# *The Evolution of Biomechanics*

Bringing movement theory back to life.


**By Stephen Braybrook, MSc**

**AKA – The Movement Man**

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Published by DM Press

ISBN 978-0-9955033-1-1

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# Acknowledgements

So many great people have influenced me and helped me along my journey that has led me to writing this book, that it is impossible to name them all. As I thank the few, I extend my gratitude equally to everyone whose path I may have crossed on my movement journey. This book is a product of many people and without their help, challenges, questions, conversations and sharing it would have not have been possible.

I would like to thank all of my close family and friends who have supported me along the way – each of you knows you who you are. And it is with eternal love and gratitude that I would like to make special mention to my mum Patricia and my dad John for their unequivocal support and belief in me; my gorgeous children Dillan and Maya for their daily inspiration and finally my wife Rebecca for her love, support, readiness to challenge me and patient translating, proof reading and editing duties. Your love and support means the world to me.

Ultimately, this book is dedicated to you, the reader. For by picking up this book you have become my fellow companion in human movement, joining me on my journey, which I am hopeful that mover by mover, we will evolve into an exodus.

# A note from the 'translator'

For anyone who knows Stephen personally, you will already know that he is an expert in his subject. However, being dyslexic has occasionally proven to be highly problematic in his professional life. He has been misinterpreted, misunderstood, assumed stupid, sacked for incompetence due to paperwork issues and even now he still gets the occasional rap via social media for not making sense due to his spelling, sentence structure, syntax and/or grammatical errors.

Living with dyslexia as an often hidden disability can be frustrating, difficult and disheartening. Stephen's dyslexia makes communication via the written word very difficult and forming coherent sentences and overall structure is almost impossible, with the sense of narrative often lost. Like his thinking, his idea of a finished paragraph is not linear! This has proven a huge challenge in actually getting his ideas written down in a logical and coherent format, resulting in a slow, stilted and drawn out process to get this book finished.

Faced with these challenges I have taken it upon myself to help Stephen spread his message, as I strongly believe it is a message worth sharing. Initially we weren't quite sure how to term my role in the production of this book and in the end we have opted for 'translator'. The way that Stephen and I have worked together, is by him writing his ideas down as he wants them to be heard and then me going through and 'translating' from dyslexic English into

something that is (hopefully) a logical, more readable format. This 'translation' process has been a labour of love and I hope that in the re-moulding of Stephen's words, sentences and structure, his ideas still shine through as he intended. For anyone who gets the chance, I cannot recommend highly enough that you experience Stephen's work verbally, from the man himself. Oration is his strongest medium of communication, where he is not bound by the restrictions of his dyslexia. He will intend to follow the release of this book with webinars and online lectures where people can experience his work orally as well as providing an opportunity for people to ask questions and engage with his work. In the meantime, I hope you enjoy this joint effort from the dyslexic, mad movement scientist and his sentence-structure loving wife!

-Rebecca Braybrook

# About the author

My love and fascination of human movement began at an early age. At seventeen years old I had a promising career in professional football ahead of me. However, sometimes fate deals you a funny hand that only makes sense in the light of retrospect. About to graduate from the professional youth team that I had been signed for at thirteen, into the world of the adult game I suffered a fateful injury. Tearing all but one of the ligaments and shattering both cartilages in my right knee. I was in a cast for six months and on crutches for eighteen months. Any shard of hope that I might return to my beloved game drained away as the months rolled by. I needed to come up with a different plan. Football had been my only love. I had taken time out of education to pursue my goal of playing professionally. This combined with undiagnosed dyslexia meant that I had left school without a single qualification to my name.

As my knee slowly healed and the realisation that I would never play again sank in, my passion for the game of football metamorphosed into something new. I threw myself into rehabilitation, learning how to build strength and condition my body in a different way than I had before. I trained. I ate a lot. I gained a lot of weight and muscle. And I became strong. Stronger than I had ever been before. As a sixteen stone powerhouse I was challenged to enter a body building competition the following year. Never one to miss out on a challenge, I dramatically changed my

training and my eating plan and lost five stone within a year to drop down to competing weight. But my five foot ten and naturally lean frame was not necessarily built for body building. As my obsession for weights and protein regressed my love for fitness and movement continued to grow. I threw myself into each and every discipline that interested me.

I trained to be a master personal trainer and enthusiastically continued to study for every type of fitness qualification that I could. In the process I became a black belt martial artist, a Pilates instructor, a football coach, an athletic coach and…well the list goes on. In all I have well over seventy sport and fitness qualifications to my name. But somehow it was still not enough. Finally, I took the decision to apply to university and at the grand old age of thirty three I embarked on my undergraduate course in Sport and Exercise Science.

I was diagnosed with dyslexia at University in my first year, which threw some light on why I had been designated into the learning needs class for all my subjects at school. It is one of my proudest achievements that I graduated with a first class honours degree without having any previous schooling qualifications. The passion for my subject shone through, despite all the additional work I needed to do to communicate this passion. I was dedicated and worked extremely hard. My love for the finer details of human movement naturally led me to further my studies by following on with a Masters in Sport and Exercise Biomechanics.

This is really where my problems began. The further I went into the theory of movement; the more I studied and learnt, the

more questions I had and the more things became confused for me. From my strong physical and movement based background I understood a lot about how the body really works on an actual physical level. As I studied the finer point of the theories and delved deeper into the world of biomechanics my much loved niche began to present me with some questions. So I allowed the question marks to flow and went deeper down the rabbit hole in search of the answers. Those questions and answers resulted in me writing this book.

# Preface

This book is a journey through the questions that I have asked about the established and oft taken for granted laws and rules that underpin how we speak about and define human movement. I started asking questions about why we do things in a certain way and why are we using certain laws or equations to define human movement. At every turn the general response that I received is "because we do." As a scientist, this is not an answer. So as the questions arose I have challenged myself to look for logical explanations, whilst at the same time opening my mind and imagination to the possibility of there being a different answer.

On expressing my views, the one question I get asked the most is "Have you got any research or references to back up what you are saying?" The answer in short, is no. Like most new scientific points of view, I am suggesting a different way, proposing new hypotheses and hopefully the research and 'proof' will follow. Some will go on automatically to assume that if there is no scientific backing then what you are saying is a waste of time. Then there is the other response. The furrowed brow, the calculating look as they way up both sides of the argument before them and the acceptance of open mindedness that allows the possibility of evolution to occur. This type of response is usually from people who understand that the hypothesis comes as the first stage of evolving a new scientific theory. I love conversing, engaging and discussing with the type of person who comes back with the second response as there is the opportunity to journey together.

With people who automatically present with the first response we do not usually have much to say to each other and I find myself feeling disappointed. Why disappointment? Well if you think about it, a lot of the research we carry out in the field of human movement today uses information in some way that has developed from older research papers, which has used even older papers and so it goes on until we find ourselves right back to the roots of a subject. The place where the information was originally birthed, setting the direction and tempo for future evolution of these ideas.

My issue is this. What if, there is the smallest chance, that the very oldest research into this subject has left us with assumptions, findings and mechanical laws that contain inherent flaws, problems and outdated ideologies? Of course, with a science background I completely understand and respect the idea that we need to test, evaluate and prove what is being said. I would be honoured to be involved in any research, development and testing that is able to prove the words in this book and if any one of you comes across a university or research establishment that is able to fund such an endeavour then please give me their phone number!

But currently, as we stand in this place in time, the movement world appears to be fractured into two dualities; those who are so entrenched with the laws and dogmas that have been laid down and accepted in stone as truth and those who are able to see and understand with their own physical being that some of the words, theories and laws we use to describe movement do not provide justice to the complexity of human movement. The second camp are often movement therapists, practitioners and people who

are working with the body in a physical capacity on a daily basis.

I am here to challenge. It is not my desire to speak someone else's words, based on the words of their predecessors, or to be told we do things in a certain way or believe certain truths "because we do." My aim is to be a catalyst. A revolutionary in the theoretical world of human movement, who sparks a thought or a feeling in people who are in tune with their own body movement. My aim is to guide you through the history of where we have come from, question the very foundations and shine a light towards the future pathway of how we talk about, define and study human movement. And although currently, at this point in time there is no 'proof' that what I am saying is true, I hope through the deductive reasoning in this book and your understanding of your movement through your own body, a natural conclusion will emerge.

Today, science still speaks of the laws of nature and movement as fixed mechanical laws. Is it not time to question this belief? Do our wonderful, dynamic, elaborate and complex bodies really move like a machine? Is it not time to use organismic control when describing biomechanics? Is it not time to accept that human movement is non-mechanical and free? Is it not time to closely analyse the foundational laws that biomechanics is built upon and ask ourselves the question:

*Are these laws correct when describing all human movement?*

If you require research and a science laboratories 'proof' that your body works like a machine as the old information on this

subject suggests, then I strongly recommend that you do not read this book. Your time and money will be far better spent on a book with repackaged archaic information that likens your body's movement to a lever or some other fixed analogy.

However, if you believe there is more to your movement than meets the biomechanical eye, then let us move on together…

# Introduction

Through the coming pages I am planning on taking you on a metaphorical journey. A whistle-stop tour through the foundational laws that biomechanics is built upon. We will pause for thought over the foundational theories that all theoretical movement education is still based upon today and question some of the biggest dogmas in the world of human movement. We will take a look at how history is still effecting the tools, language, diagnostics and conclusions of human biomechanics and most importantly, we will take a look at the possible alternative paths of evolutionary ideas to bring human biomechanics into the twenty first century.

Before we start, please note that throughout the book for simplicity and sense of continuity that I will mainly use the term 'biomechanics' and by this I am referring specifically to human, movement, biomechanics rather than any other branches of the wider term. Also, before we commence I need to make something clear. I am not here to flagrantly dismiss those who have made our understanding of human biomechanics possible thus far – their achievements speak for themselves. But I am here to stand on the shoulders of the giants of our past, in attempt to be part of the never ending and escalating tower of human evolution. I hope to provide additional and alternative information, which I believe can provide a pathway to a different way of thinking.

*"Imagination will often carry us to worlds that never were. But without it we go nowhere and without inspiration for future generations, we will continue to do as we have always done".*

- Carl Sagan

Finally, I have attempted to make the material in this book an easy and enjoyable read with succinct chapter 'pit stop' summaries for you to be able to digest the most important messages and threads that run through this book. Following the chapter summaries you will find a section entitled 'thinking cap', where I will present you with a series of questions. These questions are not designed to be taxing, nor are they supposed to be riddles but rather they are simple questions, designed for you to come up with an instant and spontaneous answer. I do not claim to have all the answers and I am hoping that by asking you, the reader, these questions will help to prompt your imagination and encourage you to ask yourself and others more questions.

The thoughts and questions that run throughout the course of this book are intended to provoke a response and I am fully expecting that some people will instantly resonate and like the ideas and some will not. My main hope is that in reading this book you will look behind your current understanding of biomechanics to the foundation of the subject and if you see even a glimmer of misconception that you are not afraid to speak out, join the movement evolution and become an evolved and integral movement practitioner.

# Part 1. The Past

## Human biomechanics: where has the theory of human movement come from?

# A summary of the forefathers of biomechanics

| | | |
|---|---|---|
| 450 – 380 BC | Euclid | Wrote postulates, which contained existing knowledge at the time of geometry and algebra. His geometric laws, which are based on straight lines and right angles are still used today in biomechanical modelling. |
| 1596 – 1650 | Rene Descartes | Devised the Cartesian coordinate system, which is a mathematical graph of three dimensions, meeting at right angles, which biomechanics uses today to pinpoint a point of reference (such as a bone, joint or object at a certain speed/angle etc.). |
| 1608 – 1679 | Giovanni Alfonso Borelli | Considered to be the first biomechanist, responsible for applying the study of mechanics to the study of human motion and developing the lever principle. |
| 1643 | Sir Isaac | Defined gravity, the Laws of Motion, calculus and many other physical |

| | | |
|---|---|---|
| – 1727 | Newton | principles. He is considered the founder of modern science and his principles of motion are what continues to underpin biomechanics today. |
| 1635 – 1703 | Robert Hooke | English polymath whose expertise included philosophy and architecture. Devised Hooke's law, which is a spring principle used in biomechanics to represent tissue movement. |
| 1707 – 1783 | Leonhard Euler | The pioneering Swiss mathematician and physicist, responsible for important discoveries in varied fields from infinitesimal calculus to graph theory. Euler evolved the Cartesian coordinate system to include rotation. |
| 1827 – 1861 | Henry Gray | The English surgeon and anatomist renowned for his dissection work and publication of his book, Gray's Anatomy, which is still widely accepted as a highly acclaimed anatomy textbook. The book was initially illustrated by Gray's friend |

| | | |
|---|---|---|
| | | and colleague Henry Vandyke Carter. |

# Chapter 1

# An introduction to the problem

*"A map is not the territory it represents, but if correct, it has a similar structure to the territory, which accounts for its usefulness".*

- Alford Korzybski

Do human beings move like robots? Is your movement a predictable, determined, mechanical action? To help me answer these questions I would like to invite you to conjure up a few images in your mind. So just humour me for a minute and play along. Think about Usain Bolt on the running track, Muhammad Ali in the boxing ring, Fred Astaire on the dance floor or Charlie Chaplain's improvised movement in the old black and white movies. Or imagine you are sat in a theatre watching the ballet, a visiting acrobatic circus or a contemporary dance collaboration. If you have children think about the movement they make as toddlers; natural, spontaneous movement. And then think about them as they learn to swim, ride their bike, practice martial arts or play football. Also, most of us can think of a time when a human beings movement has

left us awe struck and inspired. Whether it be from witnessing an extraordinary feat of acrobatics, admiring the speed and agility of our favourite athlete or being left open mouthed and astounded by a contortionist act.

Is anything about any of these individual's body movements mechanical or robotic? Instinctively, I am hoping that you are shaking your head and answering a clear, resounding "no" in response to this question. How can the beauty, agility and unpredictable nature of human movement be even closely compared to something robotic or mechanical? Even with amazing modern day advancements in twenty first century mechanics, engineers are a long, long way off even coming close to being able to replicate authentic human movement.

So, my next question is this. If our human body in all its complexity does not move like a robot then why do we use a scientific methodology to describe and analyse human movement that compares us to a machine? What is the purpose and usefulness of this?

Most individuals who are 'in to' human movement, all have something in common. Whether their interest lies in:

- Physical training - such as sportspeople, dancers, runners, cyclists, yoga practitioners, Pilate's practitioners, Feldenkrais practitioners or general fitness enthusiasts.

- Anatomy and physiology - such as massage therapists, Rolfers, fascial therapists or Alexandra Technique practitioners.
- Optimising performance - such as personal trainers and functional trainers.
- Rehabilitation, injuries or inefficient movement patterns - such as osteopaths, chiropractors and physiotherapists.
- Education – such as movement, sport or fitness related tutors, teachers and lecturers.
- Movement theory - such as kinesiologists or tensegrity advocates.

All these individuals, whether directly or indirectly; knowingly or unknowingly; independent of their background, discipline or approach to human movement share something of universal importance when it comes to human movement. Biomechanics. The underpinning, often taken for granted scientific laws that define most of the academic understanding, descriptions and analysis concerning human movement.

## What is Biomechanics?

As this succinct definition, which is separated into two parts briefly explains:

*Bio: meaning life; living organism.*

*Mechanics: meaning a machine.*

Biomechanics, therefore is the mechanical study of the structure and function of a biological system with the attempt to find the forces acting upon the mechanism of a machine. From a biomechanical standpoint this 'machine' can include humans, animals, plants, organs, and cells but for the purpose of this book we are specifically looking at human biomechanics in terms of human movement.

The ideas outlining biomechanical theories and implementation are based upon the following four mechanical principles:

Analytical mechanics – also known as theoretical mechanics, this branch of mechanics looks at scalar properties (physical quantity) of motion as opposed to Newtonian mechanics that looks at vector properties (quantity and direction). Using system constraints the degrees of freedom are limited and coordinate reduced to solve the problem of motion. Analytical mechanics does not take into account new physics.

Applied mechanics - this is a branch of the physical sciences that deals with the practical application of classical mechanics, bridging the gap between physical theory and its application. A practitioner of this discipline is known as a mechanician and is involved in examining the response of isolated bodies or systems to

external forces. Much of modern engineering mechanics is based on Sir Isaac Newton's laws of motion. Newtonian mechanics is widely known as classical mechanics, which is one of the oldest and largest subjects in science, engineering and technology. Classical mechanics was originally meant to be used in the field of engineering mechanics but it also provided a foundation from which biomechanics has sprung from.

Statistical mechanics - is a branch of mathematical mechanics that studies the average behaviour of a mechanical system, when the true state of the system is uncertain. The objective of statistical mechanics is to develop and employ mathematical models, theories and/or hypotheses to solve a question. The process of measurement is central to quantitative research because it provides the fundamental connection between small pieces of information with the aim of bridging the disconnection between the laws of mechanics and the reality of the organism human. This is achieved by making deductions about the whole or future based upon individual components of a system. It also uses simple mathematics by rejecting complex data, which does not operate in predicable ways. Statistical mechanics then attempts to find patterns, symmetry, regulatory and relationships among regulated numbers.

Computational mechanics - this discipline is concerned with the use of computational methods to represents mechanical principles. This branch is concerned with constructing mathematical models, quantitative analysis techniques and using

computers to analyse and solve biomechanical problems.

## Classical mechanics

Classical mechanics is the foundation of all mechanical principles and from the ideas outlined in the classical mechanical model, the applied and computational mechanical principles evolved. There are various branches of classical mechanics that we need to understand as we delve further into the foundation of biomechanics, including:

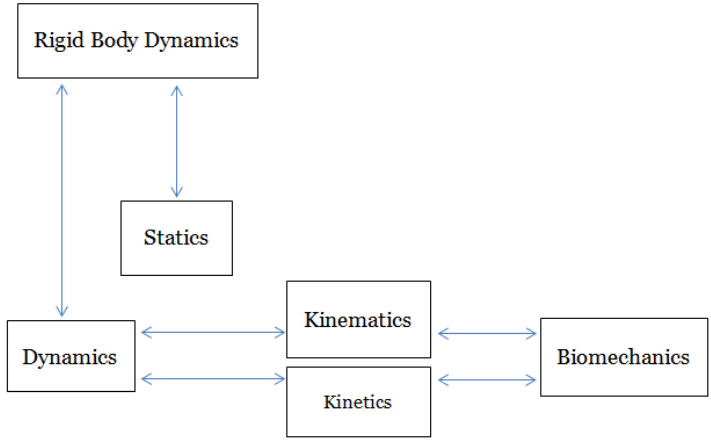
- Rigid-body dynamics – this studies the movement of interconnected bodies under the action of external forces, assuming that the objects under investigation are perfectly rigid; meaning that no part will deform, bend or stretch once forces are applied. This assumption simplifies the analysis procedure by reducing the variables.
- Statics – is concerned with the analysis of loads (force) on physical systems in static equilibrium.
- Dynamics - is concerned with the study of forces and torques and their effect on motion.
- Kinematics – based on geometry, this describes the motion of points, bodies (objects) and systems of

bodies (groups of objects) without consideration of the causes of motion.

- Kinetics - is concerned with the relationship between the motion of bodies and its causes, namely forces. Kinetics is based on mathematics and classical mechanics.

The interconnection of these branches of classical mechanics are represented in figure 1 below. This shows that statics, dynamics, kinematics and kinetics have all evolved based upon rigid body dynamics, which we will examine in more detail later on.

Figure 1




## The human body as a machine – where did this idea come from?

According to human biomechanics, man is made and moves like a machine. I am hoping the last time you looked in the mirror your reflection didn't look anything like a robot or tin person? I thought not. There is quite a lot of obvious differences between your human body and a machine, which can be defined as an often motorized tool; containing one or more parts that uses mechanical, chemical, thermal or electrical energy to perform a task.

There are six types of simple machine:

- Lever
- Wheel and axle
- Pulley
- Inclined plane
- Wedge
- Screw

Any of these simple machines uses a single applied force to do work against a single load force. Ignoring friction losses, the work performed is equal to the work produced. These simple machines are isolated parts or building blocks, which can then be connected together with rigid links to create a more complex machine.

This idea of small isolated parts being connected together to form a more complex machine is the analogy used in biomechanics to represent the human body. There are two mechanistic

frameworks that provided biomechanics with the foundational understanding that the body is a machine. Firstly, the universal mechanism and secondly, the anthropic mechanism.

The universal mechanism describes celestial and terrestrial bodies (space and earth), which is based around materialism and reductionism of the universe into simplistic mechanical principles. The concept of the universal mechanism uses Euclid's theory that nature can be described from a mathematical set of shapes, which provided those who believed in a mechanistic view that all natural phenomenon could eventually be explained in terms of mechanical laws.

The anthropic mechanism used the ideas and mathematics from the universal mechanism to describe what was happening upon the earth. When the anthropic mechanistic idea was devised, it was believed that both the body and the mind were formed of individual parts or simple machines. The ideas around anthropic mechanism is deeply indoctrinated and is still the foundation for biomechanics today.

Both, universal and anthropic mechanisms are external laws, which are deterministic; meaning that they follow a set standard of rigid rules that do not change. Biomechanics uses information from both universal and anthropic mechanisms to mathematically equate man's movement based upon simplistic and mechanistic theories.

## The organismic human

*"The whole is greater than the sum of its parts."*

- Aristotle

Today, biomechanics is still using anthropic and universal mechanics, which are over 5,000 year old ideologies. Because biomechanics is rooted in these theories, the very underpinning essence of this science assumes that our human body is a machine. Consequently, all of the scientific data involving human movement is associated with this belief. Is this theory correct? We know that the "map is not the territory" but surely there must be a more accurate map than the reductionist one we are currently holding in our hands.

The problems with viewing the body through this mechanistic looking glass are numerous. We know that machines are man-made, whereas the human organism is morphogenetic and infinitely more complex than any man built systems. One of the most vital differences between organisms and machines is to be found in the purposiveness of the systems. Both organisms and machines operate towards the attainment of a particular end, with their purposiveness being that of a completely different kind. A machine is extrinsically purposive because it operates towards an end that is external to itself, whereas an organism is intrinsic in its

design.

A machine does not serve its own interests but those of its maker or user. In contrast, an organism acts on its own behalf, towards its own ends. Its design is internal, arising from within, and serving no other purpose than to maintain its own organization. A machine is also organized, of course, given that the operation of each part is dependent on it being properly arranged with respect to every other part and to the system as a whole. But in an organism, the parts are not just there for the sake of each other, but they also produce each other, repair each other and generally exist by means of one another. Organisms, unlike machines, are not only organized but are also self-organizing and self-reproducing systems. From a mechanistic approach, with isolated parts attempting to create a 'whole' we are left with inherent separateness. True interaction between the parts is an impossibility as each part performs in isolation as its own 'whole'.

In addition, organisms have an autonomous self; the phenomena of self-formation, self-regeneration, self-preservation and self-repair are all characteristics of the internal dynamics of living systems. Machines, on the other hand, lack an autonomous self; their means of production reside outside of themselves, demanding outside intervention not just for their construction but also for their maintenance. Indeed, for the sustained operation of a machine, an external agent is required to determine when defective components need to be repaired or replaced and to carry them out in a timely fashion. In an organism, all of these processes are carried

out from within. Therefore, confronted with a machine, one is perfectly justified in inferring the existence of an external creator responsible for producing it in accordance to a preconceived plan or design.

Dynamic complex biological systems, including the human body and the production of human movement, have the tendency to spontaneously self-organize themselves to produce intricate patterns. The process of self-organization is the foundation of all living systems and is fundamentally associated with survival and evolution. The mechanistic approach of isolated parts, joined together to make up the whole cannot in reality self-organise, as within the mechanistic view, self-organisation would only effect the isolated parts. An organism however, will self-organise as a whole irrespective of the parts. The problem is that biomechanics is trying to explain biological life by means of mechanical ideology. However, unlike the predictability found in a mechanical system, self-organizing systems are non-predictable in nature.

## Quantitative vs qualitative

The preceding sections have introduced the outline of the problems associated with using a mechanistic model when analysing a complex, bio or living system such as the human body. So why has this view not been approached, questioned or

challenged before now? I believe one of the main reasons is because the mechanistic view of the world can at a rudimentary, simplistic level be mathematically understood. This enables the production of some empirical evidence, which helps to quantify the nature of life. Also, of course to challenge history and ideas that have evolved thus far takes a process of transformation. A quantum shift in education, understanding and belief.

However, just because the glorious and unpredictable nature of the human body makes it difficult to analyse from a mathematical point of view does not mean that there is not a better way. It is this unpredictability that presents a problem to the analysis of true human movement, as it is near impossible to mathematically equate the inherent random nature. So if the quantitative data is problematic, perhaps we need to look more closely at the qualitative element of analysis. Of course, there are many skilled practitioners of all disciplines that use a more qualitative approach with kinesiology at the most experiential end. Quantitative mathematics has its place, as does qualitative research but at the moment there is a huge cross wire in this area of understanding, which we will examine more thoroughly in section two.

Ultimately, I propose that for us to bring our understanding of the human body to a deeper, more profound level, we need to evolve some of the oldest foundations that our current knowledge has been built upon.

## Who cares?

I strongly believe that the biomechanical view of the human body is outdated. By questioning the foundations of a subject many of us take for granted we stand a chance of evolving our understanding and coming up with a working model that will enhance many people's understanding as well as their practice and results.

Currently, in the movement world from education through to practitioners, the theory behind the art of practice is being spread far and wide without a full understanding of the origins of the subject. There are many practitioners who are passing on their educational understanding of the theory behind their work, even though the reality is the words they are using are often at complete odds with their findings in clinical practice. So when we are talking about the theory of movement like this, it is not only paramount to enhance people's perceived understanding of the subject but it also has repercussions for implementation and practice.

The main areas that biomechanics influences on a far reaching level are:

- Improving performance.
- Preventing and treating injuries and postural related pain.

- Designing equipment to make movement easier for the human organism.

So if you are involved in any of the above then it is highly probably that you use the principles of biomechanics on a regular basis. Taking this into consideration, if you are using mechanical principles to analyse, treat, support your views or reach a desired goal then any information and subsequent prescriptions may contain inherent flaws, inaccuracies and may not be providing the most effective way of reaching a desired outcome.

Essentially, what I am talking about here is evolving our current thinking, models and way of talking about, analysing and treating human movement to fit in with twenty first century scientific understanding.

## Pit Stop Summary

- Biomechanics is based on a mechanistic view of the body with an underlying belief that the body is made up of the 6 simple machines in various combinations, in any of its systems.
- Biomechanics uses information obtained from universal mechanistic views. This theory originated from observations about space, with the parallel being drawn between occurrences happening on a celestial level and occurrences happening on earth.
- Biomechanics uses the information obtained from the anthropic mechanism, which was built upon the simplified constant of numbers being generated that reduced the complex and unpredictable to something more predictable and quantifiable.

Hopefully, from reading this first chapter you will agree that there are some obvious differences between a mechanistic system and an organismic system. Table 1 below highlights some fundamental differences. As you read through ask yourself, which column do you fall into if considering your own human body in context with the variables?

| **Variable** | **Organism / Bio** | **Biomechanics / Machine** |
|---|---|---|
| **Location** | Intrinsic | Extrinsic |
| **Identity** | Internally generated | Externally generated |
| **Operation** | Transitional | Isolated |
| **Attribution** | Interdependent | Dependent |
| **Determinism** | Whole | Parts |
| **Genesis** | Self-producing | Created by an agent/ man |
| **Product** | Evolution by nature | Designed by man |
| **Behaviour** | Flexible/adaptive | Fixed /rigid |

| | | |
|---|---|---|
| **Tested** | Non math models | Math models |
| **Outcome** | Non Predicable and non-determined | Predicable and deterministic |
| **Status** | Alive | Dead |

**Table 1 – Difference between an organism and a machine.**

## Thinking cap

*NB: Remember this Thinking Cap section contains straight forward questions. I am not trying to catch you out. As you read the questions just use your common sense to give a spontaneous answer. These are the basics and I am sure you as the reader can think of more questions that highlight the issues we face by continuing to use biomechanics, without opening up alternative movement theory possibilities.*

1) Do you move, think, feel, act and live like a machine?

2) Do you think a machine can replicate your human movement?

3) Do you think your skeleton, muscles fascia, blood, ligaments etc. operate according to mechanistic logic?

4) Does using machine science based on innate objects truly represent the human organism?

5) Remember, biomechanics is based on a mechanistic view of the body that has evolved from universal and anthropic mechanics. Does this logic provide an accurate map to describe the workings of the human organism?

6) According to mechanistic theory and human biomechanics our

body is like a machine. If this were true and we are robot like then who created and maintains the machine

I hope you have enjoyed this free chapter of my new book The Evolution of Biomechanics.

The full copy can be purchased here:

https://www.amazon.com/Evolution-Biomechanics-Bringing-movement-theory/dp/0995503303/

I always love to connect with people about movement, so please feel free to join the movement theory revolution, get in touch and share your views…

***Yours in movement***

**Stephen Braybrook**

**The Movement Man**

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