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HISTORICAL PERSPECTIVE
The developing understanding of Human Health and Fitness: 7. The Victorian Era

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Abstract

Physiological research flourished during the Victorian Era, particularly in France and Germany. Scientific societies were founded. The cult of Positivism encouraged evidence-based research, and the new laboratory equipment developed by Victorian technology allowed investigators to form an accurate picture of cardiac, respiratory and muscular function. In scientific circles, the theory of Evolution supplanted Creationism, and a growing understanding of Microbiology allowed the first effective measures to be taken against epidemics. Although a few health professionals advocated exercise for health, therapy, and intellectual development, many doctors continued to treat illness with prolonged bed rest. The first Sports Medicine texts appeared, but their focus was more upon the treatment of athletic injuries than on the promotion of positive health. Nevertheless, interest in Preventive Medicine was spurred by the work of Florence Nightingale and Almoth Wright in military hospitals. Vigorous exercise programmes also played a role in some popular forms of "Alternative Medicine." Good health had previously been seen as a gift bestowed by a capricious God. However, liberal Victorian theologians began to argue the need for both personal and societal efforts to enhance an individual's wellness. Philosophers questioned the nature of reality, and some proposed revolutionary solutions to social problems. Many thinkers began to recognize the individual's role in the quest for good health, and some political leaders demonstrated this belief through their personal lifestyle. Nevertheless, various social changes continued the trend to a reduced need for regular physical activity. Victorian society saw the construction of mass transportation systems, the introduction of new spectator pastimes and a progressive decrease in the energy costs of industrial and domestic work. In Europe, there was a strong rivalry between German and Swedish systems of gymnastic instruction, with both approaches finding their supporters among corresponding ethnic communities in North America. During the final two decades of the 19th century, English "public" school athletic programmes began to attract attention across Europe. The founding of a wide range of sporting organizations testified to both popular interest in sport and a panoply of new recreational opportunities. For women, the relaxation of dress codes allowed an ever-growing range of recreational activities. Spectator sport flourished as events were popularized by newspapers and made accessible by mass transit. Sedentary entertainment included reading, drama, concerts, and opera for the social elite, and burlesque for the working class. The wealthy frequented dining and gaming clubs, whereas workers gathered at their neighbourhood "pub" to wager on foot races and boxing matches. In the summer, the railways offered excursions to the seaside and Lakeland resorts. Boards of Public Health began major efforts to improve urban hygiene. Slavery and child labour were abolished, housing conditions were improved, and there was a burgeoning birth rate. Fitness was still considered in the context of survival. There were strident calls for church congregations to adopt Muscular Christianity, but there is little objective data on fitness of the adult population during the Victorian Era. **Health & Fitness Journal of Canada 2013;6(2):3-83.**

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Introduction

Previous articles in this series have explored the developing understanding of health and fitness, beginning in the earliest days of pre-history, and continuing through to the Enlightenment (Shephard, 2011; Shephard, 2012a, 2012b, 2012c; Shephard, 2012d; Shephard, 2013). The Victorian era corresponds, strictly, with the reign of Queen Victoria in Great Britain (from

1837-1901 CE). However, for the purpose of our present review, it is convenient to include also the shorter Edwardian era and other events until the outbreak of World War I, in August of 1914.

The reign of Queen Victoria was marked by a prolonged period of peace in Britain, with a growing prosperity in most levels of society, based in part on the exploitation of resources from distant colonies and in part on growing economic dividends from the industrial revolution. With passage of the Reform Act of 1832, the British parliament became much more representative of and responsive to ordinary people. This piece of legislation corrected the worst abuses of "Rotten Boroughs," and increased the allocation of parliamentary seats to large industrial cities (Evans, 1994). Nevertheless, most women remained disenfranchised. "Public" schools such as Rugby urged amateur sport upon upper-class students and their parents as preparation to serve the needs of "Nation and Empire." A growing middle-class now owned property and had gained some prominence in Society and in the administration of Non-conformist chapels. In general, the middle-classes wished to conserve their recent economic and social gains; thus, they favoured conservative policies. A progressive shortening of working hours and a growing disposable income allowed many middle-class citizens to contemplate new forms of leisure activity. The growing prosperity of Victorian Britain was perpetuated into Edwardian times, but the new monarch also brought a relaxation of many of the social constraints that had limited the activities of "respectable" Victorians.

In Europe, the latter part of the Victorian age corresponded with the "Belle Epoch." Many Europeans also enjoyed a growing material wealth, and with faith in the potential of new technology they saw the first signs of progress towards effective health care. In North America, it was the "Gilded Age," marked by an unprecedented growth in both population and personal wealth. By 1900, the per capita income in the U.S. was double that of France and Germany, and 50% higher than that in Britain. The "Robber Barons" of North American industry, in particular, were busy making an ostentatious display of their accumulated fortunes. But in many parts of the Globe, the horrors of World War I and the Russian Revolution brought a sudden challenge to many years of apparent progress, with a sudden disappearance of the long established distinction between a leisured class and their servants.

Technological innovation assumed a rapid pace in the Victorian Era. Steam locomotives began to haul passengers across the countryside at unbelievable speeds. Steam ferries and ocean-going ships constructed from iron or steel were also speeding travel across rivers and oceans. Horse-drawn trams gave place to electric streetcars, petrol-driven vehicles replaced horse-drawn buses, and subway routes bored their way under many of the large cities of Europe. At the same time, the scope of the scientist was greatly enhanced as the laboratory bench offered coal gas and electrical outlets. And mass circulation daily papers quickly drew the attention of a much better educated general public to all of these advances.

Many of the smaller European States and Principalities, previously insignificant and isolated entities, merged to become major players on the international stage. In a milieu of intense nationalism,

physical education often assumed the form of militaristic drill. A variety of new sports emerged, each with its own national and/or international regulatory organization. Some of these initiatives increased possibilities for active physical leisure, but many simply provided alternative opportunities for spectatorism and gambling.

We consider now the impact of these various historical developments upon the knowledge and practice of Health and Physical Fitness during the 19th century. We examine the thinking of Victorian doctors, theologians, philosophers and statesmen. We note the growth of physical education as an academic discipline, and we discuss some of the new forms of sport and recreation. Finally, we examine limited information concerning the health and fitness of the population in Victorian times.

Scientific advances in the Victorian era

The growing ease of national and international travel spurred the growth of scientific societies, including many groups devoted to the discussion of advances in Physiology and Health. Quantitative, evidence-based research received a boost from the Positivism of August Comte. New types of laboratory equipment gave important insights into the biology of the circulation, respiration, metabolism and muscle function. At least for the scientist, the theory of Evolution supplanted the doctrine of Creationism, and the idea of spontaneous generation was replaced by a growing understanding of both microbiology and the factors that led to the spread of microorganisms. Finally, epidemiologists acquired the knowledge needed to take effective measures against disease, both in hospitals and in the community.

Scientific Societies. The nineteenth century was marked by the foundation of many national societies devoted to the discussion of research in Physiology, Public Health and Sports Science, with individual groups developing their own specialty journals. The emergence of analogous international organizations allowed a cross-fertilization of the ideas developed at various national conferences.

Physiology. French physiologists had a dominant global influence during the first half of the 19th century. The *Journal de Physiologie Expérimentale et de Pathologie* began publication as early as 1821. The *Société de Biologie* was founded in 1848 (Bange, 2009), and it began publishing the *Comptes rendus des séances de la Société de Biologie et de ses filiales* in 1852. French physiologists continued to participate in these two organizations until 1926, when a separate *Association des Physiologistes* was founded. The *Association des Physiologistes* held its first congress at Strasbourg in 1927.

Many eminent physiologists were also to be found in German universities throughout the nineteenth century. *Pflügers Archiv für die gesamte Physiologie des Menschen und der Tiere* (now known as the European Journal of Applied Physiology) dates from 1868. It claims to be the first peer-reviewed journal in Applied Physiology. The founding Editor was Eduard Friedrich Wilhelm Pflüger (1829-1910 CE), a physiologist at the University of Bonn (Nilius, 2006). Somewhat surprisingly, the *Deutsches Physiologische Gesellschaft (German Physiological Society)* was not organized until much later, in 1921.

Although Experimental Physiology flourished in both France and Germany, it

remained virtually non-existent in Britain during the early part of the nineteenth century. Indeed, when Ernest Starling was appointed as Demonstrator in Physiology at Guy's Hospital in 1887, he complained (Henriksen, 2000):

"The only physiological laboratory was a small empty room. When I applied for £200 to buy apparatus...I was informed that 'a medical school is not a place to do research in.'"

When I began my studies as a Physiologist at Guy's Hospital in the late 1940s. I was shown to that same small and still empty room!

During the Victorian Era, most British students in the Health Sciences were taught at the bedside, by visiting surgeons and physicians. One exception was University College, London, where William Sharpey (1802-1880 CE) was appointed to a Chair of General Anatomy and Physiology in 1836. The British Physiological Society began as a small dining club, with a select group of 19 Academics (all men) attending the inaugural meeting on March 31st, 1876. The immediate reason for their first gathering was to formulate a cohesive response to the *Royal Commission of Enquiry into Vivisection*, which had been established in the previous year. The first issue of the *Journal of Physiology* appeared in 1878, and regular scientific meetings of the *Physiological Society* began in 1880. However, women were only admitted as members of the Society in 1915, and their participation continued to cause controversy for some further years (Sharpey-Schaefer, 1927). In contrast to the men, when presenting papers, the women were required to identify themselves by their first names rather than their initials.

The *American Physiological Society* (APS) began meeting in 1887, with a roster of 28 members. Many of the group had German, French or British roots. The first scientific gathering of the APS was held in Washington, DC, and it took the form of a joint meeting with the newly formed *Congress of American Physicians and Surgeons* (Brobeck et al., 1987). The *American Journal of Physiology* began publication 10 years later (Parascandola, 1987). For many years, Canadian physiologists were content to attend the meetings of their American colleagues, and the *Canadian Physiological Society* did not become an independent entity until 1936.

The first meeting of the *International Union of Physiological Societies* (IUPS) was held in Basel, Switzerland, in 1889, and triennial meetings of this organization have subsequently taken place in various major cities around the world.

Public health. The organization of societies devoted to Preventive Medicine and Health Promotion generally lagged behind the formation of Physiological Societies. Nevertheless, an *Association of Metropolitan Medical Officers of Health* was established in Britain in 1856, and in 1873 this became the *Society of Medical Officers of Health*. The *Royal Society of Health* was formed in 1876. The *Canadian Medical Association* dates from 1867, but the *Canadian Public Health Association* was not founded until 1910.

Sports Science. In French Canada, *La Societé Canadienne pour l'avancement du Sport* was founded in Montreal in 1899. Its objectives included the honouring of outstanding athletes, the establishment of

a library and archives and the introduction of a scientific approach to training and coaching. The Society enjoyed the patronage of the Governor General of Canada and the Mayor of Montreal, but it only survived for a year or so, mainly due to a lack of operating funds (Kidd, 1996).

Positivism, Anti-positivism and Critical Theory. Auguste Comte (1798-1857 CE) was educated at the University of Montpellier, France. He became a strong advocate of the Positivism that espoused a mechanical understanding of how the universe operated. He maintained that authentic knowledge in both social and natural sciences was derived from a person's sensory experience, followed by a logical and mathematical treatment of the resulting data. He thus set the stage for much of our modern research. Reliable and valid techniques of quantitative measurement and the sound application of Statistics provide the essential foundation for modern Evidence-based Health Care.

The doctrine of Positivism was vigorously opposed by some philosophers, particularly Max Weber (see below). More recently, this assault has been renewed under the rubric of "Critical Theory." In the view of Critical Theorists, both the questions that are asked by the Positivist and the resulting data are inherently biased. Information must be interpreted in the contexts of the society and culture where it has been garnered (Charmaz, 1995). Nevertheless, most Exercise Scientists remain essentially Positivists, working hard to eliminate any personal bias from their findings. In contrast, any research conducted by Critical Theorists is usually qualitative, and is based heavily upon descriptions and value judgments. The latter approach has sometimes proven fruitful in the areas of Sports Sociology and Sport History (Andrews, Mason and Silk, 2005; Bain, 2010). It is also worth remembering that supposedly "objective" data, such as the usually observed age and sex differences in muscular strength, reflect in part age and sex-related differences in the opportunities that people find to engage in regular and challenging bouts of physical activity.

In this connection, Victorian and Edwardian Society took the first tentative steps to curb cultural expectations that militated against the realization of physical potential by women and the older members of society.

Circulation. The new technology of the 19th century offered health scientists improved instrumentation to study the physiology of the human circulation. In some instances, investigators were spurred by a wish to monitor their own disorders of health. Now it was possible to make accurate measurements of resting blood pressure, to study pulse wave variations, to record the electrical activity of the heart, to explore cardiac innervation, and to make indirect but relatively accurate estimates of cardiac output.

Blood pressure. The Parisian physician and physiologist Jean Louis Marie Poiseuille (1797-1869 CE) was the first to introduce the mercury hydrometer, using it for circulatory studies in experimental animals. This simple device remained the preferred method of measuring blood pressures when I was carrying out investigations on rabbits and cats during the 1950s.

In 1855, Karl von Vierordt (1818-1884 CE), Professor of Physiology at the University of Tübingen, pointed out that if a sufficient external pressure was applied to a human artery, the distal pulse could be temporarily obliterated. He and Samuel Siegfried Karl von Basch (1817-1905 CE), personal physician of the emperor Maximilian of Mexico, both developed blood pressure meters based on this observation. However, the cuff sphygmomanometer was brought to its presently used clinical format by the Italian internist Scipione Riva-Rocci (1863-1937 CE), Director of the hospital in Varese. In the do-it-yourself spirit typical of the early Physiology laboratory, Riva-Rocci improvised his equipment using an ink-well, some copper tubing, a bicycle tyre and a jar of mercury (Roguin, 2006).

René Théophile-Hyacinthe Laennec (1781-1826 CE), a physician at the Necker hospital in Paris, was himself severely afflicted with tuberculosis. He is credited with invention of the stethoscope. It was originally conceived as a means of auscultating the chest and heart sounds of blushing young maidens without applying an ear to their naked chests. Laennec wrote (Laennec, 1819):

"In 1816, I was consulted by a young woman laboring under general symptoms of diseased heart, and in whose case percussion and the application of the hand were of little avail on account of the great degree of fatness. The other method just mentioned [direct auscultation] being rendered inadmissible by the age and sex of the patient, I happened to recollect a simple and well-known fact in acoustics, . . . the great distinctness with which we hear the scratch of a pin at one end of a piece of wood on applying our ear to the other. Immediately, on this suggestion, I rolled a quire of paper into a kind of cylinder and applied one end of it to the region of the heart and the other to my ear, and was not a little surprised and pleased to find that I could thereby perceive the action of the heart in a manner much more clear and distinct than I had ever been able to do by the immediate application of my ear."

Laennec quickly replaced this improvised device with a wooden tube that he called a stethoscope, deriving the name from the Greek *stethos* (chest). The potential application of this device to the measurement of blood pressure was quickly appreciated.

Credit must also be given to Nikolai Korotkov (1874-1920 CE), who gave a careful description of the sounds that were heard during the sphygmomanometric measurement of blood pressure. Korotkov was a Russian Army Surgeon with a penchant for terse prose. His description of the technique of blood pressure measurement, published in "*Izvestie Imp. Voiennomedicinskoi Akademii*" (*Reports of the Imperial Military Medical Academy*) required only 281 words (Korotkov, 1905).

The Pulse Wave. The Scottish cardiologist James MacKenzie (1853-1925 CE) was interested in recording abnormalities of cardiac rhythm, in part because he himself suffered from an ischemic arrhythmia. He developed a simple wrist polygraph, and from his use of this instrument he distinguished 3 types of arrhythmia: the "youthful" type, corresponding to our sinus arrhythmia, the "adult" type seen particularly during periods of anxiety or exertion (corresponding to ventricular extrasystoles), and the "dangerous" type

with a completely irregular rhythm, corresponding to atrial fibrillation (Mackenzie, 1902).

A somewhat related device (the "heartometer") was long used by Dr. Tom Cureton (1901-2002 CE), Professor of Physical Education at the University of Illinois, in his studies of the cardiac response to exercise. Cureton's reliance upon this instrument offers an interesting commentary on the need of Physical Educators to use very indirect measurements of physical fitness and cardiac function until the latter half of the 20th century.

The Electrocardiogram. For the medically qualified clinician, the diagnostic potential of pulse wave recording was soon eclipsed by the ability to record the electrical activity of the human heart. The British physiologist Augustus Desiré Waller (1856-1922 CE) used Lippmann's mercury capillary electrometer for this purpose, but the inertia of the mercury column precluded accurate recordings of the changes in the heart's electrical potential (Katz and Hellerstein, 1964). The principle of the string galvanometer, as described by the French engineer Clément Ader (1897), allowed Willem Einthoven (1860-1927 CE) to obtain ECG tracings of greatly improved quality. Einthoven was born in Indonesia, but he returned to Holland to complete his education (Snellen, 1995). While attending Medical School, he showed great intellectual talent, and he was appointed Professor in Utrecht even before he had formally graduated! His attitude to scientific writing was commendable. All of his reports were locked in his desk for at least a year; they were then published, but only if the findings had been confirmed by subsequent research. Einthoven described the sequential changes of electrical potential that occurred over the course of a cardiac cycle, setting these observations in the theoretical framework of his "triangle" of limb leads. In 1906, he constructed a delicate string galvanometer that could record the ECG of a recumbent subject. However, much further technical progress was needed before clear ECG recordings could be obtained when a patient was exercising.

In addition to being a brilliant laboratory investigator, Einthoven was a strong believer in regular physical activity. During the long hours of medical instruction, he repeatedly urged his fellow students "not to let the body perish". He became President of the local Gymnastics and Fencing Union, and was one of the founders of the Utrecht Student Rowing Club.

Cardiac output. Sir Thomas Lewis (1891-1945 CE) was a British cardiologist (although he himself preferred to call himself a cardiovascular disease specialist). He coined the term "Clinical Science," and founded the journal "*Clinical Science*." He spent his entire career at University College Hospital in London, establishing the reputation of that institution as a leading centre of clinical physiological research. Lewis became a pioneer in applying ECG recording to issues of clinical diagnosis. He also studied blood flow in the human limbs, using the somewhat cumbersome device of a water-filled plethysmograph. He linked the resulting data with ECG recordings, focusing particularly upon the changes in blood flow that were associated with irregularities of cardiac rhythm.

The German physiologist Otto Frank (1865-1944 CE) inherited the passion that Carl Ludwig (1816-1895 CE) and Herman Helmholz (1821-1894 CE) had shown in applying mathematical principles to circulation of the blood (Zimmer, 1996). Frank sought to apply the concepts of length and force previously established in studies of skeletal muscle to describe myocardial function, and he constructed rigorous pressure-volume curves for the left ventricle of experimental animals (Frank, 1899). Building on this research, the English physiologist to University College London, Ernest Henry Starling (1866-1927 CE), promulgated the "Frank-Starling pressure-volume relationship" (Henriksen, 2000; Katz, 2002). As he explained it (Starling, 1918):

"The law of the heart is therefore the same as that of skeletal muscle, namely that the mechanical energy set free on passage from the resting to the contracted state depends on the 'area of 'chemically active surfaces,' i.e. on the length of the muscle fibre."

Along with his colleague William Bayliss (1860-1924 CE), Starling's animal research led him into conflict with a determined group of Swedish anti-vivisectionists who had infiltrated the lecture hall at University College. It was alleged that an illegal operation on a conscious and struggling dog had been performed before an audience of 60 medical students. Bayliss maintained that the dog was fully anaesthetized, sued for libel, and won his case. Nevertheless, in 1906 the anti-vivisectionists placed a statue of the dog in Battersea Park, and this memorial was the frequent target of undergraduate pranks (Lansbury, 1985).

Attempts to determine the output of the human heart were facilitated by a Dissenting clergyman and amateur chemist, Joseph Priestley (1733-1804 CE). He was the discoverer of oxygen, and a scholar who tried to reconcile and fuse Enlightenment rationalism with Christian Theism. In 1772, Priestley synthesized nitrous oxide, then termed "Laughing Gas" or "phlostigated nitrous air" (Keys, 1941). This gas was highly soluble in blood, so until recirculation occurred, cardiac output could be estimated from the pulmonary uptake of this gas, using a principle enunciated by Adolph Eugen Fick (1829-1901 CE), a German scientist who was then Professor of Physiology and Anatomy in Zurich. The first human experiments using nitrous oxide began in the Copenhagen laboratory of August Krogh (1874-1949 CE). Here, Johannes Lindhard (1870-1947 CE) used a cycle ergometer to study the uptake of this gas at various known intensities of exercise. He further demonstrated that a course of physical training led to an increase of resting stroke volume, with a corresponding slowing of resting heart rate. Lindhard is also to be lauded for his struggle to establish the "Theory of Gymnastics" as a legitimate academic subject. He succeeded in this endeavour, at least at the University of Copenhagen; he took great care to ensure that scientific integrity was not compromised in the process, and the Copenhagen laboratories remain a highly respected centre of clinical physiology to this day (Jensen and Bonde, 2011).

Acetylene was discovered by the Irish chemist Edmund Davy in 1836 (1785-1857 CE), and in 1860 it was rediscovered by the French chemist Marcellin Berthelot (1827-1007 CE), best known for his antagonism to "*Vitalism*"

(the supposed distinction between inorganic and organic matter). Acetylene was soon suggested as another foreign gas that was suitable for the determination of cardiac output (Grollman, 1929). Grollman (1929) had exercising subjects breathe a rather unpalatable 20-30% concentration of acetylene. Although this concentration was not toxic in itself, the odour was unpleasant, and the gas was sometimes contaminated by dangerous amounts of phosphine and arsine. Grollman noted a considerable inter-individual scatter in the cardiac output at any given intensity of exercise, and he suggested that this reflected the influence of active muscles upon venous return. He further speculated that training would lead to greater muscular coordination, an increased economy of movement, and thus a lesser venous return. More recently, the acetylene technique has found renewed application, as more sensitive gas detectors have allowed the breathing of safer and more pleasant concentrations of acetylene, sometimes as low as 1% (Simmons and Shephard, 1969).

Cardiac innervation. Much of our knowledge of cardiac innervation was derived from animal rather than human experimentation. The inhibitory action of the vagus nerve was first described in Leipzig, by Ernst Heinrich Weber (1795-1878 CE), Professor of Anatomy and Physiology, and his brother Eduard Friedrich Weber (1806-1871 CE). Ernst Weber is also recognized for his studies of sensory perception, particularly Weber's Law, which states that the just perceptible difference between two stimuli (such as the heaviness of differing weights) is proportional to their magnitude.

In 1863, the French physiologist Etienne-Jules Marey (1830-1904 CE) went on to show that the heart rate was slowed if the blood pressure rose (Marey, 1863). Marey is also remembered for his conviction that movement was the most important of all human functions. Albert von Bezold (1836-1868 CE), Professor of Physiology in Jena and Würzburg, described the sympathetic innervation of the heart during the 1860s and Johann Nepomuk Czermak (1828-1873 CE), working at various universities in Austria and Germany, demonstrated that the pulse rate could be slowed by applying pressure to the carotid region of the neck. Thus the groundwork was laid for the studies of two outstanding American physiologists. Walter Bradford Cannon (1871-1945 CE), Professor of Physiology at Harvard, discovered adrenaline and the "fight or flight reaction," and the German-born Otto Loewi (1873-1961 CE), who studied the action of acetyl choline in Graz, Austria until 1940, when he "voluntarily" relinquished his possessions to the Nazis and fled to the United States. The Russian scientist Ivan Petrovich Pavlov (1849-1936 CE), Professor of Physiology at the Institute of Experimental Medicine in St. Petersburg, provided the final pieces of this puzzle with his description of circulatory auto-regulation.

Respiration. Respirologists of the Victorian era determined the characteristics of haemoglobin, built mechanical devices to provide accurate measurements of lung volumes and developed new methods to determine gas exchange both at rest and during exercise.

***Haemoglobin*.** The German chemist Julius Lothar von Meyer (1830-1895 CE)

was the originator of the Periodic Table of chemical elements. He appreciated that oxygen was carried in the blood stream not only in physical solution, but also as a loose, unstable compound with a red pigment that the Cambridge mathematician George Gabriel Stokes (1819-1903 CE) had termed *Cruorine* (Meyer, 1857; Stokes, 1863-4). Because of this chemical bonding, Meyer found that the amount of oxygen released from the blood when the atmospheric pressure was reduced was less than would have been predicted by application of Dalton's Law of partial pressures.

The German anatomist Karl Bogislaus Reichert (1811-1883 CE) succeeded in crystallizing haemoglobin in 1849. Shortly afterwards, Ernst Felix Hoppe-Selyer (1825-1895 CE), the first Professor of Biochemistry in Strasbourg and founder of the first biochemical journal (*Hoppe-Seyler's Zeitschrift für physiologische Chemie*, 1896), also managed to crystallize this pigment. Hoppe-Selyer went on to describe the characteristic absorption spectrum of haemoglobin, applying this knowledge to devise a simple clinical method of determining blood concentrations of this pigment.

It was left to Sir Joseph Barcroft (1872-1947 CE), Professor of Physiology at Cambridge, to underline the importance of haemoglobin to human existence. In his classic monograph "*The respiratory function of the blood"* he wrote (Barcroft, 1914):

"But for its [hemoglobin's] existence, man might never have attained any activity which the lobster does not possess, or had he done so, it would have been with a body as minute as the fly's."

Barcroft carried out his research in the audacious tradition of early British Human Physiology, not hesitating to serve himself as a subject in dangerous human experiments. Working in what was then termed the *Royal Engineers Experimental Station* on Porton Down (a laboratory where I also served for 6 years) he carried out experiments on asphyxiating gases, exposing himself to an atmosphere containing hydrogen cyanide. On another occasion, he remained in a glass chamber for seven days in order to calculate the minimum quantity of oxygen required for survival, and in a third experiment he exposed himself to such a low temperature that he collapsed into unconsciousness.

Details of the gas-carrying capacity of the blood were further elaborated by Christian Bohr (1855-1911 CE) and his pupils August Krogh (1874-1949 CE) and Karl Albert Hasselbach (1874-1962), working in Copenhagen's laboratory of Clinical Physiology,

Lung volumes. Although Borelli had measured the inspiratory volume of the chest as early as 1680 (Shephard, 2012d), the first large-scale survey of lung volumes was not undertaken until 1846. The English surgeon John Hutchinson (1811-1861 CE) built a water-sealed spirometer, and adopted something approaching our modern technique of representative population sampling as he evaluated the vital capacity of 2130 subjects. His volunteers ranged from "*paupers*" to "*gentlemen,"* and included artisans, servicemen, pugilists and wrestlers (Hutchinson, 1846). Hutchinson noted the direct relationship of vital capacity to the individual's height and its inverse relationship to age. His studies were warmly acclaimed in the Board

Rooms of those selling Life Insurance (Bishop, 1977; Petty, 2002):

"*we have no hesitation in recording our deliberate opinion, that it forms one of the most valuable contributions to physiologic science that we have met with for some time. In all future investigations into the phenomena of the respiratory process, the name of Mr. Hutchinson must receive honorable notice."*

It is thus no surprise that soon after completing his survey, Hutchinson obtained a rewarding contract as consultant to the Insurance Industry. Given the prevalence of tuberculosis in Victorian London, he used his tables of vital capacity to make quite successful actuarial predictions of an individual's likely longevity.

The issue of longevity had earlier attracted the attention of James Easton, an author living in Salisbury, Wiltshire. He had compiled an annotated list of names, ages, places of residence and/or decease of 1,712 persons who had supposedly lived for a century or longer between the years 66 and 1799 CE (Easton, 1799). Easton had concluded:

"It is not the rich nor the great, not those who depend on medicine, who become old, but such as use much exercise."

Borelli had appreciated that not all of the air was expelled from the lungs by a complete expiration, and the English chemist and inventor of the miner's safety lamp, Humphrey Davy (1778-1829 CE) estimated the magnitude of this "residual volume" by noting the dilution of hydrogen when this was used as a tracer gas.

The main limitation of Victorian spirometers was the substantial inertia of the water seal; this did not compromise static measurements, but it precluded the accurate recording of dynamic lung volumes. A further century would elapse before the introduction of Perspex spirometer bells and electronic flow meters resolved this mechanical problem (Shephard, 1955).

Metabolic gas exchange. The idea of using some form of spirometer to study the metabolic gas exchange of human subjects was advanced by August Krogh (1874-1949 CE) in Denmark (Krogh, 1916), and by Francis Gano Benedict (1870-1957 CE) in the United States (Benedict and Emmes, 1915; Shephard and Aoyagi, 2012). At Oxford University in England, C.G. Douglas (1892-1944 CE) and John Scott Haldane (1860-1936 CE) developed the alternative "open-circuit" method of measuring gas exchange, collecting expired gas in a series of rubberized canvas bags (Douglas, 1911).

In Germany, the High Altitude and Aviation Physiologist Nathan Zuntz (1847-1920) devised a mechanical respirometer that was small and light enough to carry on the back of a worker or a mountaineer (Shephard and Aoyagi, 2012; Zuntz et al., 1906). This set the stage for ergonomic studies evaluating the work loads imposed by heavy industry. With the exception of the Benedict clinical spirometer (where carbon dioxide output was determined by a decrease in bell volume that resulted as gas was absorbed in soda lime), these various approaches to the measurement of human energy expenditure relied for many years on the tedious chemical analysis of expired gas samples.

Zuntz underlined the importance of the respiratory dead space to the overall process of gas exchange, and after many years of lively exchange at scientific meetings and in peer-reviewed journals, Zuntz finally convinced Haldane that pulmonary gas exchange occurred simply by physical diffusion, rather than through some mysterious process of "pulmonary secretion" that the British physiologist had obstinately espoused.

Tissue Respiration. By the 19th century, it had become generally accepted that the combustion of foods occurred throughout the body. Evidence in support of this view was adduced by Magnus, Becquerel, and Bernard. The principles of the conservation of energy and the conversion of the energy content of foodstuffs into external work were established and developed by von Regneault, Helmholtz, Voit, von Mayer, Rubner, Atwater and Benedict.

Magnus. Heinrich Gustav Magnus (1802-1870) was a German chemist and physicist who spent much of his career at the University of Berlin. He made a major contribution to our understanding of tissue respiration by developing an improved mercury pump to determine the oxygen content of the blood. He found that arterial blood consistently contained more oxygen than venous specimens, thus implying that oxygen was consumed in the peripheral tissues.

Becquerel. Antoine César Becquerel (1788-1878 CE) was a pioneer French "electrical scientist." In collaboration with Breschet, he carried out (Becquerel and Breschet, 1835):

"*new observations on the measure of the temperature of the organic tissue of the bodies of men and animals by the means of thermo-electric effects.*"

He succeeded in introducing a thermocouple into the arm muscles of one of his subjects, and noted that the temperature rose by at least 1ºC during a bout of violent exercise. My personal experience as a subject who was frequently fitted with intra-muscular thermocouples while serving in the R.A.F. suggests that this would have been an unpleasant experience! However, it did provide convincing evidence that heat was being generated in the active limbs.

Bernard. The French physiologist Claude Bernard (1813-1878 CE) is best known for his ideas on the constancy of the *milieu intérieur*. He amplified work from the laboratory of Justus von Liebig (1803-1873 CE), showing that although the temperature of the active muscles was much higher than that of the blood perfusing them, blood from the left side of the heart, as sampled in the carotid artery, was cooler than that taken from the jugular vein. Thus, he disproved the long-held view that substantial heat production occurred within the heart itself (Bernard et al., 1854).

von Regneault, Henri Victor von Regnault (1810-1878 CE) was a pupil of Liebig, working in Giessen. He perfected a closed-circuit metabolic apparatus, and he developed the idea of the respiratory quotient. He determined the oxygen usage of animals as diverse as dogs and silkworms, and noted that the smaller the organism, the greater the rate of oxygen consumption per unit of body mass (von Regnault and Reset, 1849).

Helmholtz. Hermann von Helmholtz (1821-1894 CE) served several German

universities. He is known both for his studies of visual physiology and his contributions to chemical thermodynamics. He thought it important to confirm that no energy was lost during muscular movement, and that intervention of a "vital force" could be excluded. To prove this point, he developed very sensitive thermocouples, establishing the close relationship between heat production and the muscular work performed (Koenigsberger, 1906).

Voit. Carl von Voit (1831- 1909 CE), Professor of Physiology in Munich, obtained what was for the 19th century a very substantial research grant (8000 Guilders, about $3600) for metabolic studies on human subjects. He built a chamber large enough to accommodate a bed or a cycle ergometer (Shephard and Aoyagi, 2012). He estimated the metabolic rate of his subjects by collecting expired carbon dioxide in an alkaline solution and noting the resultant gain in mass of the solution. He found that the protein requirements of an individual were determined largely by a person's body mass, rather than by the amount of work that he or she performed. Thus, he disproved an earlier postulate of Liebig, showing that fat or carbohydrate rather than protein was the normal fuel for the performance of physical activity.

Voit was able to measure the total amount of heat produced within his metabolic chamber, and by looking also at the other side of the equation (the energy content of the food that had been eaten and the energy remaining in the subject's excreta), he gave a convincing demonstration that the principle of the conservation of energy applied to humankind (Editor, Journal of Nutrition, 1937). The same amount of energy was released from foodstuffs whether they were burnt in a laboratory calorimeter or consumed by body metabolism (Bischoff and von Voit, 1860).

von Mayer. A German country doctor, Robert von Mayer (1814-1878 CE), provided early estimates for the mechanical efficiency of effort. He found, quite correctly, that humans converted only about a fifth of food energy into useful mechanical work, with the remainder of the energy appearing as heat. Perhaps because this report emanated from a private residence rather than a prestigious university, his paper on this topic was rejected by the Editors of several scientific journals!

Rubner, Max Rubner (1854-1932 CE) was the founder of the Max Planck Institut für Arbeitsphysiologie in Berlin. He provided detailed calorimetric estimates of the energy yielded by various foodstuffs, confirming the principle of energy conservation within the human body (Rubner, 1885). He related the resting rate of metabolism to body size, concluding that the daily heat production of animals ranging in size from dogs to mice approximated 4.16 MJ per m^2 of body surface area (Johnson, 2007).

Atwater. Wilbur Atwater (1844-1907 CE) and Francis Gano Benedict (1870-1957 CE) carried Voit's interests in exercise metabolism to the United States, where large metabolic chambers were built for exercise studies on human volunteers (Atwater and Rosa, 1899).

Muscle Physiology. We note next a few of the landmark discoveries in muscle physiology during the 19th century.

Hughlings Jackson (1835-1911 CE) and Sir Charles Sherrington (1857-1952 CE) were dominant figures in neuromuscular research, making major contributions to our understanding of the respective roles of the brain and spinal reflexes in muscular contraction.

In Turin, the Italian Physiologist Angelo Mosso (1848-1910) invented a simple ergograph. He was thus able to quantify both the frequency of muscle contractions and the force generated by the fingers (Mosso, 1890). Mosso also noted the variations of heart rate that occurred during periods of mental stress. He invented a sphygmograph to record blood pressures, and he created the first crude neuro-imaging technique, using people with skull defects to observe changes in pulsation of the human cortex caused by cerebral activity. He founded the *Archives Italiennes de Biologie* in 1882.

Hans Piper (Piper, 1912) and Edgar Douglas Adrian (1889-1977 CE) adapted the string galvanometer to make the first recordings of muscle action potentials, an important tool of muscle physiologists today.

Evolution. The concept of the evolution of species and its underlying genetic basis began to be explored during the Victorian era. This opened up what remains a continuing debate about the relative importance of inheritance versus environment and lifestyle as determinants of health and fitness. Important names associated with this topic during the Victorian era included Erasmus Darwin, Lamarck, Spencer, Charles Darwin and Mendel.

Erasmus Darwin. Erasmus Darwin (1731-1802 CE) was both a physiologist and an Enlightenment philosopher. He lived in the small cathedral city of Lichfield, near Birmingham, and he is remembered as much for two of his grandsons (Charles Darwin and Francis Galton) as for his own personal discoveries. Nevertheless, he wrote a book entitled *Zoonomia*, which stimulated the evolutionary thinking of both Lamarck and Erasmus's grandson Charles Darwin (Darwin, 1794-96):

"*would it be too bold to imagine, that all warm-blooded animals have arisen from one living filament.... endued with animality.... , possessing the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements....to its posterity.... the strongest and most active animal should propagate the species, which should thence become improved.*"

In contrast with many of his peers, Erasmus Darwin believed that middle-class girls should be educated in boarding schools rather than at home (Darwin, 1797). He argued that they should learn such subjects as physiognomy, physical exercise, botany, chemistry, mineralogy, and experimental philosophy, supplemented by on-site visits to various local factories (such as the Wedgewood potteries, which were at that time owned by his family).

Lamarck. Jean-Baptiste Lamarck (1744-1829 CE) was a French soldier, biologist and founding Director of the Muséum National d'Histoire Naturelle in Paris. He argued that evolution proceeded purposefully, in accordance with natural laws. In his view, an inherent force drove organisms up a ladder of increasing complexity, and a second environmentally driven force adapted creatures to their

local environment through the use or disuse of these characteristics. There was finally a mechanism that allowed these acquired characteristics to be passed on to succeeding generations of a given species (Burkhardt, 1970). His "first law" of evolution offered powerful support to those who recommended engaging in regular physical activity (Bowler, 2003):

"*a more frequent and continuous use of any organ gradually strengthens, develops and enlarges that organ, and gives it a power proportional to the length of time it has been so used; while the permanent disuse of any organ imperceptibly weakens and deteriorates it, and progressively diminishes its functional capacity, until it finally disappears.*"

Although Lamarck's theories were roundly rejected towards the end of the Victorian era, they have recently seen a partial revival in the concept of Epigenetics. One of the central concepts of Epigenetics is that expression of an individual's inherited characteristics can be modified by environmental factors that limit or enhance the phenotypic expression of certain genes (Stillman and Stewart, 2004).

Spencer. Herbert Spencer (1820-1903 CE) was an English philosopher, biologist and sociologist who is generally credited with the phrase "*survival of the fittest*." Although a contemporary of Charles Darwin, many of his ideas on evolution were aligned more closely with Lamarck than with Darwin. Unlike Charles Darwin, Spencer believed that evolution would eventually allow organisms to reach a plateau where they would be perfectly adapted to their environment. He extended the ideas of biological evolution to social processes, arguing that humankind was also progressing towards a higher form of social organization.

This aspect of his thinking probably contributed to the "*Social Darwinism*" of the Victorian era. During the 18th century, many of the wealthy opposed efforts to enhance community health and lifestyle, arguing that such policies would breed a nation of weaklings (Carneiro and Perrin, 2002).

Charles Darwin. Charles Robert Darwin (1809-1882 CE) was the English naturalist who proposed that all living creatures had descended from a common ancestor through a process of natural selection (Darwin, 1909):

"many more individuals of each species are born than can possibly survive; and.... there is a frequently recurring struggle for existence, any being, if it vary however slightly in any manner profitable to itself..... will have a better chance of surviving, and thus be naturally selected."

Darwin's evolutionary views were shaped by an extensive study of fauna and fossils undertaken during a five-year voyage of the *HMS Beagle* to South America, Tahiti, and Australia (1831-1836). However, he initially allowed use and disuse to play some role in his concept of natural selection, and in his "*Origin of Species*" (first published in 1859) he praised Lamarck for his contributions (Darwin, 1909):

"the eminent service of arousing attention to the probability of all change in the organic... world, being the result of law, not miraculous interposition"

Darwin's ideas were unfortunately high-jacked by many with anti-social ideas. Thomas Malthus (1766-1833 CE) and his followers saw the excessive birth rate of Victorian times as a means of ensuring worker productivity. They justified the appalling conditions that existed in some Victorian factories on the basis that the fittest workers would survive, thereby enhancing overall population health and productivity. Others found in the writings of Darwin a justification for Racism, Imperialism, Eugenics, and emergence of a "Master Race." Negative Eugenics and enforced sterilization to "remove the feeble minded" became popular in America, Canada, and Australia, reaching an apogee in Nazi Germany.

Debate on the concepts of evolution and natural selection of the fittest continued into the 20th century. One notable landmark was in 1925, as the case of the *State of Tennessee vs. John Thomas Scopes,* was heard in the small town of Dayton, TN (Larson, 2006). A high school teacher was placed on trial for breaking Tennessee's Butler Act, which made it illegal to teach the theory of evolution in a State-funded school. Presidential candidate William Jennings Bryan headed the prosecution. Scopes was found guilty and fined $100, although the case was later overturned on a technicality. Even today, the cause of Creationism is still pushed by Fundamentalist churches and associated schools, particularly in the Southern U.S. States.

More scientific debate was stimulated through the *International Biological Programme* (Weiner, 1964). The organizer of this Programme was Professor Joseph Sidney Weiner (1915-1982 CE), founder of the *Society for the Study of Human Biology, and* well known for his exposé of Charles Dawson and the Piltdown fraud (Weiner, 2003; Little and Collins, 2012). Weiner began his career as an Applied Physiologist in South Africa, testing the heat adaptation of Bantu workers in the Rand Corporation diamond mines. South African thinking of that era had fostered research concerning small inter-racial differences between the various African tribes (Nurse, Weiner and Jenkins, 1985), apparently with a wish to "divide and conquer" the Bantu, who out-numbered white immigrants by at least ten to one. However, Weiner advanced the unpopular view that any small physical and physiological differences that he observed were environmental rather than genetic in origin, and were mainly a consequence of differences in diet. In 1937, he moved to England, firstly to the London School of Hygiene, and then to Oxford, where he became Reader in Physical Anthropology for the Department of Anatomy.

A major objective of the IBP was to seek out genetically isolated tribes that had developed unusual biological and social adaptations to their environment, thus permitting them to survive in difficult habitats such as the Canadian Arctic (Shephard, 1978; Shephard and Rode, 1996). Despite the demonstrated genetic isolation of many such communities, it was shown that their biological characteristics differed relatively little from the population norm. Two possible explanations were suggested (Shephard, 1978; Shephard and Rode, 1996). Many tribes lived at the junction of two or more eco-systems, and each was exploited at differing times during the year. Although an unusual physiological characteristic might favour the success of an individual when living in one eco-system, it might also prove

disadvantageous when exploiting a second habitat. Thus, there was no selective pressure favouring the perpetuation of an unusual characteristic. Secondly, the studies of the IBP investigators had focussed on the physical fitness and physical working capacity of the various indigenous populations. However, survival in a rigorous environment depended much more upon the individual's intelligence and the generation-to-generation transmission of acquired knowledge of hunting techniques than on an unusual level of physical fitness.

Mendel. The Austrian friar Gregor Johann Mendel (1822-1884) provided an early genetic backdrop to evolution through pain-staking studies on the inheritance of pea strains, conducted at his monastery in Brno. Mendel became the Abbot in 1868, and probably because of added responsibilities towards his monastic community, he subsequently abandoned his genetic studies. His findings were not to be rediscovered until the early years of the 20th century.

Today, one end-result of the discoveries of Darwin and Mendel is the potential for genetic manipulation. This holds promise for the treatment of a number of inherited diseases, but it also presents Sports Scientists with the disturbing prospect of "gene doping," as athletes use such technology in an attempt to enhance personal fitness and gain an unfair advantage in international competition (Collins, 2009).

Microbiology and epidemiology. The nineteenth century saw the beginnings of Epidemiology (through the efforts of Snow and Louis) and a growing understanding of the principles of Microbiology emerged from the work of Semmelweiss, Pasteur, Koch and Lister. Advances in these areas of knowledge made important contributions to the control of disease and the growth of Preventive Medicine.

Snow. John Snow (1813-1858) came from a poor family in the city of York, and at the age of 14 he was apprenticed to a surgeon in Newcastle. By 1836, he had acquired sufficient capital to enroll at the Hunterian School of Medicine, on Windmill Street, in London (Shephard, 2013b). After completing his medical qualification, he began working at the Westminster Hospital in Central London. He quickly became skeptical of the idea that cholera was spread by a noxious *miasma* emanating from the stinking swamps and creeks that surrounded the city, but unfortunately he lacked the basic understanding of bacteria that was needed to pinpoint the etiology of the disease.

He studied several of the outbreaks of cholera in the London area (Vinten-Johansen et al., 2003), and published a treatise *On the Mode of Communication of Cholera* (Snow, 1849). Shortly afterwards, he drew a careful map showing the distribution of cases in the 1854 outbreak of cholera that had affected people living around the Broad Street pump in Soho, London. In a letter to the *Medical Times & Gazette,* he noted:

"there has been no particular outbreak or prevalence of cholera in this part of London except among the persons who were in the habit of drinking the water of the above-mentioned pump well."

He stopped this particular epidemic by removing the handle from the pump, and the following year he published a second

edition of his treatise on cholera. He submitted his discoveries to the *Institute of France* in 1855, hoping to receive the 100,000 Franc prize that the institution offered for notable discoveries. Some historians maintain that he did receive a grant, but the Institut's Archives contain no record of him receiving any such award (Edwards, 1959).

Based on the Broad Street study, and subsequent examination of other epidemics of cholera associated with water pumped from the polluted lower reaches of the River Thames, Snow is now regarded as the father of modern Epidemiology.

Louis. The birth of Clinical Epidemiology and Evidence-based Medicine is commonly attributed to Pierre Charles Alexandre Louis (1787-1872 CE) (Morabia, 1996). He introduced clinicians to the idea of "*numeric reasoning*," making a quantitative analysis of the outcomes of various medical procedures. Most notably, he established that the then current practice of applying a multitude of leeches to a feverish patient had no beneficial effect. Indeed, it often increased the risk of death in patients with inflammatory disease (Louis, 1835).

Semmelweiss. The Hungarian obstetrician Ignatz Semmelweiss (1818-1865 CE) preached a doctrine of rigorous hand cleansing with chlorinated lime water. By adopting this simple measure, he quickly reduced the incidence of puerperal fever at his institution from 12.4 to 1.27%. However, his clinical acumen was not matched by his diplomatic skills. He also had the disadvantage of a Jewish family background in a virulently anti-Semitic region. His colleagues in the medical fraternity of Vienna and Budapest soon took umbrage at his vigorous condemnation of the squalor in Viennese city hospitals. Semmelweiss was quickly stripped of his hospital accreditation, and within 3 years, was "run out of town." He started writing angry letters to many European Obstetricians, denouncing them as irresponsible murderers. Many, including his own wife, thought that he was losing his mind. In 1865, he was admitted to a mental institution, and died there within 2 weeks, possibly because of a vigorous beating by one of the guards. The ideas of Semmelweiss did not begin to gain traction until Pasteur had established the germ theory of disease, and indeed even today there are still hospitals where the spread of infection has been traced to failure of staff to wash their hands when moving from one patient to another.

Pasteur. Louis Pasteur (1822-1895 CE) was born at Dole, in the Jura region of France, and he ultimately became Professor of Chemistry in Strasbourg. He is regarded as one of the founders of modern Microbiology, and his career path was strongly influenced by the death of 3 of his 5 children from typhoid fever. Pasteur demonstrated fermentation was due to the growth of microorganisms rather than some mysterious process of "*spontaneous generation*" (Lerner and Lerner, 2006). He thus introduced a method to prevent the spoiling of wine or milk by killing the microorganisms. The liquid was heated to a specified temperature for a specified time, and then cooled rapidly (the process of "Pasteurization"). He supported the emerging germ theory of disease, convincing many of his peers of the truth

of this hypothesis, and he was a strong advocate of Preventive Medicine:

"When meditating over a disease, I never think of finding a remedy for it, but instead, a means of preventing it."

Pasteur developed vaccines for rabies and anthrax, and his insistence on cleanliness did much to reduce mortality from puerperal fever in maternity wards.

Koch. Robert Koch (1843-1910 CE) was another pioneer of Microbiology (Brock, 1988). Working as District Medical Officer in the Wollstein region of Prussian Poland, he had quite limited resources, but nevertheless he studied the transmission of anthrax, and isolated the source of two major scourges of the Victorian era- the tuberculosis bacillus (1882) and the cholera vibrio (1883). He discovered tuberculin in 1890; it proved a helpful tool in the diagnosis of tuberculosis for many years, but his hopes that it might cure the disease were soon dashed.

Lister. Joseph Lister (1827-1912) was a surgeon at the Glasgow Royal Infirmary. He built upon the germ theory by using phenol to sterilize his instruments and to clean infected wounds. He believed that many dangerous bacteria were present in the air of operating theatres, and he thus sprayed carbolic acid continuously into the atmosphere while he was operating. I still remember the dissecting rooms at Guy's Hospital, which remained heavy with phenol during the late 1940s. The atmosphere was highly irritant to the eyes, nose and throat, and can hardly have encouraged a careful and methodical approach to surgery. However, towards the end of his career, Lister's emphasis shifted from antiseptic to aseptic operating theatres.

An Ontario surgeon (Archibald E. Malloch, 1844-1919 CE) who had been a House-Surgeon (intern) with Lister set up practice in Hamilton, ON. Malloch tried to teach the concept of asepsis to colleagues in the Toronto area. However, he had much difficulty in persuading the local surgeons to abandon such established practices as holding knives in their mouths, wiping bloody scalpels on dirty rags before they were re-used, and feeding thread for post-operative sutures through their button-holes (Roland, 2008).

Views of Victorian scholars concerning health and fitness

We will now consider briefly the attitudes of Victorian scholars- health professionals, philosophers, theologians, statesmen, and feminist leaders- towards issues in health and physical fitness

Health professionals. During the 19th century, there were a few health professionals such as Warren, Osler, Delpech and Piaget who advocated exercise for the maintenance of health, the treatment of selected illnesses, and the maximization of intellectual development. However, the majority of their contemporaries followed the lead of John Hilton, arguing for the traditional approach that those who were sick required prolonged bed rest. The first textbooks of Sports Medicine began to appear during the Victorian era, but their focus was upon the treatment of athletic injuries rather than on the development of positive health.

Interest in Preventive Medicine was spurred by the work of Florence Nightingale and Almoth Wright, both of

whom were seeking to reduce the heavy death toll from infection in military hospitals. Recommendations of vigorous exercise were also heard from the proponents of certain "Alternative Therapies," such as the water treatments that were advocated by Priessnitz and the herbal remedies of Thomson.

Warren. Dr. John Collins Warren (1778-1856 CE) was an influential physician of this period. He was appointed as Professor of Medicine and first Dean of Harvard Medical School, and became one of the founding Editors of the *New England Journal of Medicine.* He was a strong protagonist of regular physical activity, including gymnastics and calisthenics (Collins, 1864). In 1830, he gave an address to the *American Institute for Instruction* entitled "*On the importance of physical education."* Warren played a prominent role in establishing the Tremont gymnasium in Boston (1825), and even sought (without success) to persuade Frederick Jahn to serve as its first Director.

Through Warren's advocacy, Harvard University had in 1826 allocated $300 to clear ground for construction of a gymnasium, and various pieces of gymnastic apparatus were being installed to promote the health of the students. By 1829, the neighbouring Amherst College had also purchased a"*few horses and parallel bars, with one or two swings..."* Warren began devising exercises appropriate for female students (Wuest and Bucher, 1995), and he keenly appreciated the importance of maintaining programme adherence. He lamented that "*the exercises were pursued with ardor as long as their novelty lasted...but they have been gravely forgotten or neglected, at least in our vicinity*."

Even at the age of 75, Warren was still busy urging the President of Harvard to make "*gymnastic exercises the duty of the student'* (U.S. Bureau of Education, 1885).

Delpech. Jacques Mathieu Delpech (1777-1832 CE) was an orthopedic surgeon in Montpellier, France, who became interested in the potential of therapeutic exercise, particularly for children with orthopaedic deformities. He believed that such deformities could be both prevented and cured by following an appropriate regimen of graded exercises designed to restore the patient's muscular balance (Delpech, 1828). He established an attractive playground and exercise area for his patients in the countryside, close to Montpellier.

Delpech was also a pioneer of occupational therapy. He included in his regimen a period of piano playing. The musician sat at the keyboard with a weighted cord tied to his or her head, to ensure that an upright posture was maintained. Unfortunately, Delpech's career came to an abrupt end. Driving back to his Institute in an open coach, both he and his coachman were shot by a disgruntled patient (Le Vay, 1990).

Osler. The celebrated Canadian physician William Osler (1814-1919 CE) began his career at McGill University in Montreal. Subsequently, he was one of the four founding professors of the Johns Hopkins Hospital in Baltimore,MD. In frank opposition to Hilton, Osler argued that his patients needed the "*quadrangle of health*:" rest, food, fresh air, and exercise. He also underlined the pedagogic and preventive values of moderate physical activity (Osler, 1904):

"Within the past quarter of a century, the value of exercise in the education of the young has become recognized." "the prophylactic value of exercise, taken in moderation by people of middle age, is very great"

The truth of this assessment is suggested by Osler's own longevity (he died at the age of 105 years).

Francis Shepherd, one of Osler's junior colleagues at McGill University, placed a great emphasis upon the merits of anatomical dissection, and (as in earlier episodes in London and Edinburgh, (Shephard, 2013)) French Canadian students who were eager to pay for their tuition led body snatching forays into the Côte des Neiges cemetery in Montreal (Jack, 1963).

Piaget. Jean Piaget (1896-1980 CE) was a Swiss Developmental Psychologist and Philosopher from the city of Neuchatel. He placed great emphasis upon the importance of education for children, declaring (Munari, 1994):

"*only education is capable of saving our societies from possible collapse, whether violent, or gradual*"

In the context of health and fitness, he is best known for the sensori-motor model of intellectual development. Piaget postulated that children modified their brain structures as they adapted to their physical environment through appropriate programmes of exercise. This hypothesis attracted the attention of those conducting the Trois Rivières study of required daily physical education for primary school students. In the view of the Trois Rivières investigators, the positive influence of activity upon development of the brain might be one reason why participation in regular physical education classes helped the academic development of primary school students in the experimental classes relative to their peers, even though they spent less curricular time in learning traditional subjects such as arithmetic and languages (Piaget, 1956; Shephard, 1997).

Hilton. John Hilton (1804-1878) was an influential surgeon at Guy's Hospital, in London, England. He enriched the Hospital with an outstanding collection of wax anatomical models that are still studied closely by those aspiring to a Fellowship of the *Royal College of Surgeons*. Hilton became President of the *Royal College of Surgeons* in 1867. In the context of this review, he is best remembered for a course of lectures that he gave to the College during the tenure of his Arris and Gale Professorship (1859-1862). The series was entitled on "*Rest and Pain*." By his insistence on the "*recuperative power of Nature"* (Hilton and Jacobson, 1879), Hilton held back the active rehabilitation of conditions such as myocardial infarction for more than a century.

Athlete's Heart. Fears about the development of "*athlete's heart*" remained strong through to the dawn of the twentieth century. Dr. William Collier (1856-1935), the first Cambridge graduate to be appointed to the staff of the Radcliife Infirmary in Oxford, was a key player in the foundation of the Oxford Medical Society. In 1901, he had occasion to examine a University Freshman who had been a one-mile runner while attending Public School. The student was now falling several seconds short of his

previous best times, and Dr. Collier thought that he heard a parasternal systolic murmur after the runner had engaged in mild exercise (walking briskly around his consulting room a few times). With the superb confidence of the Victorian physician, Collier (1901) declared that he:

"had no doubt that it was over-dilation of the right ventricle."

Collier not only disqualified the unfortunate athlete from any further competition, but he also referred him to another consultant cardiologist, who promptly dispatched him on a long sea voyage where

"*the temptation to do too much was removed."*

Collier also expressed the view that the deep breathing shown by athletes at the end of their events was likely to engender what he termed a "*physiological emphysema*." He went on to warn against teenage girls over-exerting themselves, whether by taking up hockey, swimming, cycling or tennis (as some in the upper ranks of society now seemed to be doing), or by running up and downstairs too frequently (as was the lot of the typical servant-girl) (Collier, 1901).

Sports Medicine texts. The early 20th century saw a burgeoning of literature on Sports Medicine, although the first texts focussed on the treatment of athletic injuries rather than on the role of regular physical activity in the prevention of disease and the development of positive health. In the England of 1895, the *Encyclopedia of Sport and Games* included a brief section on first aid planning for sports events (Byles and Osborn, 1898), but Collier (1901), the "expert" on *Athlete's Heart* complained that the only two English-language exercise physiology books available to him were translations of texts by Georg Kolb (1893) (physician to the Berlin rowing club) and by a French physician Fernand LaGrange (1845-1909)[LaGrange, 1890).

In Berlin, a comprehensive two-volume account of Sports Medicine ("*Hygiene des Sports"; Hygiene of Sport)* was published by Siegfried Weissbein in 1910 (Jokl, 1964 ; Weissbein, 1910), and in 1914 Dr. G. Freiherm von Saar prepared a one-volume contribution to the *Encyclopedia of Surgery* under the title *Die Sportverletzungen (Sports Injuries)*(von Saar, 1914). A few years later, Ferdinand Huepper published *Hygiene der Körperübungen* (*Hygiene of body exercises*) ((Hueppe, 1922)), and in 1925 Dr. Felix Mandel wrote *Chirurgie der Sportunfalle (Surgery of Sports Accidents)*.

Herbert Herxheimer (1895-1985 CE) was originally from Berlin, and as a young assistant at the Berlin Charité Hospital he had founded an out-patient clinic for Sports Medicine (Streseman and Rudolf, 1989). However, Herxheimer decided to emigrate to England in 1938, in the face of Nazi persecution. After his arrival in Britain, he initially had to earn his living as a School doctor and biology teacher. However, with the help of Sir Thomas Lewis, he found his way back into Academia. I have fond memories of his halting English as Herxheimer addressed the British Physiological Society during the early 1950s. He became a keen student of the relationships between heart rate recovery curves and physical fitness, and he produced the first Exercise Physiology text (*Grundriss der Sportmedizin für Ärzte und Studierende*

(Foundations of Sports Medicine for Physicians and Students) (Herxheimer 1932),

Nightingale, and the role of women in Victorian health care. Few women had opportunity to become physicians during the nineteenth century. Indeed, it is rumoured that one well-known military surgeon (Sir James Barrie, 1799-1865 CE) was born a female (Margaret Ann Bulkley), but chose to live as a man in order to pursue a career in Medicine (Kubba, 2001). In 1869, a Russian woman with an intense interest in medicine (Nadezhda Suslova (1843–1918) also overcame the prevailing prejudice, travelling to Zurich to pursue her studies and become the first female Russian M.D. Her secret was kept from the Tsarist bureaucracy until after she had graduated in 1869, but when the authorities discovered what had happened, they took stern measures to exclude other women from Russian Medical Schools (Jack, 1963).

The English-speaking world showed equal reluctance to admit that women had the intellect demanded by the Medical curriculum. The author of one Obstetrics text, published in Philadelphia, described the Venus de Milo in these terms (Meigs, 1848);

"*She had a head almost too small for intellect, but just big enough for love*."

Elizabeth Blackwell (1821-1910 CE) managed to enroll in the small Medical School of Geneva, NY by the expedient of registering as E. Blackwell Esq, but when she graduated in 1849, she was obliged to travel to Paris to complete her hospital training (Jack, 1963).

The Women's Medical College in Kingston, ON, was the first Canadian establishment to receive female students. It was founded in 1883, as an affiliate of Queen's University. However, it was not allowed to become a part of the *Royal College of Physicians and Surgeons* (an early incarnation of the Queen's Faculty of Medicine), because of adverse reactions from male students. The *Women's Medical College* continued its operations in Kingston until 1894, when it was forced to close because of a lack of students. Females were not readmitted to the Queen's Medical programme until 1943.

Maude Abbott (1860-1940), an adopted relative of Canadian Prime-Minister Sir John Abbott, was one early Canadian woman physician. She overcame many practical difficulties, and in 1894 she was able to graduate from Bishop's University, a small college in the Eastern Townships of Quebec.

In Britain, prejudice against women was, if anything, even stronger. A letter to the *Lancet* concluded (Bennet, 1870):

"women are sexually, constitutionally, and mentally unfitted for the heavy responsibilities of general medical and surgical practise. *Women might become midwives, but in an inferior position of responsibility as a rule. I know of no great discovery changing the boundaries of scientific knowledge that owes its existence to a woman. What right have woman to claim mental equality to men?"*

All attempts by Sophia Jex-Blake (1840-1912 CE) to obtain a medical education in England were denied. In 1869, she was permitted to enroll in Edinburgh, but a year later her presence in the classroom provoked the *Surgeon's Hall Riot.* She never graduated in

Medicine, but by 1876 she had succeeded in encouraging the passage of legislation that gave women the right to practice Medicine.

When I became a medical student at Guy's Hospital, in 1946, the situation of female applicants was not greatly improved. Women who wished to practice Medicine in the University of London underwent segregated instruction at the Royal Free Hospital, and the other London teaching hospitals had no places for female students.

Thus, for most 19th century women, the only Health Science option was to become a nurse-probationer. During this onerous apprenticeship, many women contented themselves with seeking a good-looking Medical student as a husband, but some went on to become Registered Nurses and Hospital Matrons. Florence Nightingale (1820-1910 CE) is a prime example. She is said to have accomplished more during the Crimean war (1853-1856) than the entire military medical establishment. "*Such a head*" said Queen Victoria to her beloved Albert. "*I wish we had her at the war office*." At Skautari hospital, in the Crimea, she cut the death rate of soldiers from 42% to 2% by a judicious use of soap, water, clean linen and humane care. When she returned to England, she established the first Nursing School, at St. Thomas's Hospital, in London. Nevertheless, Nightingale did not accept the germ theory, and she still believed that disease was caused by *miasmata* and dirty bed linen. Some authors have suggested that although she did much to improve the health of the soldiers in her care, she was also guilty of manipulation, evasions and lies, with many of her more devious actions readily apparent in the official record books. According to the U.S. historian F.B. Smith (Smith, 1983):

"*Florence Nightingale, like Mr. Richard Nixon and his tapes, was so possessed of the habit of deceit and the conviction that the full record would compel posterity to vindicate her actions, that she could not bring herself to destroy material...Having brazened out lies in life, she would brazen them out in death*."

In the U.S, civil war (1861-1865), conditions in military hospitals were just as deplorable as those seen initially in the Crimean conflict, with two thirds of the Union losses of 300,000 combatants being attributable to disease rather than enemy action. In Europe, a Swiss investment banker, Henri Dunant (1828-1910 CE), halted a business trip to Algeria because he was so distressed by the neglect of wounded soldiers at the battle of Solferino, during the war between Austria and Sardinia (1864). He saw more than 40,000 wounded men left to die on the battlefield during a single day. He published an account of this suffering at his own expense (Dunant, 1939). Thereafter, he sought the establishment of a permanent relief agency that would provide humanitarian aid in times of war. This agency must be underpinned by an international treaty that recognized its neutrality, allowing it to operate in war zones. During the same year, his proposals led to establishment of the *International Red Cross* in Geneva, and the First Geneva Convention. In 1901, Henri Dunant was a co-recipient of the first Nobel Peace Prize.

Wright. Sir Almroth Edward Wright (1861-1947 CE) was a British Bacteriologist, Immunologist, and strong advocate of Preventive Medicine. He started a research department at St. Mary's Hospital, London, as early as 1902.

Wright was concerned by the high death rate from preventable diseases during the second Boer War, and he worked with the Allied Forces to vaccinate large numbers of troops before they left for the battlefields of Northern France during World War I (Walker, 2007). Alexander Fleming later worked in Wright's department, discovering penicillin, and Wright quickly warned physicians that the overuse of antibiotics would create strains of resistant bacteria. Unfortunately, his message has yet to percolate to many family medical practices in North America.

Priessnitz. Vincent Priessnitz (1799-1851 CE) was one of many entrepeneurs who made large profits from the Victorian taste for Alternative Medicine. He began life as a simple Austrio-Silesian farmer, but after treating the brother of the Austrian Emperor with apparent success, Priessnitz popularized the concept of hydrotherapy. Fashionable clients were supposedly restored to good health through a brisk country regimen of dietary restriction, regular sleep, fresh air, cold douches, massage, chopping wood, and other forms of vigorous exercise. By 1898, his approach had become so popular that a biographer claimed (Metcalfe, 1898):

"Although the name of Vincent Priessnitz is not widely known in England, you will feel gratified by my assurance that Hydropathy is being increasingly resorted to in England."

"there are hundreds of establishments where the water-cure is carried out on the principles laid down by Priessnitz"

The fad for Hydrotherapy reached North America, as Joel Shew (1816-1855 CE) opened a Hydropathic facility in New York City (1843).

Thomson. After his wife almost died from traditional medical treatment, Samuel Thomson (1769-1843) became a vocal proponent of another form of Alternative Medicine, based on the ingestion of a variety of herbs. "*Thomsonian Medicine*" began in New Hampshire. Remedies were garnered from a local "wise woman" and Indian tribes in the surrounding countryside. Treatment was intended to "*eliminate toxins*" and to *"restore body heat*" through a combination of steam baths, and generous doses of peppers, laxatives and the emetic Lobelia. "*Thomsonian Hospitals*" and "*Botanical Conventions*" flourished and a "*Guide to Health*" (Thomson, 1849) became popular reading, to the point that Thomson soon became a millionaire.

Theologians and Social Darwinists.

Earlier in history, good health had been seen as a gift that an arbitrary God bestowed on a favoured segment of the population. Those who experienced poor health had possibly sinned in some way. In any event, they were expected to bear their burdens with steadfast, Job-like faith, looking forward to an appropriate recompense in some future heavenly paradise. However, the Enlightenment began the erosion of such religious dogma, and some philosophers started to view the universe in purely mechanistic terms (Shephard, 2013).

The Victorian era saw an acceleration of this trend, as liberal theologians argued the need for personal and/or societal intervention in order to enhance Community Health. In contrast, the Social Darwinists asserted that the leisure of the

ruling classes and a fight for survival on the factory floor were necessary elements to the continuing betterment of humankind. Some Victorian philosophers began to question the very nature of reality. Revolutionary solutions to the evils of society were proposed, although most thinkers accepted the need to involve either the individual or the State in the quest for good health. A number of political leaders gave personal expression to their acceptance of this belief through the example of their own lifestyle.

Theologians. At the beginning of the 19th century, most theologians were strongly opposed to the views of Darwin, and (given that wealthy patrons controlled most of the prestigious ecclesiastical appointments) the clergy firmly upheld the privileged position of the ruling classes. However, there were notable exceptions. John Wesley (1703-1791 CE) brought a message of salvation and self-improvement to tin-miners of Cornwall, and in North America Barton Stone (1772-1844) led the *Second Religious Awakening* from the Caine Ridge Meeting House in Kentucky.

The "*Third Great Religious Awakening*" that swept the North American frontier built on the ideas of Barton Stone. It brought about a significant change in religious attitudes towards both Society and Health. Many who longed earnestly for the "*Second Coming*" of Christ thought that this would not occur until they had righted the evils that were so prevalent in Victorian society. Members of Protestant denominations on both sides of the Atlantic thus fought for a Social Gospel, winning battles that eliminated slavery, imposed severe restrictions on child labour, introduced compulsory elementary education and protected women from exploitation in factories (Fogel, 2000).

Liberal churches also gave strong voice to attacks upon the excesses of the Gilded Age. Church leaders took active measures to enhance the lifestyle of their younger parishioners, fostering recreational groups such as tennis clubs, and giving female adherents opportunities to meet and marry the "right" sort of young man. Such attitudes resulted in the development of organizations such as the YMCA, the *Cooperative Holidays Association* and the *Holiday Fellowship* (below).

Social Darwinists. Linking the free-market concepts of Adam Smith (1723-1790 CE) to Darwin's idea of Natural Selection, the English philosopher Herbert Spencer (1820-1903 CE) proposed a concept of Social Darwinism. This justified the stratification of the wealthy and poor, because it encouraged a "*survival of the fittest*". His notions became particularly popular in the U.S. In 1884, a Yale sociology professor named William Graham Sumner (1840-1910 CE) even argued that if the poor were given assistance, this would ultimately weaken their ability to survive in society (Sumner, 1952).

The American political economist Henry George (1839-1897 CE) vigorously opposed these ideas, arguing the need for a "single tax" that would equalize wealth and level out current social disparities (George, 1886). George was supported by Chicago attorney Clarence Darrow (1857-1938 CE) of the *American Civil Liberties Association*. They vigorously opposed the "*conspicuous consumption and conspicuous leisure"* of wealthy Americans (Veblen, 1965).

Debate over the virtues of Social Darwinism had a substantial impact upon Health Policy. It sparked a vigorous and continuing conflict between those who believed that good health and maintenance of a positive lifestyle were personal responsibilities and those who argued the need for extensive State interventions to regulate working conditions, environment and health (Steinbrook, 2006). In the U.S., the debate continues, and there have recently been plans to curtail MedicAID to individuals who fail to follow the personal lifestyle recommended by their physicians.

Philosophers.

Victorian philosophers built on many of the ideas of the Enlightenment, particularly the philosophies of Immanuel Kant (1724-1804 CE) and Jean-Jacques Rousseau. Kant had argued that we do not see true reality, but rather its outward appearance. Beyond this lies the unknowable (Rohif, 2010):

Up to now it has been assumed that all our cognition must conform to the objects; but ... let us once try whether we do not get farther with the problems of metaphysics by assuming that the objects must conform to our cognition."

Kant's influence can be seen particularly in the thinking of Hegel, Kierkegaard, Nietzsche, Weber and Heidegger, and in such diverse movements as German Idealism, Positivism, Phenomenology, Existentialism, and Critical Theory. Other important strands of Victorian thought can be found in the Socialist traditions of Marx, Engels and Lenin and the Social commentary found in the writings of authors and poets such as Thoreau, Thompson, Dickens, Stevenson and Wilde. Although these various ideas are not easy to encapsulate, many Victorian scholars have, in their own way, had a substantial influence upon our concepts of Society, Health and personal fitness.

Hegel. Georg Wilhelm Friedrich Hegel (1770-1831 CE) was one of the creators of German Idealism (Losurdo, 2004). He strongly believed in personal freedom and the capacity for self-determination. He regarded the extreme division of labour and the mindless repetition of simple tasks that was typical of so many factories as enervating the worker's mental faculties. His concepts influenced many subsequent philosophers, and were seized upon, criticized, and given an appropriate political "spin" by both Karl Marx and Right-Wing thinkers.

Kierkegaard. Søren Kierkegaard (1813-1855 CE) was a Danish philosopher and theologian, commonly regarded as the first of the Existentialist philosophers (Swenson, 2000). Kierkegaard highlighted the issues of personal choice and commitment that became central themes for both Social Darwinists and advocates of Public Health. Is a poor lifestyle a consequence of bad personal choices, or it should it be blamed on the overall physical and social environment in which a person is required to live (Sallis and Glanz, 2006)?

Nietzsche. Friedrich Nietzsche (1844-1900 CE) was a German philosopher who began by studying Theology, but subsequently switched to become an Atheist Professor in Basel. Like Kiekegaarde, he believed in *"der Wille zur Macht" (the will to power),* manifested by ambition and personal achievement.

Indeed, this became the title of a book of his thoughts that was compiled by his sister (Nietzsche, 1986). He questioned the value of beliefs that drained life's inherent energies, and (in contrast to Darwin and his contemporaries) Nietzsche did not see the "*Struggle for Existence*" as a major determinant of human behaviour.

Nietzsche is perhaps best known for his pronouncement *Gott ist tod (God is Dead)* (Nietzsche, 1887):

"God is dead. God remains dead. And we have killed him. How shall we comfort ourselves, the murderers of all murderers?"

The death of God implied the loss of any coherent, objective truth. Everyone retained their own diverse and fluid perspective on things ("Perspectivism"), a view that certainly ran counter to any desire for a central direction of Health Policy.

Weber. Maximilian Karl Emil Weber (1864-1920) was born to a prominent Civil Servant in Erfurt, Thuringen, and he had an early interest in Sociology. At the age of 13, his Christmas presents to his parents were two historical essays:

"*About the course of German history, with special reference to the positions of the Emperor and the Pope,"* and *"About the Roman Imperial period from Constantine to the migration of nations*."

After a youth spent largely in drinking and fencing, he finally passed his bar examinations, and joined the Faculty of Law at the University of Berlin. Around this time, he joined a new Union of Social Economists, the *Verein für Socialpolitik*, and he wrote an early tract on the thorny problem of immigrant workers. They were then termed the "Ostfluch," and were mainly Polish farm workers who had moved into eastern Germany as the original agricultural labourers shifted to factory work in the cities. As a member of the *Alldeutscher Verband (Pan-German League),* Weber campaigned vigorously against allowing any such immigration.

Marriage to a distant cousin gave him financial independence, and in 1896 he was appointed as Professor of Economics in Heidelberg. He became a leading proponent of Methodological anti-Positivism, arguing that Sociology could only be understood by looking at the meanings individuals attached to their actions. He wrote on the social "disenchantment" associated with the rise of Capitalism, arguing that the most important aspect of society was not its productivity, but how people viewed their world. The roots of Capitalism were to be found in the cultural influence of the Ascetic and Protestant work ethic, with its emphasis upon wealth as a sign of salvation (Weber and Kalburg, 2002).

As an adult, Weber did not normally engage in any exercise other than occasional duelling and hill walking. Within a few years of moving to Heidelberg, he began to suffer from bouts of depression and sleeplessness, and his physician dispatched him for a course of Hydrotherapy (above) at a spa on the shores of Lake Constance. Unfortunately, the unaccustomed exercise did not cure his insomnia (Weber, 1975).

Weber was sometimes puzzled that others did no share his intense interest in Sociology and Politics, and on a trip to America, he was tremendously surprised to find that the annual Harvard vs. Penn State football game attracted much more newspaper coverage than either the

Presidential campaign or the Russo-Japanese war (Scaff, 2011).

Heidegger Martin Heidegger (1889-1976 CE) was the son of the sexton in rural Messkirch, Germany. His family belonged to a working-class Catholic sect that was at variance with the Altkatholiken elite. He could not afford a university education, so he entered a Jesuit Seminary; however, he was dismissed within a few weeks because of what the Director of the Seminary described as a psychosomatic heart condition. He next spent 3 years at a Jesuit Theological Seminary in Freiburg, but again his studies were interrupted by a bout of poor health. Perhaps he had "overexerted himself," as he recounted in his 1915 *Lebenslauf*, or possibly his body was showing a psychosomatic rebellion against entering the wrong kind of work. Heidegger next switched to Philosophy, and profiting from connections with the National Socialist party, in 1933 he was appointed Rector of Freiburg University. He quickly told the students (Farias et al., 1989):

"Let not theories and 'ideas' be the rules of your being. The Führer himself and he alone is German reality and its law, today and for the future."

Heidegger is regarded as both an Existentialist and a Phenomenologist, with a strong desire to awaken the world to a new sense of the mystery of "*Being*." He posed the problem thus:

"If God as the suprasensory ground and goal of all reality is dead... then nothing more remains to which man can cling and by which he can orient himself."

Unlike many philosophers, he believed in tying together intellectual and physical activity, and he engaged in such activities as push-ups and running in place while he was engaged in philosophical meditation (Dreyfuss and Wrathall, 2000). Exercise in his view should encompass a wide range of physical activities (Farias et al., 1989):

"not to consist of solely gymnastics, but was to include endurance training (road building, agriculture and horticulture)."

However, Heidegger remains a controversial figure in the history of Philosophy, largely because he gave such unqualified support to Adolf Hitler and the Nazi regime.

Marx. Like many Socialists, Karl Marx (1818-1883 CE) was born into a wealthy family. They lived in Triers, Prussia. During Karl's studies at the University of Berlin, he became interested in the ideas of Hegel, and rejected the Positivism of Auguste Comte. After graduation, he wrote for various radical newspapers, particularly the *Rheinische Zeitung*, which despite a 3-tiered censorship managed to publish articles criticizing the *Rhine Provincial Assembly*, the situation of peasant vintners on the Mosel, and legislation against wood theft. However, the newspaper was banned in 1843, and Marx then moved to Paris. There, he collaborated with another wealthy Prussian, Friedrich Engels (1820-1896 CE), who also had written about the adverse conditions of work and housing endured by labourers in the Victorian era (Tucker, 1972). In many factories. Engels complained (Engels and Wischnewesty, 2009):

"*the work offers the muscles no opportunity for physical activity*"

Much of the writing of Marx and Engels sought to interpret Society in terms of a Class Struggle. Neither author wrote anything substantial about physical culture. Nevertheless, their ideas have provided a social framework for much subsequent communist interpretation of sport and physical activity (Riordan, 1976). Marx certainly acknowledged the human need (Leopold, 2007) "*to move about*" and the requirement of "*simplest animal cleanliness."* He also commented on the alienating side-effects of industrial labour apparent in the phenotypes many Victorian workers (Ollmann, 1975):

"*stunted size, bent backs, overdeveloped and underdeveloped muscles, gnarled fingers, enlarged lungs and death pale complexions..."*

Worker alienation continues a major theme in the health debate today. The followers of Marx argue that because the Proletariat is unhappy with its role in a Capitalist society, people are unwilling to take positive action to protect their health. Why should one improve one's personal fitness if this merely increases industrial productivity and thus augments the profits of the employer? However, a few Left-Wing writers have also acknowledged that if people do not value their work under Capitalism, they may compensate by placing a greater value upon leisure time participation in sport and physical activity (Kidd, 1978).

Lenin. Vladimir Ilyich Ulyanov (Lenin) (1870-1924 CE) was the revolutionary who gave pragmatic expression to the views of Marx in Tsarist Russia. He came from a comfortable upper middle-class family, with an estate in the Volga region. The family home was a "*nest of gentle-folks*" that often embarrassed his supporters, and perhaps because of this patrician upbringing, Lenin had a much greater interest in physical activity than either Marx or Engels. Lenin is said to have had the body of a well-built athlete, and to have been superbly fit.

Many of his personal attributes certaInly reflect his privileged background. His early enthusiasms included cycling, amateur photography, chess, hunting, music and long mountain hiking trips (Krupskaya, 2004). He was also a good swimmer and ice-skater (LeBlanc, 2008). On ice, he performed giant steps and Spanish leaps, and at the age of 46 he was still urging his friend Inessa Armand to take up cross-country skiing (Elwood, 2011). On one 18 km cycle trip from Paris to an air show at Juvisy-sur-Orge, his bicycle was crushed by an expensive automobile. Lenin himself managed to jump clear at the moment of impact. He used his legal training to win substantial damages from the Viscount who had been driving the vehicle, but Lenin was himself in no way deterred from taking further cycle trips with his wife Krupskaya.

Thoreau. Henry David Thoreau (1817-1862 CE) was a celebrated 19th century American author, poet, philosopher and proponent of "simple living." He was also a strong advocate of physical activity. Personal enjoyments included swimming, wading through swamps, walking in the woods and climbing trees. One winter, he reputedly skated 48 km in a single day (Canby, 1958). Thoreau valued activity not only for its potential to enhance physical health, but also for a resulting

stimulation of the intellect (Thoreau, 1840/1962):

"*They are fatally mistaken who think that while they strive with their minds that they may suffer their bodies to stagnate in luxury and sloth."*

"If you would get exercise, go in search of the springs of life."

James. William James (1842-1910 CE), brother of the novelist Henry James, was an American Philosopher and Educational Psychologist with a Medical training. He served as a Physiology Instructor at Harvard for a number of years. As a young adult, James suffered from what was diagnosed as neuasthenia, and he appreciated the importance of exercise as a means of improving his mental health (James, 1899);

"Our muscular vigor ... will always be needed to furnish the background of sanity, serenity and cheerfulness to life".

Thompson. The Scottish poet James Thomson (1700-1748 CE) is perhaps best known as author of the lyrics to "*Rule Britannia*." His final work, the "*Castle of Indolence,"* was an allegoric poem in the style of Spenser, written shortly before his death. It contains many verses that extol the virtues of physical activity and decry the false attractions of a life of ease:

"O mortal Man, who livest here by Toil, Do not complain of this thy hard Estate... Withouten That would come an heavier Bale,"

"For whomsoe'er the Villain takes in Hand, Their Joints unknit, their Sinews melt apace; As lithe they grow as any Willow-Wand, And of their vanish'd force remains no Trace"

"Health is the vital principle of bliss, and exercise of health."

Dickens. Charles Dickens (1812-1870 CE) was the leading British author of the Victorian era. His best-known contribution to Population Health was in publicizing the conditions faced by the poor in Victorian factories, slums and workhouses. However, he was also a staunch advocate of physical activity. He wrote disparagingly of the habits of the local Italians that he had observed during a visit to Turin (Dickens, 1859):

"*the phrase is 'let us go as far as the Po..'.... the promenade extends about half a mile in length.. then for three months in summer the sun is too hot, for three months in winter the air is too keen..."*

Dickens himself was an avid, even a compulsive walker from his childhood (Noden, 1988). He once wrote (Dickens, 1859):

"I think I must be the descendant, at no great distance, of some irreclaimable tramp."

He routinely walked 30 km a day, and once set out at 2 a.m. to walk the 48 km distance from central London to his country residence in Kent. He had a distinctive "swinging" gait, and according to his friend Marcus Stone he "made a practice of increasing his speed when ascending a hill,"

Stevenson. Robert Louis Stevenson (1859-1894 CE) is one of Scotland's best-known authors and poets. For much of his short life, he suffered from some form of chronic chest disease, either tuberculosis or bronchiectasis. In our present context,

he is best known for his opposition to current Epidemiological wisdom. Three examples of his iconoclastic advice on lifestyle may be cited (Stevenson, 1887):

"No woman should marry a teetotaller, or a man who does not smoke.... Michelet rails against it because it renders you happy apart from thought or work; to provident women this will seem no evil influence in married life."

"Extreme BUSYNESS, whether at school or college, kirk or market, is a symptom of deficient vitality."

"The love of living is stronger in an Alpine climber roping over a peril, or a hunter riding merrily at a stiff fence, than in a creature who lives upon a diet and walks a measured distance in the interest of his constitution."

Oscar Wilde (1854-1900 CE). The satirist Wilde drew attention to the stereotype of hunting as a healthy form of sport:

"One knows so well the popular idea of health: the English country gentleman galloping after a fox - the unspeakable in full pursuit of the unbeatable."

However, he seems also to have had an aversion to any type of exercise, as illustrated by the query about retaining a youthful appearance {Wilde, 1913}:

"To get back my youth I would do anything in the world, except take exercise, get up early, or be respectable."

Statesmen. The endorsement of physical activity by leading statesmen has sometimes had a major effect on public opinion, and a number of 19th century politicians and statesmen set a good personal example in this regard. We will comment on the lifestyle of Benjamin Franklin, Thomas Jefferson and Theodore Roosevelt in the U.S., and Lord Stanley and Lord Grey in Canada.

Franklin. Benjamin Franklin (1706-1790 CE) enthusiastically recommended the health benefits of regular physical activity, including running, swimming, and basic forms of resistance training (Karolides and Karolides, 1993). Two at least of his "thirteen virtues" spoke to a commendable personal lifestyle.

"Temperance. Eat not to dullness; drink not to elevation."

"*Industry. Lose no time; be always employ'd in something useful; cut off all unnecessary actions."*

He was very aggrieved when overtaken by repeated attacks of gout. This malady severely limited his ability to exercise (Franklin and Franklin 1818):

Oh! Eh! What have I done to merit these cruel sufferings? Many things; you have ate and drank too freely, and too much indulged those legs of yours in their indolence... the quantity of meat and drink proper for a man, who takes a reasonable degree of exercise, would be too much for another who never takes any....If your situation in life is sedentary, your amusements, your recreations at least should be active..."

Jefferson. U.S. President Thomas Jefferson (1743-1826 CE) introduced the pedometer to the United States, and he

used this device to monitor his demanding personal exercise programme. He was keen to underline the necessity of regular activity for both physical and mental health (Jefferson 1787/1966):

"Exercise and application produce order in our affairs, health of body, cheerfulness of mind, and these make us precious to our friends"

Although some might argue that he pursued this goal over-enthusiastically (Monticello, 1990):

"*Not less than two hours a day should be devoted to exercise, and the weather should be little regarded." "If the body be feeble, the mind will not be strong. The sovereign invigorator of the body is exercise, and of all the exercises walking is best."* (August 27th, 1786, to Thomas Mann Randolph).

Theodore Roosevelt. President Theodore Roosevelt (1858-1919 CE) developed a strong personal interest in fitness, stemming from a childhood battle with asthma. As an adult, he is thought to have reached a high level of physical fitness, and he certainly participated in many outdoor activities such as hiking and horse-riding. In 1905, he was one of the first recipients of an Olympic Diploma (Shephard, 1978a).

Not all subsequent U.S. Presidents have followed his example, but most have recognized that occupancy of the Oval Office required some official commitment to physical fitness (Karolides and Karolides, 1993). One more recent expression of this commitment has been the organization under President Eisenhower (1956) of a *President's Council on Fitness* (*now the President's Council on Fitness, Sports and Nutrition*).

Lord Stanley. A brief comment will be made on Frederick Arthur Stanley, 16th Earl of Derby (1841-1906 CE), and Governor General of Canada from 1888-1893. Lord Stanley was an avid sportsman (Shea, Wilson and Clarkson, 2007). He quickly embraced our Canadian winter pursuits, and was particularly interested in ice-hockey. Several of his sons serving on amateur hockey teams. He is best remembered today for presentation of the Stanley Cup, in 1892. This cup was originally intended for the best amateur team in Canada, but it became the preserve of professional hockey beginning in 1909. Lady Stanley is also honoured for establishing the *Stanley Institute for Trained Nurses* in Ottawa, ON.

George Grey. Albert Henry George Grey (1851-1917 CE) was appointed as Governor General of Canada from 1904 to 1911, succeeding his brother-in-law, Lord Minto. The posting came at a fortuitous time, as a series of unwise investments in South Africa had left Grey almost penniless. In our present context, he is best known for donating the Grey Cup to Canadian football in 1909, at the urging of P.D. Ross of the *Ottawa Journal*. This award was originally destined for the Senior Amateur Champions, and in its early years it was hotly contested by University football teams. However, Senior city leagues were the winners from 1925 to 1945, and subsequently teams from the Professional Canadian Football League became dominant.

Grey also donated awards for the Montreal Horse Show and for figure skating. However, these contributions to sporting events were a part of his overall

concern for social reform, and he is said to have had greater personal interest in the music and drama festivals that he originated than in sporting events.

The voice of women.

Throughout most of the Victorian era, women had little voice in University Faculties and remained politically disenfranchised. Thus their views on issues of Public Policy such as the enhancement of Health and Fitness generally had to be expressed through the mouths of their husbands or male relatives. Nevertheless, Public Health was enhanced through the advocacy of outspoken individuals such as Florence Nightingale (above). A few women also attained leadership roles in small Christian sects. Mary Eddy Baker (1821-1910 CE) founded the Church of Christian Science, and gave full bent to her singular views on health and illness. The Salvation Army, from its foundation in 1865, accorded equal rights to women and men, and it did much to enhance the personal lifestyle of its adherents in the poorer areas of large cities. And the Quaker movement insisted on the equality of men and women, profoundly influencing the thinking of such U.S. feminist advocates as Lucretia Mott, Elizabeth Cady Stanton, and Susan B. Anthony (Sterling, 1999).

Some women became entitled to vote in Britain, Sweden, and western U.S. states in the 1860s, but universal suffrage did not arrive until much later: New Zealand (1893), South Australia (1895), Finland (1907), Norway (1913), Denmark (1915), Canada except Quebec (1918). Great Britain (1918) and the U.S. (1920) (Blackburn, 1970).

Female participation in active recreation during the Victorian era was greatly hampered by both social conventions and the requirement to wear restrictive clothing (Sterling, 1999). However, feminist leaders clamoured for greater opportunities to engage in vigorous exercise. In her "*Discourse on Women*" of 1849, Lucretia Mott demanded that a woman (Wiggins, 1995):

"receive encouragement for the cultivation of all her powers... strengthening her physical being by proper exercise and observance of all the laws of health."

Elizabeth Stanton was a regular contributor to the *New York Journal*, and in her column she often advocated that women shorten their skirts so that they could increase their physical activity. She argued that (Griffith, 1985):

"*mental discipline and physical activity produce mental health."*

And in the opinion of Susan Anthony (Hall and Oglesby, 2002):

"*In the battle for equality, women need strong bodies as well as quick minds*"

In Britain, the early suffragette Sylvia Pankhurst (1882-1960 CE) was confined to Holloway Prison in 1906, but her jailors noted with respect that she did not neglect her exercise routine, marching silently round and round the prison yard for 30 minutes every morning.

Canada's best known advocate of women's rights, Nellie McClung (1873-1951 CE), was an advocate of physical and mental eugenics. She called for the enforced sterilization of children with limited intelligence (Strong-Boag, 1997). However, she also championed more praiseworthy pieces of health legislation,

including the provision of medical and dental services for schoolchildren, mothers' allowances and factory safety requirements.

Towards the end of the 19th century, introduction of the bloomer dress and the safety bicycle brought women new opportunities for an active lifestyle (below).

Physical activity trends in Victorian society

During Victorian times, many factors continued the trend to a reduction of habitual daily activity that had already been initiated by the spectator activities of the Renaissance (Shephard, 2012d), and the shift from physical labour to water and steam power during the industrial revolution (Shephard, 2013). Advances in technology progressively reduced the need for effort-intensive jobs in industry, the home, and even on larger farms, and the introduction of new forms of mass transportation gradually reduced the necessity for active commuting.

Industry and agriculture. Power from water, steam, gas and electricity, and a growing array of machinery progressively reduced the physical demands of factory and agricultural work. Nevertheless, at the beginning of the 19th century, much of the North American continent remained undeveloped. Those on the expanding Western Frontiers still lived on rather primitive homesteads. They spent much of their days hunting for food, ploughing, tending crops and herding cattle (Keller, 1971), and they had neither need nor opportunity to engage in exercise or fitness programmes. But on the larger and more prosperous farms, new water and steam-powered machinery began to supplant humans as a means of performing the heaviest forms of work.

Domestic activities. Most working class women still had a very heavy physical workload, caring for large families, although new technology slowly began to reduce some of the demands of their daily routine. Piped water supplanted the need to carry buckets from the nearest well, and gas or electric heating eliminated the need to carry wood or coal and to tend grates and cooking stoves.

Introduction of the domestic sewing machine greatly reduced the time needed to make household clothing and linen. Between 1850 and 1880, the Singer Corporation sold some 3 million sewing machines in the U.S. alone (Scott, 1880). However, easy access to birth control and a resulting reduction in family size was not common until after World War I.

Transportation technology.

Inventions of the Victorian era offered a greatly increased range of options for those seeking passive transportation. In 1825, George Stephenson's "Rocket" began hauling passengers along the Stockton & Darlington Railway at unimaginable speeds, and the first section of the Baltimore & Ohio Railroad was opened in 1830. The Metropolitan Railway sent specially adapted steam locomotives burrowing under London city streets, beginning in 1863, and by 1891 electric subway trains on the Central Line were venturing as much as 76 m below the centre of London.

In Wales, a horse-drawn tramcar first conveyed passengers between Oystermouth and Swansea docks in 1807, and horse-drawn streetcars also appeared in New York City and Harlem in

1832. Steam (1873) and then electricity (1881) soon replaced the horse as the source of power for these vehicles. The Siemens Company led this initiative with the opening of an electric streetcar route in a suburb of Berlin. Blaise Pascal had introduced a public bus line to Paris in 1662, but rising fares soon led to its demise. Horse-drawn buses were reintroduced in the 1820s, and these routes progressively became served by steam-, electric- or petrol-driven vehicles.

The rivers, lakes and canals also saw the introduction of scheduled steamboat and ferry services. The pioneer in this regard was John Fitch, who put a 14 m steamboat into service on the Delaware River between Philadelphia and Burlington, beginning in 1787.

Physical education

The Victorian period saw a growing emphasis upon gymnastic instruction in the better European schools, with a strong rivalry between German, Danish and Swedish systems of instruction. Czechoslovakia, Switzerland and France each added their own particular contributions to these systems of teaching. By the final two decades of the 19th century, the athletic programmes that had become popular in English "Public" schools also began to attract attention across Europe.

Nineteenth century immigrants carried interest in German and Swedish gymnastics to the U.S., although European-style gymnastic programmes were generally confined to specific ethnic communities (Barrow and Brown, 1988). Canadian efforts to enhance physical education also received some input from the German Turners, but Canadian interest in physical education was strongly coloured by continuing fears of invasion from our Americans neighbours to the south.

These disparate initiatives spurred formation of several professional associations. The *American Association for the Advancement of Physical Education* was founded in 1885, setting as its primary objective the support of gymnastics education. It was renamed the *American Physical Education Association* in 1903, and subsequently blossomed as the *American Alliance for Health, Physical Education, Recreation and Dance* (*AAHPERD*). It was not until 1933 that a separate *Canadian Physical Education Association* was established. On the global stage, the *International Gymnastic Federation* was formed in 1881, and the first International Gymnastics Championship was held in 1903.

Germany. Early German interest in Physical Education can be traced to the influence of Basedow, Guts-Muths and Jahn. The average curricular time allocated for gymnastic instruction was a substantial 2 hours/wk. One teaching guide that appeared in 1871 was entitled "*Anleitung zu Turnfahrten, Wanderungen und Schulrreisen" (Gymnastic rides, hikes and school trips*) (Bach, 1877). A more general *Handbuch der Schulhygiene (Handbook of School Hygiene),* published in 1900, included a substantial section on gymnastics (Baginsky and Janke, 1900). The militaristic style of the German programme appealed mainly to male students, and from the age of puberty girls tended to play truant from physical education classes (Naul, 2002).

Basedow. Johann Basedow (1723-1790 CE) was born in Hamburg, Germany, An enthusiastic disciple of Rousseau, he set about reforming the Prussian educational system along the lines

described in the book "*Emile*" (Shephard, 2013). Basedow had begun his career as tutor to the son of a Holstein nobleman, and on the basis of this experience he had written his M.A. thesis "*On the best and hitherto unknown method of teaching children of noblemen*" After dismissal from academies in Sorøe, Denmark and Altona (near Hamburg) for unorthodox Theological views, Basedow moved to Dessau in North Germany. There, he established a Model School or *philanthropinum,* with the powerful backing of Goethe and Prince Franz of Anhalt-Dessau**.** The daily schedule for his institution comprised a challenging 5 hours of learning, 3 hours of recreation and 2 hours of physical labour.

Basedow's knowledge of Physical Education came from his sojourn at the Knights' Academy in Sorøe, and in the *philanthropinum* he attempted to adapt riding, dancing and ball games to the Baroque taste. Nevertheless, the avowed objective of his school was an education based on human nature rather than on the privileges of the nobility (Lang, 1891; Wildt, 1971). Modernizing of the knightly exercises progressed steadily with the assistance of two French educators Simon and Du Toit. They joined with Basedow to develop the Dessau pentathlon (running jumping, throwing, carrying and balancing) (Naul, 2008).

Gut-Muths. Like Basedow, Johann Christian Friedrich Guts-Muths (1759-1839 CE) lived in North Germany. He is often regarded as the Grandfather of Gymnastics. In 1793, he published the first systematic text of Gymnastics for schools (*Gymnastik für die Jugend*)(Salzmann and Guts-Muths, 1800). In this volume, he argued that moral health and mental robustness were, more often than not, the consequences of bodily strength (Mosse, 1998). Guts-Muths also authored a comprehensive book on Games, analyzing the skills developed by participation in 105 different sports (Johnson, 1907).

Guts-Muths developed both artistic gymnastics and systematic physical exercise routines. His programmes included running, jumping, lifting, carrying, dancing, balancing, vaulting, fencing, shooting, and military drill. However, the necessary school facilities remained relatively simple; they included little more than a 6 m wooden frame fitted with ropes, a rope ladder and a climbing pole.

Jahn. Friedrich Ludwig Jahn (1778-1852 CE) was born in the small town of Lanz,, Brandenburg, in 1778. He spent much time brooding on the humiliation of the German Fatherland, following the crushing defeat of Prussia inflicted by Napoleon. He argued that an enhanced physical development of the German people through outdoor gymnastics had political potential as a tool in the rebuilding and reunification of his country. As he explained in the *Deutsches Volkstum (The German Way of Life*) (Jahn, 1991):

"Only when all men of military age have become capable through physical education of bearing arms, have become ready for combat through weapon training, prompt to strike...can a people be called militarily prepared."

Jahn established the first *Turnverein* (Turnen, to practise gymnastics, *Verein* = club) in Berlin in 1811. Soon, upwards of 1000 young enthusiasts were meeting twice per week at their permanent

grounds, the *Turnplatz*, where they found simple apparatus based on the ideas of Guts-Muths, with facilities for running, jumping, balancing, climbing, and vaulting (Matthews, 1969). The stated aims of the German Gymnastic Societies included not only the development of physical health and vigour, but also the promotion of *Deutschheit (Germanness).* Jahn seems to have been a very outspoken individual. During the French occupation, he declared quite openly that "*Poles, French, priests, aristocrats and Jews are Germany's misfortune*," thus leading some to consider him the spiritual founder of the Nazi movement. He led a ceremonial burning of reactionary books at the Wartburg festival of 1817, again foreshadowing by his action the ritual book burnings of the Nazi era (Viereck, 1961). The perpetuation of Jahn's ideas can be seen in some of Hitler's speeches. For instance, the Führer wrote in *Mein Kampf* (Shirer, 1960):

"Education by a national state must aim primarily not at the stuffing with mere knowledge, but at the building of bodies which are physically healthy to the core."

By 1819, Jahn had been arrested. He was imprisoned for 2 years, and the Berlin Turnplatz was officially closed until 1840. But in the interim, its exercise programmes appear to have continued behind closed doors.

Voelke. With the support of the philosopher Jeremy Bentham, one of Jahn's pupils, Carl Voelke, opened a *Turnplatz* near Regent's Park, in Central London, in 1825. Its facilities included horizontal and parallel bars, and equipment for rope and ladder climbing and pole vaulting. A second such establishment opened in nearby Bloomsbury, two years later. Purpose-built gymnasia also appeared at the East India Company College, Hertfordshire, in 1851, and at Uppingham School, Rutland, in 1859. In 1865, the *German Gymnastics Society* also opened a state-of-the-art *Turnhalle* at St. Pancras, in Central London (Tames, 2007).

Other German Leaders. In 1830, Karl Friedrich Koch (1802-1871 CE), Director of the Gymnastic Institute in Magdeburg (Lempa, 2007) outlined his views on the importance of Gymnastics as a means of optimizing diet and psychological behavior, and in 1836, Otto Lorinser advanced the revolutionary concept that the time students spent sitting in academic classrooms should be reduced in favor of more sports and gymnastics (Berg, 2002).

Emigrant Turners. Many of the German Turners joined an unsuccessful revolt against the Prussian monarchy in 1848, and had to flee the country. As refugees, they established *Turnvereinen* in many parts of the world, including the U.S. and Canada (Barney, 1976). A substantial German-speaking colony was established in Cincinnati, with its own *Turngemeinde*, and through such people as Beck, Follen and Lieber, it played a substantial role in shaping U.S. Physical Education programmes (Barney, 1976; Ziegler, 1972).

In Canada, the Turner movement was concentrated in that part of the country where the concentration of German immigrants was highest, Waterloo County, ON. Gymnastic establishments opened in the city of Berlin (now Waterloo, ON), and the neighbouring towns of Preston and New Hamburg.

These establishments flourished during the period 1855-1875, usually under the direction of the proprietors of the local German language newspaper (Gray, 1990).

Denmark. Scandinavian Gymnastics has often been viewed as an educational tool, in contrast with the militaristic emphasis of its German alternative. Nevertheless, a military component can be seen in both Danish and Swedish programmes. Important figures in the Danish segment of the Scandinavian story were Christiani, Nachtegall and Bukh.

Christiani. Denmark and Norway were united as a single kingdom until 1814. At the end of the 18th century, the young and liberal Regent was Frederik VI (1786-1839 CE). He instituted many reforms, including the abolition of serfdom (1788) and the first university of the joint kingdom was named after him in Oslo. Given this promising educational atmosphere, in 1795 Frederik's court chaplain Christiani opened a private school in Vesterbro, near Copenhagen, with a programme that included bodily exercises, active games and the ideals of the philanthropinum (Leonard, 2009).

Nachtegall. Franz Nachtegall (1777-1847 CE) was born in Copenhagen, and in his youth he had taken lessons in fencing and vaulting. A reading of the Guts-Muth gymnastics manual (above) persuaded him to begin gymnastics instruction, firstly in his own home, and then at a private outdoor gymnasium (Rao, 2008). In 1799, Christiani invited Nachtegall to teach gymnastics at the Vesterbro school, setting up necessary apparatus in the schoolyard. By 1805, nine private and public schools in the region were offering gymnastics courses.

Following disasters in the Napoleonic wars, Frederik VI created the *Institute of Military Gymnastics* in Copenhagen in 1804. Nachtegall was appointed as its first Director. This Institute provided instruction for future NCOs in both the army and navy. The following year, Nachtegall prepared a detailed gymnastics manual for this course (Leonard, 2009):

"*lnstruction i Gymnastikken, for de Laerere som ere ansatte ved Kavalleriets og Infanteriets Underofficeer- og Exerceerskoler. (lnstruction in gymnastics for teachers who are employees of naval and infantry NCO exercise schools*)."

In 1807, King Christian VII appointed Nachtegall Professor of Gymnastics at the University in Copenhagen, although he never seems to have taught formally in any of its lecture halls. The following year, Nachtegall was awarded an honorarium of 300 Rix-dollars (about 5 pounds sterling) in return for providing free instruction to civilians who showed an interest in the teaching of Physical Education, An ordinance of November 7th, 1809 required Danish secondary schools ("*de laerde Skoler*") to offer instruction in Gymnastics "*when and where it was possible*," and in 1814 Gymnastics became an integral part of instruction for all boys attending elementary schools (*Folkeskoler*). This innovation occurred nearly three decades before Prussia took similar action (1842) (Matthews, 1969). Every Danish school was ordered to provide 800-1200 Alen (300-450 m^2) of outdoor space to facilitate such teaching.

Bukh. Niels Ebbesen Bukh (1880-1950 CE), was born in rural Denmark. His mother thought him a sickly boy, with in-pointing toes and too large a head. However, he became the charismatic leader of modern Danish gymnastics, building on the tradition of Nachtegall (Bukh, 1938). Although an exponent of *folkelighed* (sport for all), much of Bukh's interest was focussed upon elite gymnastics and male aesthetics. Tightly clad gymnasts engaged in much gracious and suggestive touching. Such routines were followed by powerful dynamic masculine movements, performed at a frantic tempo (Bonde 1999; 2006). This was described as "*Primitive Gymnastics*," and its aim was "building the body perfect."

Bukh became seen as a Danish patriot, boosting the image of the nation with world trips by his acclaimed gymnastic teams. But the latter part of his life was marred by a fascination with the German Nazi party, a strange choice given his apparently homosexual orientation. Bukh accepted the Nazi view that Gymnastics displayed the best features of the "*Nordic-Germanic Race*," and during the 1930s his form of Gymnastics became popular both in Germany and in Japanese schools.

Sweden. Swedish physical education instructors emphasized free movement of the limbs and the perfection of rhythmic activities rather than deliberate muscle-building through apparatus work. The free movement approach seems to have begun with a German, Christian Salzmann, but it quickly became associated with the name of Ling.

Salzmann. Christian Gotthilf Salzmann (1744-1811 CE) founded the *Schnepfenthal* institution in 1784 (Christoph et al., 1800). This Institution was dedicated to new modes of education, with Natural Law and Enlightement as its watchwords. Salzmann had previously taught at Basedow's *philanthropinum* in Dessau, and he was heavily influenced by the ideas of Rousseau. In his text on *Gymnastics for Youth*, written jointly with Guts-Muths (Salzmann and Guts-Muths, 1800), he suggests:

"We are weak because it never enters our thoughts that we might be strong"

Ling. Pehr Henrik Ling (1776-1839 CE) was the dominant figure in the Swedish system of Physical Education and Therapeutic Gymnastics during the early part of the 19th century. After graduating in Theology from Uppsala University in 1797, Ling spent seven years travelling in Europe. He was then forced to return home through a combination of financial problems, overuse injuries and rheumatism. After a short spell of Arts teaching in Lund, he was appointed fencing master at the University of Uppsala in 1805. He himself was particularly active in fencing, riding and swimming. He observed that his personal programme of daily exercises had completely restored his health, and he thus became interested in auditing the Medical curriculum.

In 1813, he was appointed as Principal of the newly constituted *Royal Central Gymnastic Institute* in Stockholm, well-known today for such scholars as P-O Åstrand and Bengt Saltin. In this role, Ling developed a gymnastics system with four specific emphases: 1) Pedagogical Gymnastics, 2) Military Gymnastics, 3) Medical Gymnastics and 4) Aesthetic Gymnastics (Wide, 2009). Ling's

knowledge of Medicine was such that his programme gained the respect of local physicians, and in 1831 he was elected a member of the *Svenska läkaresällskapet (Swedish General Medical Association).*

The therapeutic component of Ling's programme (Swedish massage) became widely accepted, with its characteristic components of *effleurage* (stroking), *petrissage* (kneading), friction, *tapotement* (brisk tapping) and vibration. Some Physical Therapists viewed Ling's exercises as but one component of orthodox Medical Science, but others (as exemplified by Henrik Kellgren (1837–1916 CE) claimed that Swedish massage was a cure for disease in its own right. The demand for Swedish massage quickly exceeded the teaching capacity of Ling's school, and this stimulated a demand for machines that could assist staff in providing active, assisted and resisted exercise. One outcome of this was the medico-mechanical system of gymnastics, elaborated by Gustaf Zander (1835-1929 CE) (Levertin, 1893).

Ling recognized that exercise was essential for everyone, although he maintained that exercise programmes should be tailored to respect individual differences. He also insisted that Physical Educators acquire a sound knowledge of Physiology in order to understand the health importance of physical activity and fitness. Probably for this reason, the *Royal Central Gymnastic Institute*, in collaboration with the nearby *Karolinska Institute*, has continued to play a dominant role in Clinical Exercise Physiology for some two centuries (Matthews, 1969).

One interesting commentary on the relative effectiveness of Swedish vs. Military gymnastics is a study that was published in 1957. This noted a "remarkable decrease" of Physical Working Capacity as young men moved from their school programmes into the first year of Swedish compulsory military service (Linroth, 1957). The author of this report suggested that the pattern of physical training and occupational duties adopted by the army failed to take adequate account of the individual's abilities at recruitment.

Czechoslovakia. Czechoslovakian gymnastics followed closely along the lines of the German Turnverein, and during the 19th century the Turnverein movement spread quickly throughout Slavic parts of the German empire. The Turnverein was in part a reaction against the industrialization and urbanization of central Europe, an attempt to get exercise out of the classroom or gymnasium and into the open air.

In Czechoslovakia, it became known as the Sokol movement, from *Sokol*, the Slavic word for falcon. This Czech expression of nationalistic gymnastics originated in Prague in 1862, under Miroslav Tyrš (1832-1884 CE) and Jindřich Fügner (1822-1865 CE). Ostensibly, it was "*above politics*," but it played an important role in fostering Czech nationalism, particularly through lectures and theatrical performances that accompanied the mass gymnastic festivals or *Slets ("meeting of birds").*

The overall aim of the Sokol movement was to provide a combination of physical, moral, and intellectual training for the working classes. The physical activity component focussed on marching drills, fencing, weight-lifting and rhythmic gymnastics. The Austrio-Prussian war stimulated the militaristic component of the programme, and *Sokol* members became guards at public events. In the

first decade of the 20th century, alignment with the Czech National Socialist party brought about an unfortunate "ethnic cleansing" of non-Slavs from the movement, eliminating those of either German or Jewish birth. At the first "All-Slavic Slet" of 1912, the call was made (Nolte, 2002):

When the thunder comes and the nations rise up to defend their existence, let it be the Sokol clubs from which the cry to battle will sound..."

At this point, many former *Sokol* members chose to shift their allegiance to a rival organization, the *Delnická Telovýchovná Jednota, DTJ (the Workers' Gymnastic Club).*

Switzerland. The concept that children should receive both general and physical education irrespective of the wealth of their parents was enthusiastically endorsed by the Swiss pedagogue Johann Heinrich Pestalozzi (1746-1827 CE). Pestalozzi was born in Zürich. His father died at an early age. After graduating from the University of Zürich, Johann attempted to cultivate some wasteland near Aargau, and later he turned his farmhouse into a school. Both of these enterprises quickly met with failure. During the French invasion of 1798, Pestalozzi cared for deserted orphans in an abandoned Convent, but the building was soon requisitioned as a hospital by the French invaders. In 1799, he was finally able to establish a school, and in 1802 he travelled to Paris in the hope of interesting Napoleon in his system of education. Unfortunately, the conqueror told Pestalozzi that he was "*not interested in the alphabet*."

Pestalozzi set out his educational philosophy in the book "*How Gertrude Teaches Her Children*" (Pestalozzi and Cooke, 1989). He vigorously opposed the rote learning and corporal punishment that was typical of his era, and embraced as his motto "*learning by head, had and heart*." By 1830, his efforts had largely abolished illiteracy in Switzerland, and many influential educators were seeking out his advice. He had an important influence not only upon Academic instruction, but also on the theory of Physical Education, developing a regimen of physical exercise and outdoor activity that was closely linked to his concepts of general, moral, and intellectual education and reflected his ideals of harmony and human autonomy (Jedan, 1990).

Peter Heinrich Clias (1782-1854) was another Swiss National with an interest in Physical Education. However, he emigrated to England, to become Superintendent of Gymnastics at the Royal Military College of Sandhurst. He published a short monograph describing a system of therapeutic exercise (Clias, 1825).

France. France, like other parts of Europe, faced controversy over the relative merits of rhythmic and militaristic gymnastics, with Noverre, Delsarte and Bode promoting the rhythmic approach, and Amoroso arguing for military drills.

Rhythmic gymnastics. Supporters of rhythmic gymnastics included the celebrated French ballet-master Jean-Georges Noverre (1727–1810 CE), the musical composer and Speech Therapist François Delsarte (1811–1871 CE), and a Leipzig-born musician Rudolf Bode (1881-1970 CE). All of these teachers

believed strongly in the virtues of rhythmic movement, urging their pupils to express themselves through dance and thus to exercise various body parts. Delsarte taught relaxing exercises and breath control for actors, but he also believed that certain physical exercises contributed to poise, grace, beauty and health. Towards the end of the 19th century, a vogue for Delsarte gymnastics developed in North America (Stebbins, 1888), and this trend was perpetuated into the 20th century by such individuals as Rudolf von Laban (1879-1858 CE) and Frederick Matthias Alexander (1869-1955 CE).

Military gymnastics. The army played a major role in the development of Physical Education in France. The colonel responsible for this initiative, Francisco Amorós (1769-1848 CE) was born in Valencia, Spain. He had founded the *Military Gymnastics School* in Madrid, and had served Charles IV and Joseph Napoleon in Portugal. But after the defeat of Napoleon, political considerations forced him to emigrate to France (1814). In 1819, he organized the *Normal Gymnastic Civil and Military School* at Grenelle, a Parisian facility that was equipped with a great deal of apparatus (de Laet, 1994-2008). In 1831, Amorós was appointed as the French National Director of Gymnastics. He seemingly had a scientific attitude to his task, collating physiological record cards for each recruit, and using dynamometers to measure their muscular performance, He defined gymnastics in very broad Pestallozzian terms (Amoros, 1821):

"la science raisonnée de nos mouvements et de leur rapports avec nos sens, notre intelligence, nos moeurs et le développement de tous nos facultés (the rational science of our movements and their relationship to our senses, our intelligence, our mores, and the development of all our faculties)"

Like many of his contemporaries in Physical Education, Amorós once more found himself in conflict with the reigning government. His new problems arose from the Bourgeois Revolution of July 1830 that had ended the Bourbon monarchy. According to the *Great Soviet Encyclopedia* of 1979, in the aftermath of this action, Amorós was removed from both his position as leader of the army's Physical Education programme and from the School that he had founded in 1832. Nevertheless, the army continued to follow the Amorós plan of physical training when it established a permanent Gymnastics school in the Parisian suburb of Joinville-le-Pont in 1852.

The next venture of Amorós was to open a private gymnastics hall in Paris, and in 1838 he published his *Nouveau Manual d'Education Physique, Gymnastique et Morale*. His pattern of gymnastics, described as the natural-applied system, included many elements of the *Turnverein* programme, with an emphasis upon jumping, climbing, balancing, archery, pistol-shooting, the use of parallel bars and resistance exercises. Learning to jump well was a priority, since it was seen as a matter of self-preservation (Amoros, 1838):

"La conservation de la vie dépend plusieurs fois de la connaissance des règles de l'art de sauter, car il arrive que l'on est lancé malgré soi d'un endroit élevé sans pouvoir l'eviter..."(The conservation of life sometimes depends on one's knowledge of the rules of jumping, since it can happen

that one is thrown unwittingly form some high place without being able to avoid it).

Perhaps as a reaction to defeat of the French army by the Prussians in 1870, French schools made military-style gymnastic classes compulsory, for boys in 1872, and for girls in 1880.

Military regulations added elements of Swedish gymnastics into the army programme in 1902. George Demeny (1850-1917 CE) was a French Physiologist and Physical Educator with an interest in chronophotography. He collaboraterd with Etienne-Jules Marey, inventor of the sphygmograph, for many years, but in 1898 he returned to Physical Education. He had initially favoured Swedish gymnastics, but later concluded that the method of Ling was too static. In the view of Demeny, the emphasis of training should be upon developing the cardiorespiratory system rather than the muscles. He was also somewhat influenced by Dalcroze, and set some of his exercises to music.

A third influential figure at the end of the 19th century was Georges Hébert (1875-1957 CE), a French naval officer. He was impressed by some of the indigenous people that he had seen during his voyages around the globe, and he urged a return to primitive natural movement as the basis of gymnastics, with the slogan

"être fort pour être utile (Be strong to be useful)"

Hébert thus stripped his gymnasium of all equipment. A presentation on his methodology, based on the improvement in performance of 350 seaman, was given at the 1913 *International Congress of Physical Education* (Hébert 1912). The presentation was very favourably received, and soon afterwards Hébert was appointed Director of the Athletes' Secondary School in Reims. He also assumed responsibility for the physical training of French troops during World War I, and his ideas form the basis of the Parkour that is now to be found in many recreation grounds.

We may finally mention Fernand Lagrange (1846-1909 CE). He was a pioneer in Sports Physiology, studying training and fatigue, and he published an early textbook on this subject {Lagrange, 1888/2010}.

England. In reviewing British contributions to the development of an active lifestyle, the attention of some Sport Historians such as P.C. McIntosh has focussed upon the type of sport and athletic programme introduced by Thomas Arnold at the "Public" school in Rugby. The influential Catholic theologian Cardinal Newman also had much to say in favour of sport, although he was sometimes vigorously debated by Matthew Arnold, the son of Thomas Arnold.

However, British "Public" schools served only a small and privileged minority of the population. The great majority of British students attended State schools, often for only a few years. In Victorian times, most of these institutions were poorly equipped and often they had no more than a small tarmac or gravel courtyard for gymnastic activities. Children from average homes thus received instruction that was much more akin to the German system of gymnastics, as detailed by Archibald MacLaren. In time, the British army and even "Public" schools came to adopt some aspects of MacLaren's programme.

Thomas Arnold. At the beginning of the 19th century, headmasters of the more reputable "Public" schools in England seemed united against any participation of their pupils in sport. D. Keate, the Headmaster of Eton, opposed cricket matches against Harrow, the Westminster school objected to rowing contests with Eton, and in Shrewsbury Dr. Butler thought football was "*only fit for butcher boys*" (McIntosh, 1971). This negative attitude towards sport underwent a radical change during the period when Thomas Arnold (1785-1842 CE) was Headmaster of Rugby School. He assumed the position in 1828, and his curriculum was soon seen as providing a model for other "Public" schools. Instruction in Science was studiously avoided, since (Strachey, 1918/2006):

"it must either take the chief place in the school curriculum, or it must be left out altogether"

Arnold's athletic interests included cricket, swimming, gymnastics and spear-throwing, although apparently he was not particularly attracted to the form of football that developed at Rugby during the tenure of his Headship. Arnold exerted his main influence by banning the paper-chase game of "Hare and Hounds" and lawless forms of physical activity that had been prevalent at his school. By default, the students became increasingly interested in the sports that were permitted. A routine developed of Academic study in the mornings and evenings, with the afternoon set aside for a variety of athletic pursuits. Character training was seen as an important component of this programme.

The late Victorian era saw much of Upper-class Britain emphasizing sport and organized games within the "Public" school tradition. Interest spread progressively from this social elite to those who were seeking to emulate them. Thus, many of the Middle-class also elected to engage in Association football, hockey, tennis, rowing, cycling, cricket and track and field competitions.

Whether because of differing economic conditions or the strong early emphasis on gymnastics, interest in such forms of sport developed substantially later in Europe and North America than in England.

MacLaren. Archibald MacLaren (1820-1884 CE) studied Medicine, and later operated a preparatory school (Summer Fields) on the northern outskirts of Oxford, U.K., with the motto *Mens Sana in Corpore Sano*. He also worked as a fencing instructor and ran a commercial gymnasium in Oriel Lane, Oxford. He is best known for promoting the importance of fitness and regular exercise in a text that urged the need for physical culture in "*modern times*" (MacLaren, 1869). A reviewer of MacLaren's text wrote (Unspecified reviewer for Lancet, 1869):

"Few men have done more for physical education than the writer of this book. By his Gymnasium at Oxford he has promoted in an extraordinary degree the health and vigour of the young men of the better classes, while by his excellent athletic code for the army, and by his influence with successive War Ministers, he has aided largely in.... transforming the stiff, slow-moving grenadier of old times into the vigorous, rapid, and enduring soldier of modern days."

Maclaren recognized that growing boys and girls required regular physical

exercise, and he believed the best cure for weariness or stress was physical action. He noted that in many school programmes, the intensity of recreational exercise and sport was insufficient to attain adequate fitness levels. He documented the importance of progression in a conditioning regimen (Welch, 1996), and in agreement with Ling, he emphasized the need for a gradation of training, based on the initial fitness of the individual.

Newman. As in Canada, a substantial fraction of ordinary children in Victorian England were educated at Catholic parochial schools. Thus the views of Newman, a dominant force in 19th century Catholicism, are important to our discussion. Cardinal John Henry Newman (1801-1890 CE) was originally ordained as an Anglican priest and became a leader in the Oxford Movement. However, he transferred to the Catholic Church in 1845, and in 1854 he became rector of the Catholic University of Ireland (now University College Dublin). Later, he established the Birmingham Oratory, a "Public" school for Catholic boys.

In his "*Ideas of a University,*" Newman had much to say in favour of sport (Newman, 1999). He saw it as a category of activity that did not need to be justified by its utility. Newman was a strong proponent of the gentleman amateur, and he argued that sport lost its "liberal" character when it was motivated by a search for personal gain, as when it was made the occasion for gambling.

Matthew Arnold. Matthew Arnold (1822-1888 CE) was the son of Thomas Arnold (above), and spent some of his boyhood at Rugby School. He became a writer who frequently offered pertinent comment on social issues. During the period 1851-1886, he became firstly one of Her Majesty's Inspectors of Schools and eventually Chief Inspector. His employment involved criss-crossing England, looking at a wide range of Non-Conformist schools. Although he valued the steady income he received as a Civil Servant, he often complained that the task itself was drudgery (Collini, 1993).

He did not agree with Newman that sport should be seen as an end in itself. He wrote (Arnold, 1865):

"Bodily health and vigour are things which are nowhere treated in such an unintelligent, misleading and exaggerated way as in England."

Rather than fussing about exercise, Arnold argued that a person should concentrate on the formation of spirit and character. Particularly if a boy had to work long hours, gymnastics was the best type of physical activity to choose, since it would do the most to improve his health in the short time available.

United States. Physical education was lacking from much of the public educational system in the U.S. until towards the end of the nineteenth century (Welch, 1996). Some educators believed firmly in the value of German or Swedish gymnastics as a means of improving health-related fitness, but in many schools, the focus shifted progressively from exercise and/or gymnastics to sports, particularly team games such as American football. The debate between widely taught health- and skill-related physical activity instruction versus elite sports programmes continues today in many North American school systems (Barrow and Brown, 1988). Individuals

contributing to the fitness-related type of programming during the nineteenth century included Beck, Warren (above), Beecher, Lewis, Hitchcock, Anderson and Sargent.

Beck. The first North American school to include regular gymnastics in its curriculum was the Round Hill School in Northampton, Mass. This came about through the advocacy of Karl Beck (1798-1866 CE). Beck was born in Heidelberg, and while studying in Berlin, he began to attend the Hasenheide *Turnplatz*. He completed a Ph.D. in the classics at Tübingen, but because of Republican leanings, he could not find employment in Germany. After short periods of exile in Switzerland and Paris, he reached the U.S. in 1824. Beck quickly found employment as a teacher of Latin at the Round Hill School, and by 1825 he had persuaded the school to construct a gymnasium (Faust, 1909). Each class received 3 hours of gymnastics per week, supplemented by horse-back riding, baseball, hockey, football and gardening (U.S. Bureau of Education, 1885). Beck remained a keen disciple of Jahn, and translated Jahn's 1816 work *Deutsche Turnkunst* into English.

Beecher. The American Educator Catharine Beecher (1800-1878 CE) was sister of the Abolitionist Harriett Beecher Stowe. She was educated at home until the age of 10 years. She then went to a private school in Litchfield, Conn, where for 6 years she had personal experience of the limited tuition that was offered to Victorian women. With the death of her mother, she returned home to manage the household. However, she taught herself Mathematics, Latin and Philosophy, and by the age of 21 she had become a teacher in New Haven, Conn. She went on to establish schools for women, firstly in Hartford, Conn, and subsequently in Cincinnati, OH.

Beecher developed an extended plan for the physical, social, intellectual, and moral education of women, which included a fitness programme designed to meet the specific needs of women and girls. She objected that the regimen of Lewis (below) was (Barnard, 1878):

"*so vigorous and ungraceful as to be more suitable for boys than for young ladies*."

In its place, she recommended a system of daily calisthenics aimed at securing graceful movements, performed to music (Barrow and Brown, 1988; Beecher, 1856; Todd, 1998; U.S. Bureau of Education, 1885).

Catherine also carried out dietetic experiments on her pupils, weighing their food intake, and insisting that Graham flour was better for them than a richer diet.

Lewis. Following conclusion of the Civil War, Swedish and German Gymnastics enjoyed a moderate growth of popularity in the U.S. However, the most trendy form of gymnastics for Americans during this era was "The New Gymnastics," of Dioclesian Lewis (1823-1886 CE)(Rice et al., 1958). Like many of his contemporaries, Lewis was already working in a cotton factory by the age of 12. However, he continued studying during his evenings. At the age of 15, he established a small school, managing to keep just one lesson ahead of his pupils. He then decided to go into Medicine, and worked for 3 years in the office of the Medical Officer at Auburn State Prison.

After further (but incomplete) Medical studies at Harvard, he began practicing in Port Byron, NY, where his partner Lewis McCarthy interested him in Homeopathy. Lewis was also an ardent advocate of temperance.

He founded the *Normal Institute for Physical Education* in Boston in 1861, hoping that his programme might be widely used in schools (since it did not depend on construction of an elaborate gymnasium). His exercises were suitable for the poorest of schools, and could be performed even without moving the pupils' desks. In Lewis's view, although athletic young men could accomplish the feats required by Jahn's gymnastics, such exercises were not suited for those who most needed regular exercise: boys; old, fat or feeble men; and girls and women (Lewis, 1862). For three years (1864-67) he ran a school for girls in Lexington, Mass., with Catherine Beecher as one of the teachers.

Hitchcock. The Physical Educator Edward Hitchcock (1828-1911 CE) was the son of the President of Amherst College. He graduated from Amherst and Harvard Medical School. In 1861, he returned to Amherst, where he taught Hygiene and Physical Education. Although a number of U.S. colleges had begun hiring Physical Educators in the 1820s, he was the first formal University-level Physical Educator in North America.

He believed strongly in the importance of developing the physical health of college students, so that the mind could accomplish its best work. He thus developed a system of physical training that was intended to appeal to the students both mentally and physically. It integrated Physical Education with the Student Health Service (Welch, 1966). Hitchcock preferred light to heavy gymnastics, and made extensive use of dumb-bells.

He wrote an early undergraduate Anatomy and Physiology text that purported to deduce proofs for the existence of God from the body's characteristics (Hitchcock, 1860). From 1861 to 1888, he also ventured into Physical Anthropometry, measuring almost every Amherst student for six segmental heights, 23 girths, six breadths, eight lengths, eight measures of muscular strength, lung capacity, and pilosity (the amount of hair on the body). He wrote an Anthropometry Manual based upon these observations. This text described how to make the relevant measurements, and it introduced the concept of using anthropometric measurements to assess an individual's progress in developing his or her personal fitness.Thus colleges such as Yale and Harvard were encouraged to include Anthropometry as a part of their Physical Education and Hygiene courses. In 1885, Hitchcock became the first President of the *Association for the Advancement of Physical Education*.

Anderson. William Gilbert Anderson (1860-1947 CE) was born in St. Joseph, MI. He learned the value of regular physical exercise from his father. He studied at Amherst and the University of Wisconsin, and in 1881 he became Superintendent of the Cleveland YMCA, pursuing Medical School studies on a part-time basis. Anderson is perhaps best known for his founding of the *American Association for Health, Physical Education and Recreation* in 1885, when he was Physical Education Instructor at the Adelphi Academy in Brooklyn. NY. A year later, he had opened the Brooklyn Normal School of Physical Education. In 1892, he

moved to Yale, taking his school with him, and in 1894 he became Director of the renamed *Anderson School of Normal Gymnastics.* He wrote several texts on Physical Education, and contributed to the recognition of this field as a legitimate Academic subject.

The titles of two of his books point to an Aesthetic viewpoint: "*Light Gymnastics*" (1889) and "*The making of a perfect man*" (1901). In essence, he sought health, strength, grace and symmetry through programmes of physical education that combined elements of gymnastics and calisthenics. In the introduction to one text, he quoted Gladstone (Anderson, 1897):

"*All the time invested in training the body pays a larger interest than any other investment*."

Sargent. Dudley Allen Sargent (1849-1924 CE) is best known to health and fitness professionals for his *Jump Test*. Sargent was the son of a ship's carpenter. His father died when he was quite young, Dudley joined with some of his fellow high school pupils to erect a horizontal bar and other apparatus on the school grounds, and the group then started a gymnastic club. In 1869, he was invited to direct the gymnasium at Bowden College. During his period of study at Yale, he taught in the gymnasium and in 1878 he graduated with a Medical degree. He then moved to New York, opening a commercial gymnasium where he tested the fitness of his clients.

He subsequently taught both Swedish and German systems of gymnastics at various universities, becoming the first Director of the Hemenway Gymnasium at Harvard. One of the first students that he tested for fitness was Theodore Roosevelt. Sargent published texts describing anthropometric apparatus such as a stadiometer and a girth-measuring device (Sargent, 1887), together with simple tests of strength, endurance and power for each of six major muscle groups (Sargent, 1902). In *Health, Strength and Power,* he presented fitness-enhancing exercises for children and adults of all ages (Sargeant, 1904). Perhaps his greatest contribution was in forwarding the development of Physical Education as a professional occupation (Barrow and Brown, 1988 ; Rice et al., 1958; Wuest and Bucher, 1995).

Canada. The Turner movement had a small influence on the development of Physical Education in Canada, but with a fear of invasion from the U.S. spurred by the war of 1812, President James Polk's (1795-1849 CE) aggressive call of "*54-40 or fight*" (1845), and the U.S. based Fenian Raids of 1866-1871, there was a dramatic increase of interest in enhancing the fitness of Canadian youth. A well-trained militia was seen as the answer to each of these threats from our southern neighbours.

The earliest plea for Physical Education in Canadian schools came from Egerton Ryerson. Other important influences were the Strathcona Trust in English-speaking Canada, and Henri Scott in Quebec. A few Private Schools (such as the Upper Canada College in Toronto) mirrored the athletic programmes offered by English "Public" schools.

By 1862, the first Canadian "Normal" School had been equipped with a gymnasium for the training of teachers, and in 1865 Provincial schools were offered a grant of $50 if they added "*drill and gymnastics*" to their curriculum. This terminology reflects the nature of many of

the gymnastic instructors. Commonly, they were retired army sergeants. But despite these early initiatives, opportunities for Physical Education were still lacking in many parts of Canada.

The first Canadian Institution to train full-time professional Physical Educators was the Hamilton School of Physical Culture. It opened its doors in 1889. Three years later, Physical Education (comprising gymnastic, calisthenics and drill) became compulsory for Ontario Provincial Schools. In 1891 calisthenics was placed on a list of optional subjects for Provincial Schools in British Columbia, with an emphasis on the teaching of drill and gymnastics. The Pemberton Gymnasium, constructed in Victoria in 1893, was the first Provincial school gymnasium in British Columbia.

McGill University was originally charged with the preparation of elementary teachers for Lower Canada, and their Faculty of Education traces its beginnings to the McGill Normal School, which was established in 1857. By 1900, the McGill University Calendar was boasting:

"*The gymnasium is fully equipped in accordance with the regulations of the Swedish system."*

"The recent addition of some special apparatus enables the instructor to devote some attention to the application of exercise in treating special cases of weakness or deformity."

Ryerson. Egerton Ryerson (1803-1882 CE) was a Methodist Episcopal minister who, like many of the clerics in his denomination, rode a lengthy "circuit" to serve small chapels in the Niagara region. He was also a keen sportsman (Thomas, 1969). In terms of politics, he became the archrival of John Strachan, Anglican Bishop of Toronto. Ryerson vigorously opposed the "Family Compact," a small junta of wealthy men who held the reins of power in Upper Canada from 1810-1830.

As an Educator, Ryerson founded the *Upper Canada Academy* in Coburg, ON; this was the forerunner of Victoria College at the University of Toronto. Ryerson was appointed Chief Superintendent of Education for Upper Canada in 1844. A tour of Europe and the United States impressed him with the ideas of Pestalozzi, Guts-Muth and Ling. While in Switzerland, he noted (Ryerson et al., 1849):

"*Such is the interest which the Swiss students take in gymnastics that they form themselves into Turnvereins, ... Each of these associations holds annually a Turnfest, or Gymnastic Festival, at which all the members attend."*

Among many educational reforms introduced by a succession of three *School Acts*, Ryerson planned that during the winter months, Canadian students should engage in gymnastics, calisthenics and work with dumb-bells and Indian clubs, and in the warmer months they should replace the indoor activities by walking, skipping, dancing and lawn bowling. The Normal School that Ryerson founded at St. James Square, Toronto, in 1847 gave birth to several major academic institutions: the *Ontario Institute for Studies in Education*, the *Royal Ontario Museum* and *Ryerson University* in Toronto, and the *Ontario Agricultural College* in Guelph, ON. One less positive legacy of Ryerson's administration was the *Native Education Commission*, which

foreshadowed the enforced attendance of Aboriginal children at church-operated "Residential Schools."

Enthusiasm for games and sports was initially restricted to Private Schools such as Upper Canada College, but in 1860 *The Journal of Education for Upper Canada* included an article on the "*social necessity*" of providing more uniform recreational opportunities to all of the population if (Lindsay, 1970):

"*the children and youth of our Canadian cities are to grow up with half the proper quantity of bone and muscle and with a fractional part of the elasticity of spirit which of right belongs to them*."

Strathcona Trust. Lord Strathcona (1820-1914 CE) was Canada's High Commissioner to Great Britain in the early 19th century. He was very impressed with the syllabus of Physical Training that had recently been introduced into British State elementary schools. In order to develop a similar regimen in Canadian primary and secondary schools, he established the Strathcona Trust Fund in 1909-1910. An endowment of $500 000 was to be administered by the Federal government. The stated objectives of the Trust were "*the encouragement of physical and military training in the public schools of Canada*" (MacDiarmid, 1970).Thirty-five per cent of funding was allocated to cadet training, 15% to rifle shooting, and the remaining 50% to Physical Education. The North Bay Normal School was established to train teachers in the new system of drill and gymnastics, and the Strathcona programme continued with little change until outbreak of the second world war (Morton, 1977).

Scott. In Quebec, Henri-Thomas Scott (1880-1925 CE) received his first Physical Education lessons at the age of 15. As a young man, he enlisted in the Mount Royal Rifles, and his commanding officer was sufficiently impressed with his abilities to send him to the Royal Military College at St. Jean-sur-Richelieu, 40 km to the south of Montreal. There, Scott trained as an Infantry Instructor. The Canadian government was at that time offering Physical Education instruction to one representative from each military district, and in 1903 Scott profited from this provision, attending the *Royal Military College* in Kingston, ON.

In 1905, while continuing to serve in the militia, Scott began teaching Physical Education at various schools in the Montreal area. He led a wave of enthusiasm for Swedish drill (which was popular because it required a minimum of equipment) (Cosentino and Howell, 1971). His appointment coincided with a growing concern about the prevalence of infant mortality and tuberculosis in Montreal. In consequence, the City Fathers of the day were calling for more parks, public baths, playgrounds, and vacation camps, and a child-centred pedagogy that encouraged physical exercise. The efforts of Scott were thus supported by both the army and prominent members of the Catholic clergy including Pope Pius X. Scott was assigned responsibility for Physical Education in the Catholic school system, although gymnastic instruction was still not a mandatory component of a child's education. Scott organized gymnastics clubs in many schools, bringing them together in a *Ligue des Sociétés de Gymnastique Interscolaires.* On Saturdays, interested students also had the opportunity to attend Gymnastic classes

that he taught at the *Catholic Commercial Academy of Montreal*.

Scott's influence soon extended beyond the school classroom. In 1905, he established the *Société Nationale de Gymnastique.* This organization planned to set up gymnastics societies, gymnasia, and vacation camps throughout Quebec. Gymnasts began performing at St Jean Baptiste Day celebrations, and a Montreal newspaper *(La Presse*) assigned a columnist (Joseph-Pierre Gadbois) the specific responsibility of promoting physical activity. In 1908, *La Presse* decided to sponsor the travel of Scott's gymnastic team to an international gymnastics congress that was celebrating the 50th Anniversary of the ordination of Pope Pius X, The Canadians were declared the winners of this competition, and emboldened by the warm reception of this victory in Montreal, Scott quickly moved to establish a gymnastics school for women. He also offered home lessons in riding, tennis and snowshoeing to young ladies who remained a little shy of exercising in public.

Upper Canada College. Upper Canada College was founded in 1829. With its boarders, spacious sports grounds and cadet corps, the College was modeled on Eton, and even today it retains many similarities to an English "Public" school, with the extensive involvement of most pupils in athletic pursuits. An early report from the Ontario Minister of Education commented (Minister of Education, 1890):

"No report on Upper Canada College would be complete without a reference to the proficiency of the pupils in the games and sports that flourish there...especially the cricket ground and football field."

Sports, recreation and entertainment

During the 19th century, the founding of a wide range of sporting organizations offers evidence of increased participation in active leisure among the Middle Class, a growing popular interest in Spectator Sport and a wide variety of new recreational opportunities. Technological innovations such as the safety bicycle provided new possibilities for both active commuting and active leisure. The relaxation of dress codes allowed women with domestic servants to engage in a range of new sports. For many, archery was supplemented by cycling and a relatively static form of tennis. Women also began to participate in foxhunts, snowshoeing events (the Ladies' Prince of Wales Snowshoe Club was formed in 1861), rowing regattas, figure-skating championships and foot races. And with introduction of the waltz and the polka, even ballroom dancing became more vigorous than in previous generations.

Spectator sports flourished as major contests and associated gambling were popularized by a steam-powered printing press, and railway and steamboat companies encouraged both sporting teams and large numbers of their supporters to make day excursions to the sites of competition. Nevertheless, the impact of easier travel upon Spectatorism remains debated (Huggins and Tolson, 2001), and it remains unclear how far the time spent in passive travel to distant sports events affected overall population energy expenditures.

Sports organizations. The 19th century was marked by a revival of the Olympic Games, and the development of Worker Sports Movements, the YMCA, YWCA, YHMA and YHWA, Athletic

Associations and organizations serving many individual sports.

***Olympic Games*.** The concept of the Modern Olympic Games is often attributed to Pierre de Freddy, Baron de Coubertin (1863-1937 CE), a French educationalist and historian. de Coubertin's family were aristocrats, dedicated to the traditional values of royalty, the church and the classics. de Coubertin himself was educated at a Jesuit college and subsequently lived in the family chateau (*Domaine de Coubertin*) at Chevreuil-sur-Yvette, on the outskirts of Paris. Studies in Education led de Coubertin to Thomas Arnold of Rugby School, and rightly or wrongly he credited Arnold's system of Physical Education with the expansion of British power during the Victorian era (in stark contrast with the inadequacies of prevailing French Physical Education, which de Coubertin was sure had led to his nation's ignominious defeat by Prussia). The incorporation of regular Physical Education classes into the French school curriculum thus became one of de Coubertin's enduring (but unfruitful) passions (Hill, 1996).

The idea of reviving the Olympic Games goes back some time before it was broached by de Coubertin. In Revolutionary France, an *Olympiade de la République* was held annually from 1796 to 1798 (Le, 2008). The first *Montreal "Olympic Games"* were held in 1844, with events that included lacrosse, rifle-shooting, track and field competitions, climbing the pole and quoits (Schrodt, Redmond and Baka, 1980). de Coubertin's desire for an international competition seems to have been triggered by his discussions with Dr. William Penny Brookes (1803-1895 CE), an English surgeon who believed that the best way to prevent illness was through physical exercise. In 1850, Brookes had already held a local athletic competition involving activities that ranged from running to soccer. This event had taken place at the Gaskell Recreation Grounds in Much Wenlock, Shropshire, and it had been described as "*Meetings of the Olympian Class*" (Hill, 1996). Brookes went on to organize "*Olympic Festivals"* in Liverpool, from 1862 to 1867, and a "*National Olympic Games"* at London's Crystal Palace in 1866.

In 1888, de Coubertin founded the *Comité pour la Propagation des Exercises Physiques,* and with the support of Brookes, he decided a year later to organize an International Olympic event. With nationalistic fervour, he wrote (Loland, 1994)*:*

"Germany has brought to light what remained of Olympia. Why should not France succeed in restoring its past spendours?"

In collaboration with a Mr. C. Herbert, secretary of the *British Amateur Athletic Association*, and Professor W.M. Sloane of Princeton University, he convened a meeting in 1893, under the auspices of the French Athletic Sports Clubs. The primary goal of the gathering was shrouded in secrecy. Nominal issues for discussion were (1) the defence of amateur sport against professionalism and (2) clarification of the rules governing amateur status. However, preliminary negotiations for an international Olympic competition were conducted in the back rooms, and the *International Olympic Committee* was born in 1994, at an Athletic Congress held in Paris (Shephard, 1978a). Greek

interest in such an initiative had been strong subsequent to their War of Independence (1821), and indeed one Olympic Games had already been held in Athens in 1859. Thus, with the generous support of several substantial Greek legacies, the original Panathinaiko Stadium (which had been rebuilt some forty years earlier) was further refurbished for the first *Modern International Olympic Games* of 1896. The Opening Games brought together 241 athletes from 14 nations; they participated in 43 competitions.

de Coubertin valued Amateurism (although some have regarded this as an attempt to restrict participation to the "right" sort of people, from his level in Society). He also viewed the Games as a means of encouraging international harmony, and although he encouraged a high level of performance, he argued that the important thing was participation rather than winning (Hill, 1996):

"L'important dans la vie ce n'est point le triomphe, mais le combat, l'essentiel ce n'est pas d'avoir vaincu mais de s'être bien battu. (The important thing in life is not the triumph but the struggle, the essential thing is not to have conquered but to have fought well)."

The contribution of the Modern Olympic movement to Population Health and Fitness is still hotly debated. For much of the world's population, the Olympic Games are just one more Spectator event. Olympic feats stimulate some youngsters to pursue excellence in a particular athletic discipline, but top-level competitors typically train to the exclusion of their normal social development, and until recently a rigid insistence upon Amateurism has excluded the participation of many youngsters from poorer families. Some classes of Olympic competition carry inherent risks of serious injury and death (as with fatalities in the Luge events at Innsbruck in 1964 and Whistler in 2010), and such hazards are compounded by the temptation to engage in various types of Doping. On several occasions, politicians have seized upon the Olympic Games as one more weapon to be exploited in a Cold War. Poor countries have been pressured to divert an inordinate fraction of their Gross National Product to the construction of Olympic facilities (sometimes, at the expense of health care for the ordinary citizen), and even the choice of the site of competition has been marred by reports of large bribes paid to members of the Organizing Committee.

Some 45 individual Canadians competed in the St. Louis Olympic Games of 1904, but the first "official" Canadian team of 84 contestants attended the 1908 Olympic Games in London. The *Canadian Olympic Committee* was formally constituted in 1913. Canadian athletes were also featured in the Buffalo Pan-American Exposition of 1901, presaging introduction of the *Pan-American Games*, and in 1911 Canadians participated in the *Festival of Empire* at the Crystal Palace in London. This event marked the Coronation of George V. For most of the participants, it was seen as the forerunner of the *British Empire Games*, first held in 1930, but for the organizers it was in part a reaction to difficulties in recruiting young men of adequate fitness to fight in the Boer War.

During World War I, the *Canadian Sportsmen's Patriotic Association* emphasized that sport provided the foundation for "*the character and physique of the future builders of the*

nation." After the war, charity hockey matches hosted by this organization raised funds to help the resettlement of returning veterans.

Worker Sports Movements. Perhaps because of the perceived "upper crust" nature of the Olympic Games, Labour movements have at various times established Socialist-based international sports competitions. The first such initiative was the *Confédération sportive internationale du travail*, founded in Ghent, Belgium in 1913; it brought together various national worker sport movements. After the disruption caused by World War I, the *Confédération* resurfaced as the *Socialist Sports Workers International*. It began organizing *Workers' Olympiads*, and exported an explicitly class-conscious *Workers' Sports Movement* to Canada during the 1920s (Kidd, 1996).

YMCA. Several institutions provided low-cost accommodation and fostered physical activity among the young men who flocked to major urban areas during the industrial revolution. These various forerunners of the YMCA included the Basel *Lediger Verein ("Unmarried Association")* of 1787, the *Glasgow Young Men's Society for Religious Improvement* of 1824, the Nimes *Société Philadelphique* of 1834 and the Bremen *Jünglingsverein (Youth Club)"* of 1834. However, the YMCA proved the most successful and enduring of these initiatives. Its founder was George Williams (1821-1905 CE). He had himself moved from rural Somerset to central London to work in a draper's store, and he was appalled by the terrible conditions in which many of his peers were forced to live. Williams successfully courted the daughter of his employer, thus persuading his boss to support him financially. The first YMCA opened in London, England, in 1844, with the stated aim of putting Christian principles into practice by developing "*a healthy spirit, mind, and body*." The institution quickly became one practical expression of the "*Muscular Christianity*" that many Victorians viewed as a means of "*leading young men to Christ*" (Smith, 2010).

By 1851, the first Canadian branch of the YMCA had opened in Montreal, and there were already YMCAs in the United States, Australia, Switzerland, Belgium, Germany, the Netherlands and France. Individual branches offered Evangelical Christianity through Sunday and weeknight services, and they encouraged good sportsmanship in gyms (where basketball and volleyball were invented) and in swimming pools (Frost, 1998). The specific Christian focus of the YMCA has now largely disappeared, but there remains an emphasis upon the core values of caring, honesty, respect, and responsibility, now supplemented by the deliberate inclusion of minorities. The housing component of YMCA branches has waned since the 1960s; the main focus is now upon the provision of gymnastic facilities.

YWCA. Soon after founding of the YMCA, the organizers recognized the need for a parallel organization that would cater to young unmarried women. The YWCA was established in 1855, through a merger of two earlier institutions for young women: Lady Mary Jane Kinnaird's *General Female Training Institute* and Emma Robarts' *Prayer Union*. The YWCA initially offered safe hostels to young women who were *en route* for Nursing service in the Crimean War. Branches now continue to provide shelter for single

women who are migrating to the city and for women with abusive partners, as well as seeking to build the confidence of their members through sports and fitness programmes (Rice, 1947).

Agnes Blizzard opened the first Canadian YWCA in Saint John, New Brunswick in 1870, and other branches quickly appeared across Canada. Members were soon learning phonography, stenography and typing, trades that at the time were considered too demanding for women. However, the first course for female Physical Education Directors was not held till 1933.

YMHA and YWHA. In response to the specific Christian orientation of the YMCA and YWCA, parallel Jewish associations were established. These catered to Jewish dietary preferences, and played an important role in helping Jewish immigrants adapt to conditions in the New World. The YMHA began in Baltimore, in 1854, and the first YWHA was set up as an annex to the New York YMHA in 1888.

Other sports organizations. The *Montreal Amateur Athletic Association* made its debut in 1880, and the *Amateur Athletic Association of Canada* dates from 1884. At the urging of Theodore Roosevelt, the *U.S. National College Athletic Association* was founded in 1906 to "*protect young people from the dangerous and exploitive athletics practices of the time*," with a particular emphasis upon regulating American football.

Peter McIntosh (McIntosh, 1971) offers an impressive listing of individual English sporting organizations that were founded during the nineteenth century, including: the *Alpine Club* (1857), the *Football Association* (1863), the *Rugby Football Union* (1871), the *Yacht Racing Association* (1875), the *Bicyclists Union* (1878), the *National Skating Association* (1879), the *Metropolitan Rowing Association* (1879), the *Amateur Athletic Association* (1880), the *Amateur Boxing Association* (1884), the *(Field) Hockey Association* (1886), the *Lawn Tennis Association* (1888), the *Badminton Association* (1895) and the *Amateur Fencing Association* (1898).

Parallel organizations emerged in Canada during the Victorian and Edwardian eras, although often with a time lag of a few years relative to their British counterparts. Thus Canadians saw emergence of the *Amateur Skating Association* (for both speed and figure skaters) in 1887, the *Amateur Athletic Association of Canada* (1883), the *Canadian Baseball Association* (1876), the *Ontario and Quebec Basketball Associations* (1911), the *Canadian Rugby Football Union* (1882), the *Canadian Canoe Association* (1900), the *Canadian Cricket Association* (1892), the *Canadian Branch of the Royal Caledonian Curling Club* (1852), the *Canadian Wheelman's Association* (1882), the *Royal Canadian Golf Association* (1894), the *Amateur Hockey Association of Canada* (1886), the *Canadian Lacrosse Association* (1887), the *Canadian Lawn Tennis Association* (1890), the *Canadian Association of Amateur Oarsmen* (1880), the *Canadian Snowshoe Union* (1907), the *Dominion Football Association* (soccer)(1878), the *Canadian Squash Racquets Association* (1913), the *Royal Life Saving Society* (1909) and the *Canadian Jockey Club* (1895).

Sports and Entertainment. Middle and Upper-Class society showed increasing interest in various forms of

recreation during Victorian times- not only yachting, but also punting, rowing, canoeing and snow-shoeing (the last two becoming particularly prevalent in Canada). This frenzy was fostered by the advent of the half-day holiday, with Saturday afternoon crowds flocking to attractive reaches of rivers that were accessible by rail. The railways fostered top-level regattas as Spectator events, both in England and in Canada. Henley on Thames hosted the first University Boat Race in 1829, and it established the Royal Regatta in 1839. The construction of a branch railway line to this town in 1857 meant ever-larger crowds of spectators (Dickens and Cruikshank, 1837):

"*A well-contested rowing-match on the Thames, is a very lively and interesting scene. The water is studded with boats of all sorts, kinds, and descriptions; places in the coal-barges at the different wharfs are let to crowds of spectators*."

In Canada, railways were equally active in promoting trips to Toronto and London, ON, where rowing enthusiasts could watch the performances of champion oarsmen such as Ned Hanlan (Cosentino, 1978; Gruneau, 1999; Jobling, 1976).

On the streets of Europe, cycling and pedestrianism attracted the interest of large crowds, and many people themselves began hiking over large tracts of open moorland. The opening of the *Mount Washington Cog Railway* (1869) and Europe's first rack railway, the Swiss *Vitznau-Rigibahn* (1870-73), popularized substantial weekend treks over suddenly accessible mountain paths. Other new recreational pursuits included baseball, basketball, curling and the variants of football played in Canada, the U.S. and Australia, Horse racing also became popular in North America during the final two decades of the 19th century. Reading, drama, opera, music-hall burlesques, dining clubs and neighbourhood pubs also offered opportunities for sedentary entertainment, particularly to the urban population.

Punting. The pleasure punts that are used in England today first appeared around 1860 and reached their peak of popularity in the 1910s, particularly at Cambridge University and near Stratford on the River Avon. Delight in this form of exercise was described by Dorothy L. Sayers (Sayers, 1935):

I admit that it is better fun to punt than to be punted, and ... a desire to have all the fun is nine-tenths of the law of chivalry.

The use of punts declined during the 1950s and 1960s, apparently in direct proportion to the increase of powered craft on English waterways.

Rowing. Competitive rowing began on the River Thames during the 17th and 18th centuries (Shephard, 2013b), but interest in this form of sport quickly spread to Canada. A *Rowing Regatta* was held on Northwest Arm, Halifax, in 1826 (Schrodt, Redmond & Baka, 1980) and a rowing club was founded in Bytown (Ottawa) by 1839. When the Prince of Wales visited Canada in 1860, a Rowing Regatta was convened in his honour; this event included competitions between skiffs, 4-, 6- and 10-oared vessels. More leisurely rowing also became a popular form of recreation for the general population, and on public holidays the River Thames at

Chatham, ON, was frequently crowded with small rowing boats (Daley, 1977).

The same could be said of the English River Thames at Maidenhead and Windsor. Growing emancipation opened up recreational boating to women as well as men, although more frequently they were assigned the task of steering the boat for their perspiring sweethearts. Sometimes, rowing holidays extended for a week or more, as in Jerome K. Jerome's satirical account of a voyage up the River Thames, from Kingston, near London towards the city of Oxford (Jerome, 1889). As a commentary on the changing nature of leisure pursuits during the 20th century, it was difficult for me to find a rowing boat to rent at Maidenhead when I wanted to share the pleasures of the river with my daughters around 1970. Almost all of the available craft had been fitted with small gasoline engines.

Canoeing. In the early 1800s, Canadians enjoyed watching canoe races between indigenous groups, and such events were gradually incorporated into regattas, as at Halifax in 1826. Indians competed with lumbermen on the Ottawa River during the 1860 visit of the Prince of Wales. Recreational canoeing in Muskoka was stimulated by the construction of a railway to Gravenhurst, ON, in 1875, and the launching of a scheduled steamship service on the Muskoka Lakes. The Toronto Canoe Club, founded in 1880, was the first club to specialize in canoe racing. Canadian paddlers became highly proficient, and won every event at the Buffalo Pan-American Exposition of 1901.

Recreational canoeing in Britain began with the Scottish explorer John MacGregor (1825–1892 CE). He brought canoeing back to Britain following a camping trip to Canada and the U.S. MacGregor constructed his own canoes and used them in both Europe and the Middle East (MacGregor, 1866). He founded the *Royal Canoe Club* in 1866 and launched the Paddling Challenge Cup in 1874.

Sailing. The construction of sailing vessels has a long history in Canada, beginning with the Port-Royal boatyards of Acadia during the 17th century. Initially, ships were needed for commerce and military defence, but recreational use gradually became more important. Joshua Slocum of Wilmot Township, NS, achieved the distinction of undertaking the first solo circumnavigation of the Globe (1895-1898). By 1924, there were a sufficient number of recreational yachtsmen in Ontario for the *Yacht Racing Association of Lake Ontario* to send a team to the Paris Olympics.

Sailors in most Canadian Provinces are blessed with access to large tracts of open water. But in more land-locked countries, the construction of railway lines has sometimes allowed the wealthier inhabitants of large cities to take an interest in sailing. For instance, in England, Burnham on Crouch and the Norfolk Broads began to develop as sailing centres between 1850 and 1870, as new railway routes brought previously rural areas within the commuting range of Londoners.

Ice-sailing is a winter variant of sailing that was already popular on the Hudson River as early as 1790. The original craft was simply a square box, mounted on three runners, but in 1853 the triangular frame was introduced. The sport was soon widely practiced on the Great Lakes, with active centres in Kingston and Hamilton, ON.

Cycling. The first bicycle-like contraption (a "*Laufsmachin*e" or "*Draisine"*) lacked both pedals and steering. It was built by Baron Karl von Drais, a civil servant to the Duke of Baden in 1817 CE. Steering was added within a year, and the device quickly became known as the *velocipede*. In the mid 1840s, there were attempts by Scottish blacksmiths to add pedals, but it was not until the 1860s that French designers introduced a popular and practicable machine with rotary cranks and pedals that were connected to the front wheel hub.

By the late 1860s, the cycling craze had reached the New World, and even the relatively small city of Halifax, NS, boasted five velocipede rinks. During the 1870s, the format of the cycle evolved into the "*Penny-farthing*," and the addition of ball-bearings and solid rubber tyres enhanced the comfort and efficiency of the rider. Cycling clubs appeared in Montreal (1876), Toronto (1881) and Halifax (1882). The popularity of cycling increased rapidly in Europe, as the macadamizing of roads provided users with a much smoother riding surface. In Canada, the poor quality of roads outside of major cities remained a problem for most cyclists, although in 1893 a large-scale road race covered 32 km of Kingston Road, eastwards from Toronto.

Initially, cycling was a sport limited to adventurous young men, but during the 1880s the development of the rear-driven safety bicycle with pneumatic tyres opened up the sport to less adventurous men and women of the Upper and Middle Classes. Female participation was facilitated by the advent of athletic bloomers or knickerbockers, skirtless, baggy knee-length trousers that were fastened to the legs a little below the knees. These scandalous garments first appeared in Canada around 1895, the year that Elizabeth Cady Stanton, a leader in the Women's Movement, wrote for the "*American Wheelman*" that (Strange, 2002):

"*the bicycle will inspire women with more courage, self-respect, self-reliance…."*

In 1900, the amalgamation of three smaller companies formed the *Canadian Cycle and Motor Company (*CCM), and sturdy roadster bicycles were soon being marketed for as little as $25. Women found new opportunities to leave their homes unchaperoned, to cycle on country roads and to become involved in public life. Susan B. Anthony commented on the importance of cycling to female emancipation (Sherr, 1996):

I think it has done a great deal to emancipate women. I stand and rejoice every time I see a woman ride by on a wheel. It gives her a feeling of freedom, self-reliance and independence. The moment she takes her seat she knows she can't get into harm while she is on her bicycle, and away she goes,

Canada inaugurated a *National Bicycle Week* in 1916, and this idea subsequently spread to both Britain and the U.S.

Although cycling became largely a participatory sport, there was also a Spectator element. The first documented cycling race was a 1,200 m event, held in St-Cloud, Paris, in 1868. The winner was an English expatriate James Moore, who rode a bicycle fitted with solid rubber tyres. Moore also won the first distance event, the 123 km race from Paris to Rouen, covering this distance in 10 h 40 min (Heijmans and Mallon, 2011). In

1901, Archie McEachern of Toronto shared the $1500 first prize after winning a paired 6-day velodrome race in New York, NY. He also performed well in paired 6-day events in Boston. The paired format was adopted for these various races because New York City Councillors had decided that watching a man cycle for 24-hours on end was to participate in a cruel, barbaric display.

Pedestrianism. Pedestrianism, the predecessor of race-walking, became a popular spectator sport during the 18th and early 19th centuries. Captain Robert Allardice (1779-1854 CE), of Stonehaven, Scotland, was perhaps the most famous race-walker of this period (Thom, 1813). He came from a very muscular family, known for such feats as bull-wrestling and the up-rooting of trees. He himself is reputed to have lifted a 115 kg man onto a table, using only one hand, and two of his favourite pastimes were hammer and caber tossing. In 1801, he won a wager of 5000 guineas by walking (at his third attempt) a distance of 145 km in 21 hours. The following year, Allardice covered a distance of 103 km in 10 hours. In 1809, he completed his most ambitious achievement, walking 1606 km in 1000 hours. He ended this last event with a weight of 70 kg, some 14.5 kg less than when he began the race; however, he apparently remained in good health, and carried away a cumulative purse of over 100,000 guineas. The London Times described the final stretch of his event in these terms:

"He had until four o'clock P.M. to finish his task; but he performed his last mile in the quarter of an hour after three, with perfect ease and great spirit,"

His lifespan (75 years) was outstanding for his era.

In the latter half of the 19th century, pedestrianism also became popular in Canada, the U.S. and Australia. The "*Olympic Club*" of Montreal was founded in 1842, with foot-running as one of its main preoccupations. The group reformed in 1873, as the *Montreal Pedestrian Club.* One goal of the members was to walk 100 miles (161 km) in less than 24 hours, successful participants in judged contests being nicknamed "Centurions." At a 48-hour event in Winnipeg, MN, the winner covered a distance of over 240 km. Sometimes, competitions were held indoors. Thus, in 1879, the Adelaide Street Rink in Toronto saw a 6-day walking match, with the winner covering a total distance of 698 km.

In 1867, Edward Payson Weston (1839-1929 CE), a reporter for the *New York Herald*, won a $10,000 prize by walking 1824 km from Portland, Maine, to Chicago in 30 days. He, again, had a very unusual longevity for his era (90 years), despite death threats from gamblers who had bet large sums against his successful completion of the event (Weston, 1862).

One of the greatest 19th century distance runners was Higasadini, (1830-1897 CE), a Seneca from the Cattaraugus Reservation, near Buffalo, NY. He was later known as *Deerfoot* (Kidd, 1978). Higasadini toured Canada and the U.S, during the 1850s, challenging other runners for stakes of $250. On one occasion, Higasadini won $1000 by outpacing 3 horses over a 16 km distance. In 1863, he covered 18.3 km in a 1-hour run, a record that was only beaten by Jim Peters 90 years later. During the early 20th century, the Mohawk Tom Longboat (1887-1949 CE) became one of Canada's

most celebrated distance competitors. He, also, was a runner rather than a walker, although his training programme included alternate walking days, a practice that was roundly condemned by his contemporaries. Longboat's career began when he won the Hamilton, ON "*Around the Bay"* race of 1906. He set an eye-catching time of 2-24-24 in the 39.3 km Boston marathon of 1907, but collapsed during the course of the 1908 Marathon. The following year, he became a professional runner (Kidd, 1992).

A few women engaged in outstanding pedestrian feats during the 18th and early 19th centuries. In 1765, a woman walked from Blencogo to near Newcastle-on-Tyne, a distance of 116 km, in a single day. Several times during her youth, a Yorkshire woman named Mary Wilkinson walked from her home to London (a distance of 402 km) in less than four days, and in 1764 (at the reported age of 90) she strapped a keg of gin and other provisions onto her back, completing the same journey in 5 days and 3 hours. She apparently did not die until reaching the age of 109 years (Polonides., 1846). In 1826-27, the 60-year-old Mary McMullen engaged in various walks over distances of 32-145 km (Jütting, 2004), and in 1829 two women with their 8 children completed the winter trek from Montreal to Albany NY in one month (New York Times, February 20, 1899, p. 5). In 1823, Emma Freedman (who was then 8 years old) walked a distance of 64 km in 7 hours 50 minutes (Kolata, 2007). However, walking in multi-layered petticoats was a major hindrance to the performance of many women. This issue began to be resolved in the 1850s, as Amelia Bloomer popularized the use of baggy pants, cuffed at the ankle and worn beneath a skirt.

Victorian pundits proclaimed Pedestrianism as both immoral and excessively strenuous for frail creatures such as women (Vertinsky, 1994). Many of the general public also viewed *pedestriennes* as brazen entertainers, always ready to violate the current moral standards. Some even argued that such activities had a negative impact on the involvement of decent women in sport (Gems, 1993). Nevertheless, female participation in walking races continued. In 1851, a "bloomer pedestrienne" and "notorious bawd," (Mrs. C.C. Cushman, alias Susie Morgan), undertook to walk 803 km in 500 hours at the Arsenal Grove arena in St. Louis (Cushman, 1855), in 1858 Julia Archibald Homes climbed Pike's Peak, CO (Mazel, 1991), and in 1864 Mrs Emma Sharp walked a distance of 161 km in 1000 hours. In the late 1870s, Ada Anderson, a music-hall artiste, set further records, walking in what was considered a very revealing knee-length skirt. On one occasion, she covered 402 m every 15 minutes for over 1,000 hours, and another time she walked 1606 km in 672 hours (Shaulis, 1999).

***Snowshoeing*.** During the winter months, Canadians found snowshoeing a popular alternative to walking races. Early militias were trained on snowshoes, and in 1859 General Eyre presented a silver cup for the Montreal snowshoe competitions (Becket, 1882). The first North American *Snowshoe Club* was founded at Montreal in 1840, and later this club began organizing races at St. Pierre *Blue-Bonnets Raceway*. Native contestants were generally the winners of such races, and in the summer of 1867, a team of Caughnawagas gave a snow-shoeing demonstration on the lawns of Crystal Palace, in London (Kidd, 1978).

In 1877, the *Montreal Snow-shoe Club* was still sufficiently active to send an exhibit to the Paris World Fair. However, a poor attendance at the Annual Championships of 1900 heralded a waning interest in this form of sport.

Hiking. Towards the end of the 19th century, group hikes across areas of open moorland became popular in England. Treks were often organized by the *Cooperative Holiday Association* (CHA, founded in 1897). This Association was developed by a young Congregational Minister (Thomas Arthur Leonard) and was affiliated with the *English Cooperative Movement*. It offered the working poor a week's stay in a large country house for a modest fee, organizing daytime treks, and evenings of vigorous country dancing. Griffiths commented (Stephenson et al., 1989):

"*the great majority of young folk did not know how to get the best out of their holidays.*" "*he led the people of Colne* (a Lancashire industrial town) *out of Blackpool* (a sedentary seaside resort) *into the mountains. In June 1891, he took members of the Rambling Club associated with his chapel for a four-days holiday in the Lake District at a cost of 21s a head, including railway fare."*

The original accommodation at the CHA Centres was quite Spartan. Some members sought to make the facilities more comfortable, and partly for this reason, Griffiths left the CHA in 1913. He then formed a similar organization, calling it the *Holiday Fellowship*. These two groups, along with various one-day rambling associations such as the "*Sunday Tramps*" (founded in 1879, by Leslie Stephen), the *Workers Educational Association* (organized by Albert Mansbridge in 1903) and the *Federation of Rambling Clubs* (formed in 1905) helped to promote physical activity among poorer British citizens by negotiating discounted railway fares for their members.

At times, they found themselves in conflict with the local aristocracy, who for many years had regarded the moorlands as their private domain for hunting, fishing and shooting. In England and Wales, the right to roam over moorland was finally resolved by the *Countryside and Rights of Way Act 2000*. Unfortunately, much of the open space in North America is still regarded as private property, but parallels to the struggle of the English rambling associations can be seen in campaigns such as that of the *Coburg Beach Society*, whose members have been active in insisting upon public access to the shores of Lake Ontario. This right became enshrined in the Ontario Provincial Legislature with the enactment of Bill 32, the *Great Lakes Shoreline Right of Passage Act* of 2011.

Development of the Youth Hostel Association (YHA) provided a further resource for hikers and cyclists with a limited income. The YHA had its beginnings in Germany. Richard Schirrmann (1874-1961 CE), a Prussian schoolmaster, and Wilhelm Münker, a Conservationist, saw the need for simple overnight accommodation in the countryside when their pupils (who were engaged in a 1907 field trip) had to spend their nights sleeping in drafty barns. Schirmann decided that during the summer months he would open his own schoolroom in Altena, Westphalia, as the first *Jugendherberge* (youth hostel). Three years later, the school accommodations were replaced by a permanent hostel in

the recently reconstructed Altena Castle. The full blossoming of the youth hostel movement occurred immediately following World War I, although unhappily in Germany the arrival of the Nazi youth movement soon left no place for Schirrmann and his *Wandervögel ("*migrating birds"). Under the Führer, all legs were expected to march to the goose-step (Williams, 2007).

Baseball. Baseball apparently had its origins in England, usually under the name of stoolball. In 1700, the Puritan preacher Thomas Wilson expressed his disapproval of people who engaged in *"Morris dancing, cudgel-playing, baseball and cricket*" on Sundays (Block and Wiles, 2006). The rules of *Englische Base-ball*" were published in 1796 (Saltzman and GutsMuths, 1800) and in 1798-1799, the athletic heroine of Northanger Abbey expressed her preference for cricket, baseball, riding on horseback and running about the countryside to the reading of insipid books (Austen, 1818). The rules of baseball were summarized in the British *Boy's Own Book* of 1828 (Clarke, 1828/1831).

Immigrants brought the game to North America, and by 1791 the game had become sufficiently prevalent in Pittsfield, Mass. that the local council passed a by-law prohibiting people from playing the game within 80 yards of the town meeting house. The US *Spalding Commission* of 1908 concluded, erroneously, that Abner Doubleday had established the first rules of the game in 1839, and a Baseball Hall of Fame was established in Doubleday's hometown (Cooperstown, NY). The first team to play under North American rules was the *New York Knickerbockers*. Their club was founded in 1845. The game became progressively professionalized from the mid-1860s.

In Canada, local baseball clubs were formed by 1854, and in 1859 Toronto faced Hamilton in the first recorded match between the two cities. Formal leagues had appeared by 1877, and in 1885 the *Toronto Baseball Club* was sufficiently professionalized that it needed to form a joint stock company. In 1896, the word "Amateur" was officially deleted from the title of the *Canadian Baseball Association*.

Basketball. The game of basketball, also, is sometimes claimed as a U.S. invention. In fact, it originated in 1891 with the Canadian clergyman, educator and physician Dr. James Naismith (1861-1939 CE) of Almonte, ON (Naismith, 1941). The first game was played in the U.S., but many of the participants were university students from Quebec. Naismith had been charged with the task of inventing a new indoor sport while conducting an international physical education class at the YMCA training school in Springfield Mass, and the game was introduced to Canada through YMCAs in Montreal, QC, and St. Stephen's, NB. Naismith saw the new sport as his contribution to "*Muscular Christianity*," particularly during the harsh months of winter, when outdoor recreation was less feasible. Others, also, saw basketball as a wholesome influence that would (Sclar, 2008):

"*transform the children of American immigrants...into productive Americans by teaching them American values."*

Curling. Curling was popular in Scotland from the 16th to the 19th centuries. Two monks had reportedly

engaged in a curling match in 1541, although the term *curling* was first used in 1620, when the Scottish poet and Provost of Perth, Henry Adamson (1581-1639 CE) wrote an elegy describing his friend, Mr. Gall (Adamson, 1638/1774) as:

"*a citizen of Perth, and a gentle-man of goodly stature, and pregnant wit, much given to pastime, as golf, archerie, curling and jovial companie."*

The game quickly became almost too popular in Scotland. In 1638, a Glasgow Assembly of Presbyterians accused Bishop Graham of Orkney of a terrible act: he was a Sabbath curler.

Curling is now most firmly entrenched in Canada, having been brought to North America by Scottish soldiers and immigrants. Troops serving with Generals Murray and Wolfe reputedly brought the sport of curling to the St. Charles and St. Lawrence Rivers during their occupation of Quebec, from 1759 to 1763 (Schrodt, Redmond and Baka, 1980). The *Montreal Curling Club* was established in 1807 (Richard, 2007); members of this club constructed the first covered curling rink in North America near the Lachine River. By 1843, a Canadian had won the prestigious Denham Medal, and a Toronto journalist boasted (Redmond, 1982):

" Curling may now be considered in this Province, a Canadian rather than a Scottish game."

The boast seemed vindicated by 1908, when a Canadian team toured Scotland, winning 23 of 26 contests. By the 1830s, there were also many curling clubs in the U.S, and they often engaged in cross-border competition with their Canadian counterparts.

Football. Rules for the form of football associated with Arnold's Rugby School were first formulated in 1845, and the schism between Association and Rugby football was formalized in 1863. The Rugby Union has continued to be associated with privilege and Private Schools, whereas the Rugby League form of the game became a working class, professional sport (Collins, 2006).

Rutgers University played some form of football against Princeton in 1869, and Yale and Harvard adopted the Rugby Union code in 1875. Artillerymen in the British Army also began playing Rugby Union football while in Canada, and in 1874 they competed against McGill University (Football Canada., 2012). The game was no less violent in the 19th century than it can be today, and there were reports of deaths from injuries in St. John, NB (1884) and Victoria, BC (1913). Some of the trophies associated with Rugby competitions have quite a long history; for example, the McKechnie Cup was first presented to the BC Rugby Union by Dr. McKechnie, a Vancouver Island physician, in 1896.

Some Canadian schools still play the classical form of Rugby Union football, but a divergence of rules, introduced by Walter Camp (1859-1925 CE), adviser to the Yale football team, led to the development of both American and Canadian forms of football (Braunwart and Carroll, 2012). In Australia, the Melbourne club set the rules for Australian football in 1859.

Horse racing. For many early North American settlers, ownership of a horse was a status symbol, and horse racing

became a popular spectator activity during the 18th and 19th centuries. A racecourse was constructed at Digby, NS as early as 1787. Nevertheless, some of the city fathers looked askance at horse racing. A Halifax city statute of 1771 banned horse racing because it made the population "*idle, immoral and gamblers*." This decision had evidently been reversed by 1825, when the *Halifax Turf Club* was founded. The *Québec Turf Club* dates from 1789, and the *King's Plate*, with a purse of 100 guineas, was first held in Trois-Rivières in 1836. Initially, this last race was restricted to horses bred in Lower Canada, but in 1859 horses from Upper Canada were also admitted. The following year, the *Queen's Plate* was held in Toronto for the first time. This event has been run every year since, making it 15 years older than the better-known Kentucky Derby.

Races were being run on Toronto Island as early as 1812. The Montreal/St. Pierre (Blue Bonnets) Raceway opened in 1872. The Woodbine Race-track on the Toronto lakeshore opened 2 years later, to become the headquarters of the *Ontario Jockey Club*. Under Colonel C. Czowski, the Club attempted to rid horse racing of its bad reputation. A racetrack was built in the heart of Vancouver in 1889. However, the *U.S. Jockey Club* did not appear until 1894.

The popularity of most horseracing tracks waned during the final years of the 20th century. The downtown Toronto Race course fell to the bulldozers of "developers" in 1993, and in Vancouver the racetrack (now displaced to suburban Hastings Park) complained it could not survive unless it was allowed to install an ever-growing number of "one-armed bandits."

Harness racing began in rural areas of North America towards the end of the 18th century, and it is still popular in some rural areas of Canada. A trotting race for a purse of $50 was held at St. Pierre, Montreal in 1830, and the *Quebec Trotting Club* was established in 1864. Pneumatic-tyred sulkies were introduced in 1892, increasing speeds, and the Canadian driver Dave McClary achieved the first 2-minute mile in 1897.

The first equestrian competitions were held in Toronto as early as 1842, and by 1909 an Equestrian team was able to compete in London, England.

Sedentary activities. During Victorian times, patterns of sedentary entertainment varied widely, depending upon the individual's social class. As an ever-increasing proportion of the population became able to read, libraries, both privately owned and municipal, flourished in most cities. There was a keen interest in the writings of authors such as Charles Dickens, Arthur Conan Doyle and William Makepeace Thackeray. Steam printing allowed the relatively inexpensive production of serialized, mass-consumption novels, and in North America, the Scottish-American businessman Andrew Carnegie provided funding for the construction of some 2500 public libraries between the years 1883 and 1929.

Drama, music and opera were also popular with the social elite, and most major cities constructed imposing opera halls and theatres. Rigid dress codes excluded poorer citizens from such venues, but by the 1890s, the lower echelons of society were enjoying their own forms of musical burlesque. Well-connected London gentlemen also spent many of their evenings at dining and

gaming clubs such as the *Beefsteak Club* or *Savages*. Many of the less wealthy went to the neighbourhood "pub," drank large quantities of ale, joined in raucous singing and gambled on foot races and boxing matches.

In the summer months, the railways offered cheap excursion fares to seaside resorts, where adults could sit in deck chairs while they watched their children playing in the sand. The Quaker industrialist Henry Pease (1807-1881 CE) decided that a week at an alcohol-free resort would improve the health of the labour-force in his Middlesborough iron and lime stone quarries and his Darlington woollen mills. So, he bought land from the Earl of Zetland, and proceeded to construct the resort of Saltburn-by-the Sea on the cliffs of the Yorkshire coast. He claimed to have had (Institute of Historic Buildings Conservation 2012);

"a prophetic vision of a town arising on the cliff and the quiet, unfrequented and sheltered glen turned into a lovely garden"

The construction of the resort certainly proved beneficial for Pease's financial health, as he owned the Stockton and Darlington Railway (which provided the only means of access to the town), the Bank underwriting the local brickworks (which sold the unique type of bricks used in constructing the town) and the *Zetland Hotel* (where most of the holidaymakers eventually stayed).

The Railway Era saw similar resorts develop within travelling distance of cities such as London (Southend, Margate and Brighton), Manchester (Blackpool) and Liverpool (Rhyl, Colwyn Bay and Llandudno on the North Wales Coast). Thus, the population of Blackpool grew from a mere 500 in 1801 to 14,000 in 1881. Many visitors took a quick dip in the ocean, but the water was too cold for extended swimming, and much of a week's holiday was spent in a deck-chair, preferably with a canvas screen to protect oneself from the wind. For the few who wished to exercise, many of the larger seaside resorts constructed promenades that were gaily illuminated in the evenings.

Seaside resorts also began to appear within commuting distance of large East Coast U.S. cities, often with a similar history to Saltburn, Yorkshire. The development of Atlantic City was promoted by a local physician (Jonathan Pitney) and a group of his business associates; over the next 4 years, as the resort developed, they constructed a rail link from Camden, NJ. Crowds quickly flocked to amusement piers, floor-shows, and beauty pageants, and on cooler days at least some of the visitors enjoyed a stroll along the lengthy boardwalk.

In Canada, a combination of the Toronto, Simcoe, and Muskoka Junction Railway and the Mail Steamer *RMS Segwun* allowed the development of lakeside resorts such as *Windermere House* (1870) and the *Bala Bay Inn* (1910) to the north of Toronto. For many, a holiday in the Muskoka Lake District was an occasion for over-eating, relaxation in a deck-chair and a visit to the Gravenhurst Opera House, although some of the visitors also engaged in fishing, golf, canoeing and repairs to their property.

We may comment on a few other recreational pursuits. Ottawa introduced a bill banning Prize-Fighting in 1881, and this Act remained unchanged on the Statute Books until 1933. The first Canadian licence for the operation of a public billiards table was granted to a

Montreal facility in 1802. Bowling was brought to North America as the game of Nine-pins, but by 1803 a tenth pin had been added in most bowling alleys. Already, by 1797, Montreal had enacted a City ordinance fining Public Houses that permitted play in "ball alleys" on Sundays. By 1852, four new bowling alleys had opened on Toronto's Front Street- a measure of the sport's growing popularity.

Health and fitness

The Victorian era was still marked by major epidemics, but a growing understanding of microbiology and improved urban hygiene held growing prospects for the prevention of infectious disease. There are few objective measures of fitness in Victorian times, other than statistics for height, body mass and human longevity. On such criteria, the health of most people was poorer than it is today.

Public health. The Victorian era was marked by the introduction of Boards responsible for Public Health in large cities. This led to substantial gains in urban hygiene. There was a gradual improvement in the quality of housing, and demographics showed a burgeoning birth rate. Social reformers also succeeded in abolishing child labour and slavery, at least from Western Society.

Epidemics and Boards of Health. Bruce Hailey has argued that in the society of Victorian England, major epidemics of influenza, cholera, typhus, typhoid fever and scarlet fever sparked a deep concern about population health (Hailey, 1978), and that the fears created by the prevalence of deadly illnesses encouraged a mania for sports participation. Statistics of the British *Registrar General of Births and Deaths* for 1841 showed a mean life expectancy of 45 years in the wealthy county of Surrey, but the average was only 37 years in the city of London and only 26 years in the less prosperous environs of Liverpool. The average age at death of "*labourers, mechanics, and servants*" was said to be only fifteen years. Edwin Chadwick noted that for every 7 adults dying of old age or violence, eight died from specific infectious diseases (Chadwick, 1839).

In London, two major cholera epidemics killed 14,137 people in 1848-49 and 10,738 in 1853. But leaders of a new sanitary movement, people such as Edwin Chadwick (1800-1890 CE), who had begun reform of the Poor Laws, and Thomas Southwood Smith (1788-1861 CE), Physician to the London Fever Hospital, recognized that the health of the individual soon became the health of the population. They thus made urgent calls for the universal provision of clean drinking water, with proper refuse removal and sewage treatment. London established a *General Board of Health* in 1848, with Chadwick and Smith as Commissioners. This body regulated the water supply and sewer connections of all new housing in London, and it provided adequate burial grounds for those who died. The quality of London's drinking water was rapidly upgraded (Vinten-Johansen et al., 2003), and more money was also spent on medical technology, including methods of preventing death during childbirth.

Sanitary Reform began rather later in the U.S., with New York enacting the *Metropolitan Health Bill* in 1866. This legislation created a 9-person *Board of Health*, with 3 of its members being physicians. The *Public Health Acts* of 1848

and 1875 also established public baths and wash-houses, and by the 1870s, health-conscious municipalities were building public swimming baths. However, the treatment for established cases of cholera still ranged from copious bleeding or transfusion to repeated doses of calomel.

Many citizens still died from eating unwholesome, adulterated or diseased food. A report to the *British Privy Council* in 1863 estimated that 20% of the meat that was sold for human consumption came from diseased cattle. To this toll was added the disease caused by the exposure of workers to industrial dusts in many common trades, seen in the "black spittle" of miners, grinder's rot and potter's asthma.

Demographics. Greater prosperity during the Victorian era allowed many people to marry at a much earlier age than their predecessors. This contributed to a population explosion throughout Europe. Birth rates did not flatten out until around 1900, when effective methods of birth control first became accessible to ordinary women, and the banning of child labour removed the economic incentive to rear large families. Mortality rates declined slowly but steadily throughout the Victorian era. For example, in England and Wales, rates dropped from 21.9 per 1000 population in 1848-54 to 17 per 1000 in 1901. Nevertheless, Social Class continued to have a major impact upon death rates, and vigorous debate continued over the relative importance of Public Health policies versus economic progress as a means of enhancing Population Health (Szreter, 1988). In Britain, the issue attracts attention even today, with a continuing 8-10 year difference of life expectancy between the wealthy Counties around London and the rust-belt cities along the Clyde, the Tyne, and Merseyside.

Housing. In the early part of the 19th century, the sudden influx of people into major cities created hideous slums (Chesney, 1970):

"some of them acres wide, some no more than crannies... make up a substantial part of the metropolis... In big, once handsome houses, thirty or more people of all ages may inhabit a single room."

Housing conditions in Britain and the U.S. generally improved as the Victorian era continued. Many workers accumulated sufficient surplus income to purchase modest but well-built homes. A few enlightened industrialists also constructed model housing estates for their employees. Robert Owen (1771-1858 CE) was one such entrepreneur. He began life as a cotton spinner, but rose to become head of the New Lanark cotton mills and the founder of the *Utopian Socialist Movement*. He believed that the health of workers reflected not only their heredity but also the influence of their environment. He thus supported the views of Pestalozzi on the importance of providing both general and physical instruction to the poorest of children. In the course of a debate with Alexander Campbell, leader of the small Christian sect in which I was reared, Owen stated (Owen and Campbell, 1852):

"*can I give you anything of more infinite value than to make your offspring superior, physically and intellectually...*"

Owen organized a Model Community for his employees at the New Lanark mills, in Scotland. This was complete with a nursery school for the children of working mothers. In 1825, he engaged in a more ambitious project of communal living in New Harmony, IN, and this innovation failed within two years.

The Quaker chocolate manufacturer George Cadbury (1839-1922 CE) also attempted to improve the living conditions of his workers. In 1893, he built a Model Village for his employees around his factory at Bournville, near Birmingham. His stated objective was to (Harvey, 1906):

'alleviate the evils of modern more cramped living conditions'.

Other charitable foundations undertook more general slum clearance projects. The *Metropolitan Association for Improving the Dwellings of the Industrious Classes* (founded by Southwood Smith) and the *Peabody Trust* (founded in 1862 by a London-based American Banker, Charles Peabody) began to replace the worst of London's slums with well-built if Spartan apartments. The first Peabody block, at Spitalfields in central London, opened in 1864. For a total cost of £22,000, the Trust was able to build 57 dwellings for the poor, 9 shops with accommodation for the shopkeepers, and baths and laundry facilities on the upper floor. Many of the Peabody Buildings were still standing when I entered my Obstetrics rotation in 1951. I recall being summoned in the wee hours of one winter night to a back street in Bermondsey, where a young woman was in labour. I penetrated a dimly gas-lit stairwell, and climbed four floors of a worn stone staircase to a landing where four or five crowded apartments were served by a single cold-water tap. The husband heated large quantities of water from this source, and as far as I can recall the birth was completed without infection of either mother or child.

Child labour. In the early part of the 19th century, poor children were expected to work long hours at dangerous jobs in order to balance the family budget. Agile boys served as chimney sweeps, scrambled under dangerous machinery to retrieve cotton bobbins, and crawled through mine shafts that were too narrow to admit adults. Charles Dickens himself worked in a boot-blacking factory from the age of 12, because his father (the inspiration for Mr. Micawber) had been confined to a Debtors' Prison. In 1840, only 20% of the children in London received any formal education. Testimony before the *Parliamentary Commission on Child Labour in Mining* of 1842 explained the situation of one family (Bowditch and Ramsland, 1961):

"My father has been dead about a year; my mother is living and has ten children, five lads and five lasses; the oldest is about thirty, the youngest is four; three lasses go to mill; all the lads are colliers, two getters and three hurriers."

Nevertheless, conditions in Victorian industry were progressively improved through the efforts of Social Reformers such as Robert Owen (1771-1858 CE) and Lord Ashley, 7th Earl of Shaftesbury (1801-1885 CE). A succession of *Factory Acts* progressively reduced the role of young children in industry, and the *Education Act* of 1870 required universal school attendance, initially for five years, but rising to 9 years by 1914.

Slavery. The abolition of slavery had a major impact upon the health of a large segment of the North American population. An estimated 12 million slaves were transported to the Americas between the 16th and the 19th century, and in 1860 the US Census noted the presence of almost 4 million slaves, with a third of the "white" population in the southern half of the U.S. being slave-owners. By the year 1772, an English Court had refused to enforce slavery in other jurisdictions, and a further critical event was the *Zong* trial of 1783. The captain of the *Zong* had thrown 133 live slaves into the Atlantic in order to claim £30 in insurance for each of his captives. Stimulated by this horrific event, the Chancellor of Cambridge University set as the title for the prestigious annual Latin essay "*Anne liceat invitos in servitutem dare? (Is it lawful to make slaves of others against their will?)*. The prize-winner, Thomas Clarkson, was sufficiently impressed by the facts unearthed that he wrote (Smith 2012):

"In the daytime I was uneasy. In the night I had little rest. I sometimes never closed my eyes for grief."

He quickly established a small committee that worked tirelessly to abolish slavery. In 1807, through the further efforts of William Pitt the younger, William Wilberforce and John Newton, slave trading became illegal throughout the British Empire. The *Slavery Abolition Act* was passed by the British Parliament in 1833. In the U.S., the importing of slaves became illegal in 1808, but existing slaves were not emancipated until 1863.

Fitness. As noted above, the Victorians first considered fitness in the context of survival, with Social Darwinists joining ideas on the *Origin of Species* to the views of Malthus on over-population of the universe. Some of the clergy called for *Muscular Christianity* and some Physiologists argued the need to enhance muscular strength, but objective assessments of fitness seem limited to occasional articles on sport participation and longevity, public records of height and body mass, and military reports on the condition of recruits and serving officers.

Muscular Christianity. Liberal segments of the Christian Church began to speak approvingly of "*Muscular Christianity*" during the latter part of the Victorian era. Young men were called to personal piety, vigorous Masculinity and good health. Proponents of this movement included in England Charles Kingsley (1819-1875 CE, one of the first Churchmen to praise Darwin's research) and Thomas Hughes (1822-1896 CE, author of Tom Brown's schooldays), and in Canada the novelist, Master of Upper Canada College and Presbyterian Church leader Ralph Connor (1860-1937 CE). Practical expressions of the desire to encourage "*Muscular Christians"* included such movements as the YMCA and the *Holiday Fellowship*.

The "*Muscular Christians*" favoured team games such as cricket and football, arguing that they encouraged unselfish action, and were (Hughes, 1858):

"much better games than fives, or hare and hounds or any others where the object is to come in first and to win for oneself."

Such pursuits favoured (Kingsley, 1874)*:*

"self-restraint, fairness, honour, unenvious approbation of another's success and all that 'give and take' of life."

Possibly, they also contributed to the Military Spirit of the Victorian British Empire (Mangan, 1981), as exemplified in Sir Henry Newbolt's *Vitae Lampada* :

"The voice of a schoolboy rallies the ranks. "Play up! Play Up! and play the game!"

Many of the well-known English soccer clubs, including Aston Villa, Bolton Wanderers, Wolverhampton Wanderers, Everton and Queen's Park Rangers began with a Non-conformist Minister who introduced football to the younger members of his congregation. In 1880, 83 of the soccer clubs in Birmingham, England, were associated with some Church or Chapel (McIntosh, 1971). Development of soccer leagues was fostered by introduction of the weekly Saturday half-holiday. This had originated during the 1860s with the Quaker chocolate manufacturer George Cadbury (1839-1922 CE), and by the mid-1870s most workers enjoyed a free Saturday afternoon. George Cadbury was a keen promoter of worker fitness. He installed lavish physical activity facilities around his Bournville factory, including gardens for men and women, sports fields, women's and men's swimming pools, football, hockey and cricket pitches, tennis and squash racquet courts and a bowling green (Shephard 1991).

Development of muscular strength. Some early Physiologists had conceived fitness mainly as the development of prodigious strength. Benedetto Morpugo (1861-1944 CE), a pathologist from Turin, developed the concept of progressive resistance exercise, and he reported a 55% increase in the girth of the sartorius muscle when he trained dogs by having them run on an exercise wheel, He argued that muscular dimensions were increased through a hypertrophy of existing muscle fibres (hypertrophy) rather than by an increase in the total population of muscle fibres (hyperplasia), a view that is generally maintained to this day. The family of Murpugo were Jewish, and he was finally forced to flee to the Argentine in 1935, during the Fascist dictatorship in Italy.

One expression of the quest for strength was the wielding of Indian clubs, weighing up to 25 kg each. Use of such clubs became popular as a method of enhancing physical fitness during the final decades of the nineteenth century, with Dioclesian Lewis (above) devoting an entire chapter of his text "*The New Gymnastics*" to this topic (Lewis, 1862).

Longevity. Occasional attempts were made to assess the impact of physical fitness upon health by comparing mortality statistics for University Athletes with data for the general population. Given the elevated social status of those attending universities during the 19th century, such studies were inherently spurious. Nevertheless, they did serve to overturn the argument of some Victorians that participation in high performance athletics shortened an individual's lifespan by causing development of "*Athlete's Heart*" (Whorton, 1982). In one of Wilkie Collin's novels, a surgeon declares that (Collins, 1870):

"young men who are now putting themselves into violent athletic tests of strength and their endurance are taking that course to the serious and permanent injury of their own health."

One earnest Victorian Physician went so far as to suggest that no cyclist should continue riding a bicycle if he became short of breath (Herschell, 1895). With inauguration of the Boston Marathon (1897), cardiac damage from participation in this event was also suggested as inevitable (Editor, JAMA, 1903):

"The men were examined just before and just after a run of twenty-four miles. While in some the pulse rate was not much increased, it usually was high, even 180 being recorded. In practically all cases the hearts, already hypertrophied from training, became more or less dilated, often with systolic murmurs.... That repeated exercise, such as prolonged training in successive years, may lead to permanent injury of the heart or kidney is unquestionable"

However, when John Edward Morgan, Lecturer in Pathology at the Manchester Royal Infirmary, compared the age at death of 294 Oxford and Cambridge oarsmen with general Insurance Statistics, he discovered that the rowers lived two years longer than the actuarial norm (Morgan, 1873).

George Meylan conducted a similar study on Harvard oarsmen, and he noted that the rowers lived 2.9 years longer than the average U.S. citizen. Indeed, if allowance was made for the fact that many of the rowers died of accidental deaths, a health advantage as great as 5.1 years might be imputed (Meylan, 1904).

Height and body mass. Large-scale studies of height and body mass were first conducted in Belgium, by Lambert Adolphe Jacques Quetelet (1836) and in England by John Hutchinson (1846, above); Hutchinson's standards were for a time used by U.S. Actuaries. The earliest U.S. data are for federal soldiers who were involved in the American Civil War (1863-1864). These figures may not be representative of young adults, because many of the soldiers were suffering from a poor diet (Davis 2003), and a few of them were as young as 13 years. Their height averaged 1.73 m and their body mass was 65.2 kg, giving a typical body mass index (BMI) of 21.7 kg/m^2 (Volo and Volo 2009). Data collected on insured persons by the U.S. Society of Actuaries dating mainly from 1885-1900 showed a median height of 1.72 m in the men and 1.60 m in the women, with respective body masses of 68.6 and 53.6 kg, corresponding to BMIs of 23.5 and 21.0 kg/m^2. Secular trends in subsequent years were strongly influenced by the ethnic origin of successive waves of American immigrants. During the first World War, the height of the average recruit decreased slightly, to 1.71 m, but by the 1950s it had gained about 50 mm; the body mass at a given height showed relatively little change over the period 1846-1929 (Czerniawski 2007), but by 1999-2002 the average body mass index for young U.S. male adults had increased to 27.5 ml/kg^2.

Military Reports. Military reports from many parts of the world have recognized the need for physical fitness in those recruited to National Armies, but frequent renewal of measures designed to enhance the fitness of those already serving in the armed forces suggests that

all too often ways were found to avoid the supposed requirements.

During the U.S. Civil War, "Stonewall" Jackson trained a brigade of rural Virginians rigorously by such measures as speed marches carrying a 27 kg pack under winter conditions. This was followed by success in a series of "*lightning strikes*." But fitness was the exception rather than the rule during this conflict, Robert E. Lee lost 16,000 stragglers in a single march as he approached the critical battle of Antictam.

Towards the end of the 19th century, Herman J Koehler succeeded in integrating Gymnastics and Physical Culture into the curriculum of the *West Point Academy* (1885). A gymnasium was constructed in 1892, and 100 years later I remember the vigorous sounds of both male and female recruits being chased around the sports fields by their Gym Instructors at 6 a.m. every morning.

In 1896, General Nelson Miles ordered all U.S. soldiers at Western posts to engage in at least 30 minutes of physical activity per day, and 10 years later Chief of Staff J. Franklin Bell enacted an order requiring all garrisons to engage in regular exercise, including gymnastics, outdoor athletics, and swimming, with weekly marches of at least 19km, or horse-back rides of 29 km. However, his order met much local resistance from officers who could not themselves meet the requirements and he was told that such regulations were having a negative impact upon recruitment. Even the example of President Theodore Roosevelt (who instituted an annual fitness test for officers, and himself rode 145 km in 2 rather than the required 3 days) failed to persuade some officers of the need to meet the published standard.

The importance of conditioning programmes for new recruits was repeatedly underlined by the poor physique of the general population. The *U.S. Draft Report* for World War I shows that one man in 3 was unfit for combat at recruitment and many of the remainder were in relatively poor condition when they first enrolled. The picture in Britain was very similar; 2 of every 5 men volunteering to fight in 1915 were judged unfit for military service because of poor health and/or fitness.

Conclusions.

During the 19th century, thinking became progressively more rational, and less reliance was placed upon metaphysical explanations of the universe. Many details of whole organ Physiology were clarified, and there was a growing understanding of Biochemistry, Metabolism, and Microbiology, all of which set the stage for a modern approach to the promotion of Population Health, fitness-based Preventive Medicine and a healthy lifestyle. Physical Education programmes gained a formal place in the curriculum of many schools, individuals with a strong social conscience enhanced conditions in cities and in factories, and some (but by no means all) political leaders encouraged the adoption of a healthy lifestyle. A range of new recreational opportunities became available to the general population, including both working class men and emancipated women. The average longevity increased, due to reductions in neonatal and puerperal mortality, and the progressive control of major epidemics. However, there is little objective evidence to determine whether fitness levels improved or worsened during this era.

Author's Qualifications

The author's qualifications are as follows: Roy J. Shephard[3], M.B.B.S.; M.D. [Lond.]; Ph. D.; D.P.E.; LL.D.

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