall the days when a light-bulb was attached to your bike, and as you pedalled your human-energy was converted into mechanical energy and finally transformed into electrical energy, thereby lighting up the path in front of you. Wind-up clocks were also in great use back in the day; human-energy was converted to energy stored in the