

**אוניברסיטת בר-אילן**

**תכנית למדע, טכנולוגיה וחברה  
לימודים בין-תחומיים**

**הצעת מחקר לתואר שלישי**

**בנושא:**

## **A History of Life-Extensionism in the Twentieth Century**

**היסטוריה של רעיונות אודות הארכת חיים במאה עשרים**

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דצמבר 2006

## **Introduction. Aims**

This work will explore the history of life-extensionism in the 20<sup>th</sup> century. The term life-extensionism is meant to describe an ideological system professing that radical life extension (far beyond the present expectancy) is desirable on ethical grounds and is possible to achieve through conscious scientific efforts. There have been relatively few attempts to research the history of life-extensionism and its underlying ideological and social motives.<sup>1</sup>

This dissertation will examine major lines of life-extensionist thought, in chronological order, over the course of the 20<sup>th</sup> century, while focusing on central seminal works representative of each trend and period. These works will be considered in their social and intellectual context, as parts of a larger contemporary social discourse, associated with major political upheavals and social and economic events, such as wars and revolutions, scientific advances, prosperity, and the valuation of this-worldly life.

This work will pursue two major aims. The first will be to attempt to identify and trace throughout the century several generic biomedical methods whose development or application were popularly associated with hopes of life-extension. In other words, I will inquire what kinds of biomedical interventions (actual or potential) raised the expectations of radical life-extension enthusiasts over the years. There exists an extensive number of sources containing suggestions for possible methods of life prolongation, written by elite scientists and science popularizers. A taxonomy emerges: idealistic approaches advocate direct mind over body control, whereas materialistic methodologies seek ways of elimination of damaging agents, maintenance of homeostasis, biological replacements, and man-machine synergy. The apparent relative weight of each method in public discourse (in terms of notoriety and prestige, funding, amount and dissemination of relevant publications, etc.) will be shown to change with time.

The second goal will be to investigate the ideological and socio-economic backgrounds of the proponents of radical life extension, in order to determine how ideology and economic conditions motivated the life-extensionists and how it affected the science they pursued. For that purpose, the biographies of several outstanding longevity advocates will be studied. Their specific ideological premises (attitudes toward religion and progress, pessimism or optimism regarding human perfectibility, and ethical imperatives) as well as their socioeconomic conditions (the ability to conduct and disseminate research in a specific social or economic milieu) will be examined in an attempt to find out what grounds have encouraged or discouraged life-extensionist thought.<sup>2</sup> Despite the wide variety of methods professed, what seems to unify the diverse life-extension advocates is an assertion of the unconditional value of human life, unmitigated optimism and belief in progress, and a striving toward the absolute goal of maximal

life prolongation for as many as possible. This desire was neither trivial nor self-explanatory, and its expression required a certain daring on the part of life-extensionist writers.<sup>3</sup>

Prominent life extensionist authors were not isolated, but parts of respective societies. Therefore life-extensionism needs to be examined as a social movement. Several national contexts will be studied: Russia, the US, the UK, France and Germany. An attempt will be made to relate the ebbs and flows in the popularity of life-extensionist ideas to the valuation of an individual life and socio-economic conditions in these countries in different periods. An attempt will be made to relate state ideology and various markers of social prosperity (such as wealth per capita, economic growth, periods of peace, low mortality rates, etc.) with the popularity of life-extensionism (in terms of funding, institutional research, appearance and dissemination of relevant publications, membership in life-extensionist communities, etc.). The data I have collected so far (see Chapter Outline below) seem to indicate that in periods of peace and socio-economic prosperity, life-extensionist ideas receive a greater prominence.

## **Chapter-by-Chapter Description**

### **Ch. 1. 1900-1930: Popular Idealistic Life-Extensionism and Materialistic Methodologies**

The Fin-de-Siècle period was a time of peace, yet with a widely felt apprehension of stagnation, even imminent extinction of humanity.<sup>4</sup> The horrible death-toll of the First World War exceeded even the most pessimistic expectations. An essential question during these upheavals was the value assigned to an individual life, as the mortality rates soared and people were confronting death with increased immediacy. Perhaps as a way of rationalizing the high mortality, in an attempt to make sense of the often inescapable violent death, there flourished elaborate belief systems designed to justify individual death, and thus possibly ease one's transition to nothingness.<sup>5</sup> And yet, people detested the war: pacifist movements gathered momentum and mass desertions took place.<sup>6</sup> Pacifist thinkers felt that resisting or escaping death by all means was the right course of action.<sup>7</sup> The abhorrence of death, heightened by the extent of disaster, may have provided an important foundation for the advent of modern life-extensionism. The quantity of life-extensionist publications grew in the times of peace<sup>8</sup> before the war, in apprehension of destruction, and immediately after the war in recoil from it.<sup>9</sup> Perhaps an even more substantial contribution to its development may have been the astonishing scientific, technological and industrial achievements of the period: the advances in transportation, energy supply, agriculture and general medical care. It became evident, perhaps for the first time in history, that science did have the genuine ability to ameliorate social plights, cure diseases and extend human life.

These motivations are expressed in the overtly life-extensionist works of Bernard Shaw and Elie Metchnikoff. Shaw's *Man and Superman* (1903)<sup>10</sup> and *Back to Methuselah* (1921)<sup>11</sup> are prime examples of popular "idealistic" advocacy of life-extension, stemming from a general humanistic/socialist and pacifist worldview, and employing contemporary concepts of "eugenics," "psycho-regulation," "energy field" and "Neo-Lamarckism". Scientific "bio-materialistic" methodologies will be represented in this thesis by the work of the Nobel Laureate in Medicine (1908), the great immunologist Elie Metchnikoff's *Etudes of Optimism* (1903-1915), underwritten by materialism, Darwinism, pacifism, and a profound belief in progress and human perfectibility.<sup>12</sup>

Shaw's earlier *Man and Superman* promotes humane eugenics: differential reproduction aimed at health and longevity, while caring for the less able. This was an extremely popular movement in the West at the beginning of the 20<sup>th</sup> century.<sup>13</sup> Later, Shaw's views shifted towards a more egalitarian behaviorist life-extensionism. *Back to Methuselah* is a call for public support of life preservation on the assumption that it is more likely to be achieved collectively.<sup>14</sup> Shaw's major humanistic rationale for the necessity of life-extension is that we die in our "infancy," without having had time to mature. He argued that a society composed of "infants" is childish and prone to self harm, and therefore extended life-spans are needed for the survival and benefit of the society as a whole.<sup>15</sup> His prescriptions for the actual attainment of longevity may be termed "idealistic" or "vitalistic" as they advocate the power of the mind to strengthen the vital force of the body. In Shaw, the vital force assumes the scientific appearance of a field of energy "governed by mathematical equations." As I will show, similar idealistic/vitalistic views were broadly propagated in Shaw's time and remained an indispensable part of life-extensionist thought throughout the century.<sup>16</sup> In *Back to Methuselah*, the direct positive influence of the mind over the body is, however, mainly described in neo-Lamarckist terms. Shaw saw human salvation – individual and social – in neo-Lamarckist biology, favoring creative evolution toward longevity (and virtual immortality) by the power of the will. As I will show, to the present time neo-Lamarckism represents an enticing (yet not firmly scientifically supported) branch of life-extensionism.<sup>17</sup>

Metchnikoff, the more materialistic and scientific life-extensionist, envisioned extreme longevity being achieved through the progress of medical science, and called for a massive collective support of research and health care. Metchnikoff believed that it is the duty of conscious human beings to fight death, the main disharmony and evil of nature. Without belief in an afterlife, Metchnikoff valued on this-worldly survival and progress. He strongly emphasized that every death has an identifiable, preventable cause and that in this sense every death is "violent" and not "natural." For him, the fact that everyone had to succumb to it eventually did

not make it right or even tolerable. Metchnikoff's practical suggestions included microbiological and toxicological methods. These represented broad scientific trends of the period and will be described in that context. Specifically, Metchnikoff suggests combating putrefactive micro-flora by an acidified-fermented dairy diet (which can be tentatively termed "elimination of damaging agents"),<sup>18</sup> bioenergetic and constructivist suggestions (which might be termed "modulation/restoration of substance and energy balance"),<sup>19</sup> and he also alludes to hormone therapy and gland transplantations (which could be generally termed "biological replacements").<sup>20</sup> These generic trends have retained their influence down to our time. Of note is the emergence of bio-replacement methodologies in the richest European countries and their availability to the rich.<sup>21</sup> Perhaps the most crucial issue in Metchnikoff's writings, which became a major bone of contention in the ongoing dispute, concerns the existence of an inherent limit to the life span. This issue later became firmly associated with the question of bio-economic resource allocation and exhaustibility (see Ch.4).

Whatever the method may be, for early twentieth century proponents of life-extension, such as Shaw and Metchnikoff, life was the absolute value, worth preserving by all means. For both thinkers, the writing of the life-extensionist treatises corresponded to periods of affluence and influence (both personal and national). The sense of high self-security may have nurtured the ambitions implicit in Metchnikoff's "Optimistic Studies"<sup>22</sup> and Shaw's "Metabiological Pentateuch."<sup>23</sup> The immense fame of these works seems to testify that life-extensionism at the beginning of the twentieth century went beyond the confines of the laboratory and was increasingly forming into a social movement<sup>24</sup> with very similar objectives and moral imperatives, yet with a considerable (though not unbridgeable) distinction in method.<sup>25</sup>

## **Ch. 2. 1930-1950: Conflicting Political and Economic Factors in Life-Extension Research**

The war-mongering atmosphere of this period was not especially conducive to research on and advocacy of radical life-extension. Both in the Communist and Fascist blocs, the survival of the group (the society) was valorized over individual survival. Moreover, the public discourse, dominant at that period, praised a "noble/heroic" death, as can be seen in the contemporary propaganda in public media and literary fiction.<sup>26</sup> In both social theories, honors and ideals of various kinds, including such fetishes as the glory of the leader or the land, were considered more valuable than life.

The fascist theory, particularly its Nazi German branch, appropriated a very selective view of the value of an individual life.<sup>28</sup> Life of a less physically capable person was considered worth less than that of a young healthy individual (hence the extensive Nazi use of euthanasia, sterilization, and concentration camps for the physically and mentally disabled). Most

notoriously, the tenets of racial hygiene assigned less or no value to the lives of persons considered racially inferior.<sup>27</sup> The elimination of “parasites” was advocated. However, the lives of the members of the “superior” race were considered valuable: before the war, massive hygienic, epidemiological and prophylactic measures were undertaken in Germany to improve public health-care and “health-span.”<sup>28</sup> A number of works on life-extension had been published by 1942.<sup>29</sup> I will focus on a book by the prominent German physician Ludwig Roemheld: *Wie verlängere ich mein Leben? (How do I Prolong My Life?)*. First published in 1933, it was extremely popular, offering “health regimen” suggestions for practical life-extension and advocating eugenics as a long-term program for the German people.<sup>30</sup> Obviously, many of the book’s suggestions, such as “avoidance of stress and overwork,” could not be implemented during the war. The Nazi neo-Darwinism (or selective life-extension for a defined elite group) represented the most dangerous and morally objectionable form of “life-extensionism,” which was perhaps more in line with death-apologetic views. From 1943 to 1945, the publication of works on life-extension completely ceased, which may indirectly reflect the Reich’s plight.

In the Soviet Union, egalitarianism and human progress were parts of the professed ideology. However, despite the widely announced support for science, the fear of technological advancement was widely spread in Stalin’s times, during the massively supported persecutions of educated professionals, when an engineer was seen as a saboteur, a geneticist a polluter of nature, a cyberneticist a madman and enemy of humanity, and a doctor a poisoner.<sup>31</sup> Nevertheless, extensive social and biological experimentations were under way, in line with the official “where there is a wish, there is a way” ideology.<sup>32</sup> Atheism and the absence of belief in an after-life contributed to the popularity of life-extensionism as part of a new, “this-worldly” progressivist eschatology, a new ‘secular religion.’ On the popular level, various physiotherapeutic, exercise and recreational techniques became widely practiced for life-extension.<sup>33</sup> The adoption of these techniques, the massive construction of recreational facilities, and the public promotion of gerontological research, were propagandized as signs of the growing prosperity of the Soviet people.<sup>34</sup>

The leading Soviet gerontologist of that time was Academician Alexander Bogomolets, the head of the Institute of Experimental Biology and Pathology in Kiev. In his research, Bogomolets synthesized most of the ‘biomaterialistic’ methodologies available at that time: immunological/toxicological means for eliminating damaging cells and toxins, biological replacements and “homeostatic” means (hormone replacement and serum transfusion for reticulo-endothelial stimulation).<sup>35</sup> The degree of governmental support for Bogomolets’s studies (especially Stalin’s personal support), reflected the extent to which the USSR strove for increased productivity in that period. It reached a peak in a period of economic stability (1936-1938)<sup>36</sup> and

declined after 1940, under the massive deployment of economic and human resources to the war effort.<sup>37</sup>

In the countries of the “Free World” such as the United States and the United Kingdom, general health care improved as well, becoming more available to the low-income populace.<sup>38</sup> The war effort contributed to the development of surgery, prosthetics and pharmaceuticals mass production (specifically the mass production of antibiotics).<sup>39</sup> However, the amount of writing on radical life-extension was largely reduced, being of less immediate relevance during the great depression (1929-1933) and the war.<sup>40</sup> There was no shortage of pessimistic or derogatory writings.<sup>41</sup> Still, the discussion did not cease and continued earlier traditions. In the post-depression period especially, the amount of life-extensionist literature increased. The research of the Austrian physician Eugene Steinach on rejuvenation by gonad stimulation was still celebrated.<sup>42</sup> The search for anti-toxins and appropriate diet continued.<sup>43</sup> Moreover, there appeared rudiments of the genetic theory of aging and regenerative medicine.<sup>44</sup> Idealistic views existed alongside the more medical/scientific: either hard-core spiritualism or more scientific-looking works.<sup>45</sup> In the US, the seminal “Rate of Living” theory of aging was posited by the prolific American biologist Raymond Pearl (1928) just before the depression, and the connection between a low metabolic rate and longevity was emphasized by the American physiologist Clyde McCay (1935) immediately following it.<sup>46</sup> In 1950, the International Association of Gerontology was established in Liege, which was an important landmark in the institutionalization of biological gerontology, perhaps even an early mark of a new boom of life-extensionism in the post-war period.

### **Ch. 3. 1950 – 1990: Life-Extensionism Burgeons**

The period 1950s - 1970s shows a great expansion of life-extensionist literature and movements (as shown by the sheer quantity of publications, in both scientific and popular-scientific genres).<sup>47</sup> This might have been a direct reaction to the war, as the unprecedented horror of massive slaughters may have produced a corresponding unprecedented desire and drive not only to prevent future wars, but to abolish suffering and death altogether.<sup>48</sup> The optimism at the prospect of extending the life-span was also boosted by ground-breaking contemporary scientific and technological achievements and by the overall increase in industrial productivity and quality of life.<sup>49</sup> The potential for progress seemed unlimited, and life-extensionism fitted well into the paradigm.

Several methodological directions were strongly associated with hopes for a significant life-extension. The advances in pharmacology and medical industry proved the ability to eliminate harmful agents by fairly simple, inexpensive and mass-producible means.<sup>50</sup> In combating aging,

special attention was drawn to the workings of synthetic hormones, vitamins and anti-oxidants (as can be seen by the relative quantity of scientific publications and the massive public awareness and application of such research).<sup>51</sup> Antioxidant-rich foodstuffs or supplements were relatively inexpensive and could be mass produced and widely consumed. Rich industrial/agricultural countries, generally capable of mass production and distribution, had a clear advantage in developing this field. The works of the Nobel Laureate Linus Pauling and of the Nobel nominee Denham Harman became major benchmarks in the advancement of this branch of life-extensionism. Through them, a link will be demonstrated between the life-extensionist enterprise, pacifism, and the availability of a rich socio-economic infrastructure.<sup>52</sup>

Beside the search for biologically active, damage-repairing pharmacological agents, there also flourished the “homeostatic” approaches, seeking ways to maintain body energy and material balance, strengthen internal defense mechanisms, and conserve or replenish vital energy. In the “homeostatic” approach, the “rest/activity” cycle and “calorie restriction” received special emphasis. The work of Hans Selye, the renowned endocrinologist and pioneer in the research of stress physiology and adaptation energy, led the way (*The Stress of Life*, 1956).<sup>53</sup> Selye’s “adaptive” life-extensionist theory may have stemmed from two seemingly conflicting aspects of prosperity: the possibility of leisure and the need to cope with production demands. It was suggested that rest had to be balanced with exercise, both activities requiring free time that might be unavailable under social and economic stress.<sup>54</sup> Relaxation (or slowing down the metabolism) was believed to favor longevity, while excessive exhilaration was seen as harmful. Besides rest, a widely publicized way to “slow down the metabolism” was dietary “calorie restriction.” This trend is well represented by the bio-gerontologist and life-extension activist Roy Walford, who became the founder of the Calorie Restriction Society (1984).<sup>55</sup> “Calorie restriction” was yet another mark of western prosperity: it required a choice of “nutritious” foods, and therefore could not be practiced in societies plagued with under-nourishment or with having to subsist on classical carbohydrate-rich “poverty foods.” The ideas of “homeostatic” life-extensionism came to be widely adopted into the health regimen of publics enjoying socio-economic security.

The book of the physicist and life extensionist philosopher Robert Ettinger *The Prospect of Immortality* (1964) took to an extreme the public fascination with the ideas of life-extension and specifically with the idea of body preservation by “lowering energy expenditure” through cryonic suspension. After a prolonged period of “freezing,” subjects hoped to be revived and to reap the benefits of improved medical technology. Ettinger transformed the concept of suspended animation into a basis for a comprehensive life-extensionist/immortalist ideology, suggesting the enjoyment of life and prosperity as a rationale. With the publication of this work, “Immortalism” (openly expressing the desire for physical immortality and one’s belief in its possibility) became

an articulate ideology and a social movement, with an initially well-to-do constituency gradually spreading into the middle class.<sup>56</sup>

Ettinger surveys several methods which, if developed, could effect the repair and rejuvenation of the resuscitated body, such as bio-transplants, organ cultures and regenerative medicines, mechanical aids and prosthetics and electro-stimulators – which could be collectively termed “biological replacements.”<sup>57</sup> Advances in computer technology and robotics yielded visions not only of bionic replacements but of cyborg synergy.<sup>58</sup> Thus, practical ways were now being outlined for providing spare parts (natural or bionic) and fuel (hormones and energy carriers) for the body, perhaps to sustain it indefinitely. In contrast to psycho-regulatory and homeostatic means, most of the replacement interventions were extremely costly and required significant investments to develop. Hence, this branch became even more dependent on prosperity, on the resources that society was ready to spare for it.

The scientific “materialistic” wing of life-extensionism, drawing on the booming development of the exact and biomedical sciences, arguably dominated in this period. Yet the idealistic wing did not disappear, though its proponents attempted to blend into the scientific discourse. The concept of a bio-field or energy field provided the idealistic movement with scientific-sounding terminology for describing direct control of the mind over the body.<sup>59</sup> Colin Wilson’s novel *The Philosopher’s Stone* (1971) is a good literary example of this hybrid ideology.<sup>60</sup> The idealistic branch, though advocating a “do it at home” form of life-extensionism, was likewise firmly associated with prosperity – with the availability of spare time, financial security and a level of education.

In the period under consideration, advances in the science of life-extension were encouraging, and widely covered by the media.<sup>61</sup> This progress became an issue of competition between the “Western/capitalist” and “Eastern/communist” social systems, as part of the general dispute over which “social system” affords greater prosperity to the public. At the same time, the subject was perceived as a matter of international cooperation.<sup>62</sup> Life-extensionism was less advertised in the countries of the “Third World,” where life-preservation was more a question of immediate daily survival, where leisure, productivity or resources were dramatically wanting. These poorer countries were also generally characterized by a younger population, which made gerontology less relevant. And yet there as well, the awareness of the possibility of significant life-prolongation grew, providing a hope and drive to ameliorate the substandard health care.<sup>63</sup> Despite the unavoidable politicization, life-extensionism, or the natural desire to preserve life and health, served as a unifying progressive social principle, a new “metabiological religion,” providing a common humanistic ground above ideology.<sup>63</sup>

#### **Ch. 4. 1990-2005: New Hopes and New Restrictions - The Reinforcement of Popular Advocacy Groups**

The life-extensionist thought of our own time generally has continued the trends that emerged in the 1960s. Yet the principal novel components of the modern biological revolution – such as the breakthroughs in the research and technologies of DNA sequencing, telomerase, stem cells and cloning – were heralded as a possible basis for unprecedented biomedical interventions, capable of radically extending human life within a very short time. Biological replacement therapies and the existence of immortal cells gave perhaps the greatest hope for an eventual subduing of aging and death. *The Immortal Cell* (2003) by Michael West, one of the pioneers of telomerase research, summarizes contemporary hopes based on cells' potential immortality, and recounts the economic and social conditions facing a scientist embarking on this field.<sup>64</sup>

The concept of an inexorable, programmed, inherent limit to the life span has been increasingly challenged by modern genetics. Genes responsible for aging in plants and animals have been discovered and manipulated to produce a drastic increase in longevity: telomerase, the suppression of apoptotic genes, SIR2 inhibition of energy expenditure, the inhibition of hormone action via DAF2, nuclear transfer – are a few recent examples.<sup>65</sup> Genetic manipulations play a major part in the SENS project (Strategies for Engineered Negligible Senescence) headed by Dr. Aubrey de Grey of Cambridge University (the term SENS was coined in 2002). The SENS project synthesizes various approaches toward “curing aging”: biological replacements, repairing damage, and homeostasis. The politics surrounding the SENS project are extremely intricate, largely centered on competition for funding, and they will be considered in detail.<sup>66</sup>

Beside the “biomedical” branch of life extensionism, there have flourished the “technological” wing (also highly materialistic), and the “spiritual” (idealistic) branch. The technological vision developed the ideas of man-machine (cyborg) synergy that emerged in the 1960s. Based on recent developments in nano-technology and brain-computer interfaces, prospects of nano-size machines for cellular repair (nanobots) and digital personality uploading have been discussed.<sup>67</sup> In more extreme visions, the aim is to transcend the biological substrate, to “upload” the mind into a super-computer, and arrive at a new immortal life form with a mixed artificial and human intelligence. *The Age of Spiritual Machines* (1999) by Ray Kurzweil, the father of Optical Character Recognition technology, is an epitome of this transhumanism, which is becoming increasingly popular in affluent computerized countries.<sup>68</sup>

The idea of immortalization by personality uploading into a “quantum computer” resonated with the spiritualist “new age” offshoots of life-extensionism, imagining “electromagnetic and quantum processes” as modern-age substitutes for the “vital force” and carriers of a disembodied mind. This system of beliefs professes the conscious manipulation of the “information field” or

“energy components” to prolong body existence. This “low budget” approach has been booming all over the industrial world, even in countries with relatively low productivity, yet prosperous enough to allow a certain degree of leisure and high education.<sup>69</sup> In the West, a popular advocate of this trend has been Deepak Chopra (*Ageless Body, Timeless Mind: The Quantum Alternative to Growing Old*. 1993), who synthesizes the ideas of “quantum field,” meditation, psycho-somatic regulation of homeostasis, and a variety of alternative medicines. The popularity of such authors as Deepak Chopra and Louise Hay (as evidenced by the book sales and the emergence of numerous “rejuvenation centers” and study groups) testifies to the tremendous rise, in prosperous countries, of spiritualist “new age” movements, whose membership largely exceeds that of “hard-science” life-extensionists.<sup>70</sup>

In this recent period, the possibility and desirability of radical life-extension have continued to be the subject of fierce ethical and political debate. On the one side, many skeptical secular and religious humanists continued to attack life-extensionism as a futile, unnatural, ungodly and wasteful enterprise (William Hurlbut, Leon Kass, Leonard Hayflick).<sup>71</sup> Of note is the general conservative bent of these authors and their common anxiety over shortage of resources. The influence of such views has been large, and has led to very tangible budget cuts and research limitations. These arguments can also be interpreted as rationalizations of cuts and limitations. Multi-million dollar cuts and numerous restrictions have been imposed on biological research by US President G. W. Bush’s administration, corresponding to a period of slower economic growth and enhanced military expenditure.<sup>72</sup> Often, skeptical voices come from orthodox religious groups, suggesting that radical life extension runs counter to the promise of an afterlife.<sup>73</sup> A large number of contemporary scientists, entrepreneurs and bio-ethicists, endeavor to oppose the skeptics (John Harris, Ronald Bailey, Nick Bostrom, Aubrey de Grey, James Hughes and others).<sup>74</sup> Several advocacy attempts have been made in literary fiction as well, as for example in James Halperin’s *The First Immortal* (1998), asserting the value of life extension and promoting cryo-preservation.<sup>75</sup>

Presently, largely thanks to the internet, life-extensionism has become recognized as a world-wide social movement. Its least ambitious and most numerous “right wing” consists of medical practitioners, biological researchers and health enthusiasts. In this group, radical life extension is tacitly desired, but the hope is seldom expressed. The proponents work to maintain health and vigor, to “compress morbidity” but rarely dare to hope for any ground-breaking advances. In the radical “left wing” are persons who fail to ignore or accept mortality, people with extremely high hopes, who openly profess and pursue these expectations.<sup>76</sup> Presently, major “left wing” movements comprise immortalists (hoping to indefinitely preserve the biological substrate) including cryonicists, unorthodox gerontologists, ethicists and research advocates;

transhumanists (who also believe in biological preservation, but place a greater stock in technological advances, cyborg synergy or brain-computer symbiosis), and several “new age” groups (believing in the power of the spirit to preserve the body indefinitely).<sup>77</sup> Notably, a great number of “biomedical” and “technological” life-extensionists are young relatively well-to-do men, studying exact and biomedical sciences. There is a majority of members from affluent Western countries, while representation of the Developing World is minimal.<sup>78</sup> Despite the fact that Western countries dominate anti-aging research and advocacy, hopes of universal sharing of relevant future technologies have been expressed by life-extension proponents, in line with the general meliorist program for absolute life valuation and universal prosperity.<sup>79</sup>

## **Literature**

Insofar as the life-extensionist authors extrapolated on contemporary biological and medical advances, the history of life-extensionism represents an integral part of the general history of biology and medicine. There exist classical compendiums of the history of medicine such as Richard Shryock’s *The Development of Modern Medicine: an Interpretation of the Social and Scientific Factors* (1947), Roy Porter’s *The Greatest Benefit to Mankind: A Medical History of Humanity from Antiquity to the Present* (1997), Erwin H. Ackerknecht’s *A Short History of Medicine* (1997), Henry Sigerist’s *A History of Medicine* (1951), Gert Brieger’s *History of Medicine* (1980) and Stephen Boyden’s *Western Civilization in Biological Perspective: Patterns in Biohistory* (1987). These works offer valuable portraits of the development of biomedicine in the Western world since antiquity. However, the weight given to life-extensionist ideas in biomedical history literature is minimal.

There is an extensive literature on the history of biomedicine in different national contexts, yet there too the more radical aspirations of life-extensionist scientists are almost never discussed. Thus for example, most comprehensive accounts of Soviet science, such as Loren Graham’s *Science in Russia and the Soviet Union* (1993) in the extensive appendix on Soviet Medicine and Life Sciences, David Joravsky’s *The Lysenko Affair* (1970), or Nikolai Kremontsov’s *The Cure* (2002) – listing hundreds of scientists and officials – never mention Alexander Bogomolets or his work on rejuvenation (despite the fact that Bogomolets headed the Ukrainian Academy of Sciences for 15 years and enjoyed Stalin’s and Khrushchev’s personal patronage), neither relate to the works of other outstanding life-extensionist Academicians such as Nikolay Amosov, Alexander Kuprevich or Victor Skulachev. With regard to the history of biomedicine in Germany, comprehensive accounts of it are given in Paul Weindling’s *Health, Race and German Politics between National Unification and Nazism. 1870-1945* (1993), Robert N. Proctor’s *The Nazi War on Cancer* (1999), and Monika Renneberg’s and Mark Walker’s *Science, Technology,*

and *National Socialism* (2003). In these histories, as well, life-extensionist physicians and biologists like Steudel, Venzmer, and Roemheld, are never mentioned, even though their works held several editions and circulated in millions of copies in Nazi Germany. Considering the history of biomedicine in the US, France and the UK, the situation is similar. Richard Brown in *Rockefeller Medicine Men: Medicine and Capitalism in America* (1979), Odin Anderson in *The Uneasy Equilibrium* (1968) and John Geyman in *The Corporate Transformation of Health Care* (2004) study in great depth the involvement of corporate interests in American biomedical research and practice. Yet the politics surrounding the establishment of the American Geriatric Society, the National Institute on Aging, or the relation of NIA with The Academy of Anti-aging Medicine are not part of the history, not to mention more radical enterprises, such as cryonics. Marilyn Ferguson, in *The Aquarian Conspiracy. Personal and Social Transformation in Our Time* (1980), gives an exhaustive account of idealistic “new age” visions of health care in the US, yet radical life-extensionist groups like “People Forever” are omitted. Bruno Latour’s *The Pasteurization of France* (1988) elaborates in detail on the social backgrounds of biomedicine in France in the 19<sup>th</sup> century, yet the rejuvenation attempts by Claude Bernard, Brown-Sequard or by Elie Metchnikoff (a director of the Pasteur Institute since 1886) are not dealt with. William Schneider’s inclusive *Quality and Quantity: The Quest for Biological Regeneration in Twentieth-Century France* (2002) makes mention neither of Metchnikoff, nor Serge Voronoff (whose rejuvenation techniques were the ultimate hype in France in the 1920s) nor Paul Niehans (in whose regeneration clinic Charles de Gaulle was treated). Histories of British biomedicine are equally tacit on this subject: Anna Mayer’s and Christopher Lawrence’s *Regenerating England: Science, Medicine and Culture in Inter-War Britain* (2000) and David Edgerton’s *Warfare State: Britain, 1920-1970* (2006) treat on the relations of British imperial expansion, the military and state politics with biomedicine. However, the life-extensionism and pacifism of Alexander Comfort receive no notice. Classical literary histories, such as Michael Holroyd’s *Bernard Shaw* (1988) too pay almost no attention to Shaw’s life-extensionist theories (which Shaw himself considered to be his highest achievement). Moreover, in flag journals in the history of medicine and biology, such as *Journal of the History of Medicine and Allied Sciences*, *Medical History*, *Bulletin for the History of Medicine* or *Journal of the History of Biology*, articles on the history of life-extensionism are conspicuously absent. The present work will attempt to fill in these omissions. The scientific contributions of life-extensionist writers, such as the Nobel laureates Metchnikoff, Pauling and Carrel, were considerable, as was their public appeal, and their life-extensionist views need to be considered to create a more rich and balanced biomedical history.

Despite the general silence of the above history books with respect to radical life extension, they will provide an invaluable methodological and factual source for the proposed thesis. As

Proctor and Joravsky show, the effect of ideology on science development was crucial, selectively favoring certain branches of biomedicine (e.g. eugenics and epidemiology in Nazi Germany or Neo-Lamarckism and bio-economics in the USSR). Schneider, Mayer and Lawrence show how nationalism and imperial aspirations translated into health care efforts in France and Britain. Brown and Anderson emphasize the role of corporate interests in biomedical research in the US, while according to Ferguson, a revolt against corporatism induced “new age” health care perceptions. The present thesis will use factual materials from these works and examine whether similar social motives were present in the history of life-extensionist enterprises.

While the more general literature on the history of medicine and its particular trajectories in different national contexts have neglected the history of life-extensionism, specific books on the subject have been quite rare. In recent years, a few survey works on radical life extension have been published, including Stanley Shostak’s *Becoming Immortal* (2003), Jay Olshansky and Bruce Carnes’ *The Quest for Immortality* (2001) and Ray Kurzweil and Terry Grossman’s *Fantastic Voyage. Live Long Enough to Live Forever* (2005), which recount recent scientific advances in longevity research; while Stephen Hall’s *Merchants of Immortality* (2003) gives an extensive journalistic account of the current politics of life-extension research in the US. Similarly structured accounts of longevity studies had been published earlier, e.g. Albert Rosenfeld’s *Prolongevity. A Report on the Revolutionary Scientific Discoveries Now Being Made About Aging and Dying* (1976) or Joel Kurtzman and Phillip Gordon’s *No More Dying: The Conquest of Aging and the Extension of Human Life* (1976). These works popularize contemporary scientific developments (such as the research on DHEA and anti-oxidants in the 1970s or telomerase and stem cells in the 1990s), but do not provide any historical perspective on this research, neither discuss the socio-economic and ideological backgrounds of the researchers. The same holds true for several other surveys of gerontology. For example, the historian of medicine Mirko Grmek, in *On Aging and Old Age, Basic Problems and Historic Aspects of Gerontology and Geriatrics* (1958), devotes only five pages to the history of “Modern Geriatric Movement” and basically provides a brief classification of laboratory research in Austria, Germany, France, the US, the UK, the USSR, Yugoslavia and Rumania. The Russian gerontologists V.N. Anisimov and M.V. Soloviev, in *The Evolution of Concepts in Gerontology* (1999) trace the transition from “quantitative analytic” to “cybernetic systemic” models in gerontology. Neither of these works make an attempt to relate the research classification and expansion to the social settings. Such an analysis will be an inherent component in the proposed thesis, as the knowledge of the communal willingness to fund longevity research and the ideological justifications for its necessity may help understand the emergence of, and the hopes associated with, specific biomedical interventions.

The present proposed project is relevant not only to the body of literature dealing with the history of bio-medicine, but also to the more specialized literature in the history and philosophy of science dealing with the social construction of knowledge. The crucial impact of socio-economic and ideological backgrounds on the history of science has been firmly established.<sup>80</sup> The seminal works of Boris Hessen (1931) in the classical Marxist basis-superstructure conceptual framework or Robert Merton's theory of "puritan work ethics" (1971) showed how economic drives and ideological identity may provide a spur toward development of specific branches of science. Joseph Needham (1954) professed the interrelation of science, democracy and socialism, while Carl Becker (1932) showed how secular humanism boosted the hopes in scientific progress, building a utopian "Heaven on Earth." The relation of science and ideology has been elaborated in such works as Mannheim's *Ideology And Utopia* (1936) or Georges Canguilhem's *Ideology and Rationality in the History of the Life Sciences* (1988). Moreover, such works as *The Scientific Revolution* (Steven Shapin, 1996) and *Leviathan and the Air-Pump* (Steven Shapin and Simon Schaffer, 1985) show how "gentlemanly" social and moral codes may affect the perception of scientific validity. Other classical works in the "strong program" in science and technology studies, emphasizing the role of cultural assumptions and economic and political interests in science, are David Bloor's *Knowledge and Social Imagery* (1976) and Harry Collins and Trevor Pinch's *The Golem: What Everyone Should Know about Science* (1998). Mark Walker's (ed.) *Science and Ideology: a Comparative History* (2003) and Etel Solingen's (ed.) *Scientists and the State: Domestic Structures and the International context* (1994) make more specific correlations between national ideological contexts and science development (the former concentrating on European countries and the US, the latter also including countries like Brazil, China and India). The proposed study will be a further addition to this kind of literature, since life-extensionism will be shown as a strongly ideologically, and socially constructed enterprise: In different national contexts, different ideological schemes – secular humanism or religion, Neo-Darwinism or Neo-Lamarckism, discrimination or egalitarianism – will be shown to yield different justifications for the necessity of life prolongation and longevity research and to impact profoundly on the way such goals were conceived and pursued.

Beside ideological rationales, economic and psychological factors too may have played a significant role in promoting life-extensionism. Much research has been done on the relation between socio-economic and educational status to life expectancy. High socio-economic and educational levels have been shown as predictors of longevity.<sup>81</sup> This thesis will attempt to test the hypothesis that not only is life-span affected by these factors, but also the very quest for longevity is greatly influenced. The enjoyment of this worldly life may favor such an optimistic pursuit. According to Robert Veatch's medical ethical theory in *Death, Dying, and the Biological*

*Revolution* (1977), the absence of suffering is strongly associated with the desirability of life extension (though, in Veatch, this premise relates to life extension for terminal patients, rather than radical life extension). The psychological grounds for this effect may be found in theories regarding rationalization and endowment.<sup>82</sup> According to Richard Thaler's effect of "endowment" (1980) and Anna Freud's theory of rationalization (1938), a drive to avoid cognitive dissonance may induce a person toward excessive hopes of prolonged personal enjoyment or toward welcoming the end of suffering in death. A high valuation placed on individual life and an absence of belief in an afterlife may positively correlate with life-extensionist pursuits. The latter factors may, in turn, be affected by quality of life. Such features, encouraging or discouraging life-extensionism, will be evaluated in the proposed thesis.

This thesis will most closely follow the methodology used in Gerald Gruman's *A History of Ideas about the Prolongation of Life. The Evolution of Prolongevity Hypotheses to 1800* (Transactions of the American Philosophical Society, Volume 56 (9), Philadelphia, 1966). The book provides a systematic historical analysis of life extensionist tendencies, based on literature survey. It describes major schools of life-extensionism or "prolongevity" (such as Alchemy, Taoism, Hygienism and Philosophical Enlightenment) and several systems of argument for or against the possibility and desirability of radical life-extension. The classifications supplied by the book (e.g. "spiritual" vs. "physiological" techniques, or "prolongevity" vs. "apologism") span across cultures over wide stretches of time. Life prolongation methods enjoined by each school are described in detail, yet an even greater weight is given to the social and ideological backgrounds of the exponents. However, the book's analysis ends at 1800<sup>83</sup> and calls for an expansion, examining the applicability and evolution of such categories in the modern period.

## **Methods**

The proposed research will be primarily a work of intellectual history, tracing several notions at the heart of life extensionism as they assume different forms in different circumstances over the course of the 20<sup>th</sup> century. It will be based on an extensive survey of available literature. This survey will include the following types of sources: life extension manifestos (or "inspirational works," such as those of Elie Metchnikoff, Robert Ettinger or Ray Kurzweil), literary fictional treatments and futuristic works (such as those of Bernard Shaw, Collin Wilson and James Halperin), scientific literature (original research and reviews from journals like *Rejuvenation Research*; *Mechanisms of Aging and Development*; and *The Gerontologist*), sociological and ethical literature (by philosophers like Robert Veatch, John Harris, James Hughes or Igor Vishev), longevity regimen propositions (such as those of Nikolay Amosov, Linus Pauling and Deepak Chopra), popular-scientific accounts (e.g. Albert Rosenfeld, Joel Kurtzman and

Alexander Comfort), data on life-extensionist societies (from the societies' archives and newsletters, such as *The Longevity Meme*, *The Immortalist* and *The Life Extension Magazine*), news media coverage, and archival materials (mainly those available online, e.g. from the US National Institutes of Health, the Russian Academy of Science, or the World Health Organization). For a detailed thematic breakdown of sources please see the References section. For the chapter on the contemporary period, personal communications and interviews will be sought.

In reviewing scientific and popular scientific literature, the primary task will be to trace several generic lines of life-extensionist thought throughout the century: putatively, the skeptical, idealistic, bio-materialistic and technological approaches to the possibility of radical life extension. In each particular period, distinct biomedical advances were associated with greater or lesser hopes for a significant prolongation of life, and their changing forms will be set out in this work. For that purpose, I will examine seminal books by authors openly expressing the desire for extreme longevity and will show their inter-textual relations. Most theoretically relevant to such a history of ideas are works on the history of mentalities (Marc Bloch 1924, Peter Brown 1975, Peter Burke 2005), history of ideology (Karl Mannheim 1936, Georges Canguilhem 1988, Gerald Gruman 1966) and discourse analysis (Julia Kristeva 1966, Mikhail Bakhtin 1981, Michel Foucault).<sup>84</sup>

In investigating the second question of this thesis, namely establishing the ideological and social grounds supportive or discouraging of life-extensionism, I will mainly employ qualitative methods of social history. An attempt will be made to describe how the pursuit of life extension (the degree of hopefulness, practice of life-extension regimens, and involvement in research and advocacy) were related to the protagonists' socio-economic conditions and ethical premises. I will follow historiographers of medicine such as Roy Porter (1997), Gert Brieger (2001) and J.P. Goubert (1987) who call for a synthetic, indeed eclectic, large scope, comparative and categorical analysis of historical texts.<sup>85</sup> According to these authors, such an approach is needed to avoid unsystematic and narrowly specialized data collection. Methods of inferring social relationships from texts are succinctly defined as “describing the negotiations between leaders of medical institutions and those of the state, indicated by the cross references” (Daniel M. Fox 2001), “charitable [sympathetic] interpretation of controversies” as manifested in published texts (Steven Shapin and Simon Schaffer 1985), or studying “all the translations, drifts and diversions as they are made by the writers of the period” (Bruno Latour 1988).<sup>86</sup>

The social hypotheses will be tested on the personal and national levels. On the individual level, biographies and writings of a limited number of prominent life-extension advocates will be studied to determine their social, economic and ideological backgrounds and motivations

(personal wealth and availability of research funds, degree of repression, religious/non-religious identity, and attitudes to war). The historical agents will be approached not as self-sufficient creative geniuses, but rather as parts of complex webs of interaction (the method advocated by Bruno Latour 1988, and others).<sup>87</sup> To further assess the larger national settings, statistical assistance will be sought and some supplementary use of quantitative methods will be made. An attempt will be carried out to correlate between periods of prosperity (absence of war or high economic growth) in major superpowers (the US, the UK, Germany, France and Russia) and the emergence and dissemination of life-extensionist writings and public bodies in these countries.<sup>88</sup> The data I have collected so far seem to indicate that in affluent, less religious and more socialist environments, life-extensionist ideas receive a greater prominence.<sup>89</sup>

### **Expected Significance**

In contrast to the recent surveys on the possibilities of radical life extension mentioned in the Literature section (by Shostak, Olshansky, Kurzweil, Austad, Ben-Bova and Hall), the present thesis will have the following novel components: 1) At the outset, I will attempt to further clarify the notion of “life extensionism.” It will be clarified that the investigation of “life-extensionism” is mainly concerned with the study of hopes associated with science, and with bio-gerontology in particular. When hopes are high, the proponent may be qualified as a “life extensionist.” 2) Besides scientists proper, this thesis will consider thinkers who advocate a direct “mind over body” control for life extension. Writers of literary fiction will also be considered. Such authors are usually excluded from accounts of longevity research. 3) The works mentioned mainly recount *recent* scientific advances and hopes, while earlier developments remain largely forgotten. The present thesis will provide a longer historical perspective. 4) The works mentioned concentrate on the US, being an indisputable leader in modern longevity research. The proposed thesis will offer a broader international perspective, with a focus on Russia, France, the UK and Germany, and some comparison with the developing world. 5) A greater focus will be placed on life-extensionist public groups, their ideology and politics. 6) An original periodization and categorization will be provided, based on social, rather than scientific, timelines (scientific advances will be related to periods of social rest vs. upheaval, idealism vs. materialism, socialism vs. capitalism, libertarianism vs. totalitarianism). 7) The earlier works are mostly popular scientific surveys, enumerating possible biomedical interventions. The proposed thesis will provide an original social perspective, attempting to correlate life-extensionist enterprises with economic prosperity and ideology.

## References and Notes

<sup>1</sup> One of the few attempts at a systematic historical analysis of life extensionist tendencies is Gerald Gruman's *A History of Ideas about the Prolongation of Life. The Evolution of Prolongevity Hypotheses to 1800* (Transactions of the American Philosophical Society, Volume 56 (9), Philadelphia, 1966). It surveys major schools of life-extensionism or "prolongevity" (such as Alchemy, Taoism, Hygienism and Philosophical Enlightenment) and several systems of argument against the possibility and desirability of radical life-extension (termed "apologism"). However, the book's analysis ends at 1800.

<sup>2</sup> The emergence of life-extensionist ideas may well be the result of a complex "push and pull" mechanism, arising, on the one hand, from a desire to escape adversity, and on the other, from a profound optimism and enjoyment of life.

<sup>3</sup> It is important to stipulate that life-extensionist authors can be distinguished by their openly expressed desire for a significantly extended healthy life-span (rather than life-expectancy). Among the authors that I will discuss, the most "moderate" aim at reaching the 150 year mark (e.g. Metchnikoff, Bogomolets, Pauling), the more "radical" hope to abolish death altogether. This attitude contrasts with that of many scholars who set an insurmountable and rather low limit to the life-span and only hope to reach it in good health (see for example Morris Fishbein, *The Medical Follies*, Boni and Liveright, NY, 1925, that set a limit at 70, or James F. Fries and Lawrence M. Crapo *Vitality and Aging*, W.H. Freeman and Company, NY, 1981, that set it at ~80). Figuratively speaking, while "healthists" toast "To 120", for life-extensionists it's "From 120 onward and upward". In each historical period, certain biomedical advances were associated with greater or lesser hopes for a significant life extension. Their changing forms will be shown in this work.

<sup>4</sup> Mike Jay and Michael Neve (Eds.), *1900: A Fin-de-siècle Reader*, Penguin Books, London, 1999.

<sup>5</sup> A characteristic literary example glorifying the sacrifice of individual life on the altar of War and Revolution is Nikolay Ostrovsky's *How the Steel was Tempered* (Khudozhestvennaya Literatura, Moscow, 1986 [1932]).

<sup>6</sup> A literary example of the war-defying behavior is Ernest Hemingway's *A Farewell to Arms*, Scribner, New York, 1929.

<sup>7</sup> The pacifist ideology was most famously espoused by such great thinkers as Bertrand Russell and Albert Einstein. For a partial list of life extensionist writers who expressed a similar pacifist stance see note 9.

<sup>8</sup> These assessments are based on William G. Bailey's bibliography *Human Longevity from Antiquity to the Modern Lab* (Greenwood Press, Westport CN, 1987), including over 1400 entries. In the dissertation, the voluminous Nathan Shock's compendia *Classified Bibliography of Gerontology and Geriatrics* (Stanford University Press, Stanford CA, 1951, 1957, 1963), including tens of thousands of entries, may need to be used and statistical assistance sought to assess the rises and falls in the number of publications in certain periods and countries.

<sup>9</sup> A large number of progressive life-extensionist authors expressed a strong pacifist stance, such as the British playwright Bernard Shaw, The Russian/French/Jewish biologist Elie Metchnikoff, the Russian/French/Jewish physician Serge Voronoff and the Austrian/Jewish physiologist Eugene Steinach, who opposed the war completely. The position of Alexis Carrel was peculiar. This French Nobel Laureate in medicine and a prominent proponent of eugenics, worked during the war as a military surgeon developing pioneering techniques for wound healing, attempting to prolong life even amidst slaughter.

<sup>10</sup> Bernard Shaw, *Man and Superman. A Comedy and a Philosophy*, Penguin Books, 1994 (1903).

<sup>11</sup> Bernard Shaw, *Back to Methuselah*, In *Bernard Shaw Selected Plays* (Dodd, Mead and Company, Vail-Balrow Press Inc., New York, 1949, first published in 1921, first performed in 1922).

<sup>12</sup> Elie Metchnikoff, *Etudes On the Nature of Man* (Russian), The USSR Academy of Sciences Press, Moscow, 1961 (1915). The first edition was published in French in 1903, but it is also available in English (Putnam's Sons, NY, 1910) and in Russian (Metchnikoff's own translation, used here).

<sup>13</sup> Charles Davenport's *Eugenics: The Science of Human Improvement by Better Breeding*, Holt, NY, 1912; Irving Fisher, *National Vitality: Its Wastes and Conservation*, US Government Printing Office, Washington, 1910.

<sup>14</sup> Shaw's *Back to Methuselah* (1921), including the play and the prefacing manifesto on the sociology of science, was pioneering in that it presented life-extension as a positive phylogenetic quest of humanity. This representation sharply contrasted with earlier Fin-de-Siècle and contemporary fictional treatments of extreme longevity, which presented its attainment in a strongly negative light: In H.G. Wells's *The Time Machine* (1895), the ageless Eloi are inferior to present day humans, while in his *Men Like Gods* (1923), the longevous Utopians are disturbingly superior. In Bram Stoker's *Dracula* (1897), the immortal vampire is downright monstrous. In Oscar Wilde's *The Picture of Dorian Grey* (1890), the physically rejuvenated Dorian is morally corrupt, while in Karel Capek's *The Makropoulos Secret* (1922) the long-lived Helen is plagued with eternal ennui. Howard Lovecraft's fiction too is largely dystopian: *The Call of Cthulhu* (1928) features an immortal monster and its minions, while his *Herbert West – Reanimator* (1922), continues the *Frankenstein* tradition (Mary Shelley 1818), featuring creation of monsters in pursuit of immortality. Notably, there appears a surge of interest in the subject in the aftermath of WWI (1921-1923).

<sup>15</sup> On Shaw's socialist ethics, pacifism and health promotion see John Steward Collis "Religion and Philosophy," Brigid Brophy "The Way of No Flesh," and Robert Skidelsky "The Fabian Ethics," In *The Genius of Shaw. A symposium*, Michael Holroyd (Ed), Hodder and Stoughton, London, 1979.

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<sup>16</sup> Similar ideas were expressed, for example, by Vladimir Bechterev (1919), Alexander Gurvich (1923), Alexander Lubishev (1920), Ferdinando Cazzamalli (1923) and Hans Bender (1929). A comprehensive account of “energetic healing” schools can be found in Andrey Levshinov, *Russian Health-Improvement Systems* (in Russian), Olma Press, Moscow, 2002, and his *Health Improvement Systems of the East and West* (Russian), Olma Press, Moscow, 2002.

<sup>17</sup> Neo-Lamarckist ideas became widely popular in Soviet biology until the 1950s, upheld by Timiryazev (1843-1920), Michurin (1855-1935), and most notoriously Lysenko (1898-1976) and Olga Lepeshinsky (1871-1963). A good historical account of Soviet biology of that time is given in David Joravsky, *The Lysenko Affair*, Harvard University Press, Cambridge MA, 1970. Neo-Lamarckism resurfaced in the 1960s with the emergence of the “non-neuronal memory transfer” theory (James McConnell “Memory Transfer through Cannibalism in Planaria,” *J. Neuropsychiatr.* 3:42-8,1962).

<sup>18</sup> The first antibiotic, penicillin, was officially discovered in 1928 by Alexander Fleming in the UK. Shortly before, antibacterial phage therapy (also termed “antibiotics”) was pioneered by Felix d’Herelle in 1922. These almost synchronous discoveries may seem serendipitous, yet Metchnikoff’s somewhat earlier study attests to the massive effort on the part of the contemporary scientific community searching for anti-microbial agents.

<sup>19</sup> Homeostasis was then perceived in terms of substance and energy expenditure and replenishment, as in Walter Cannon, *The Wisdom of the Body*, Norton, NY, 1932; Ivan Pavlov, *Conditioned Reflexes: An Investigation of the Physiological Activity of the Cerebral Cortex*, Translated by G.V.Anrep, Oxford University Press, London, 1927; Hans Selye, *A Syndrome Produced by Diverse Nocuous Agents*, Nature, 1936, 138, 32; Sigmund Freud, *Beyond the Pleasure Principle*, Translated by James Strachey, Liveright, New York, 1976 (1920). Accordingly, death was seen as due to bio-economic imbalance or inadequate supply of nutrients/energy – conditions that could be rectified. The implications of lowering body energy expenditure for achieving longevity (reducing “wear and tear” or “burn out”), have been brought to the forefront of life-extensionist discourse in a later period, and will be elaborated on in the following chapters.

<sup>20</sup> The humoral theory of aging had been gathering momentum, giving birth to anti-aging hormone therapies with a special emphasis on sex hormones and glands: In the hopes to achieve rejuvenation, Eugene Steinach performed vasoligations in 1912 (Austria), and Serge Voronoff conducted first sex gland transplantations in 1920 (France). Frederick G. Banting and Charles H. Best isolated and applied insulin in 1922 (UK) and Paul Niehans pioneered thyroid hormone replacement and cell therapy in 1931 (Switzerland) -- Norman Haire and Eugene Steinach, *Rejuvenation, the Work of Steinach, Voronoff, and Others*, G. Allen & Unwin, London, 1924; Eugene Steinach and John Loebel, *Sex and Life; Forty Years of Biological and Medical Experiments*, Faber, London, 1940; Serge Voronoff, *The Conquest of Life*, Brentano’s Ltd, London, 1928; Paul Niehans, *From the Cell to Therapy*, Verlag Hans Huber, Berne and Stuttgart, 1964. For an historical exposure of this trend see the more sympathetic Joel Kurtzman and Philip Gordon, *No More Dying: The Conquest of Aging and the Extension of Human Life*, J.P. Tarcher, Inc, Los Angeles, 1976; and the less sympathetic David Hamilton, *The Monkey Gland Affair*, Chatto and Windus, London, 1986. A superb contemporary literary treatment of these rejuvenation attempts is Michael Bulgakov’s *The Heart of a Dog*, Literatura Artistike, Kishinev, 1989 (1925).

<sup>21</sup> At that time, the popular interest in “biological replacements” was unprecedented though not always sympathetic. The opposition was partly due to the fact that these replacement therapies were extremely costly and restricted to the financial and political elite of the richest European Countries. This, for example, can be seen from Niehans’s, Voronoff’s or Steinach’s affluent clientele (note 20). It was feared, that hormone replacement therapies would never be widely shared. This prediction proved to be wrong in later periods with the advent of synthetic hormones (Robert Wilson, *Feminine Forever*, 1966, M. Evans & Co., NY).

<sup>22</sup> I. E. Amlinsky, “The Creative Path of I.I. Mechnikov and Etudes on the Nature of Man,” in Metchnikoff, *Etudes On the Nature of Man* (see note 12). Metchnikoff’s strongly advocates intellectual investment in science, yet never mentions funding. However the fact that he himself left Russia and went to work for the Pasteur Institute in Paris (in 1886) may suggest that funding and prestige did matter. Beside the economic reasons (denial of funding), his emigration was also brought about by anti-liberal repressions at Odessa University.

<sup>23</sup> Ivor Brown, *Shaw in His Time*, Nelson, London, 1967; Michael Holroyd, *Bernard Shaw. Vol. 3. 1918-1950. The Lure of Fantasy*, Penguin, Harmondsworth, 1988.

Michael Holroyd, in *Bernard Shaw* (New York: Random House, 1988-1992) distinguishes three periods in Shaw’s life: 1856-1898: *The Search for Love*; 1898-1918: *The Pursuit of Power*; and 1918-1950: *The Lure of Fantasy*. The writing of *Back to Methuselah* corresponded to the period of “The lure of Fantasy” when Shaw’s economic and social status was assured. Coincidentally, this was the period of Britain’s recovery from WWI and the peak of British imperial expansion (Thomas Lloyd, *The British Empire, 1558-1995*, Oxford University Press, Oxford, 1996). The reception of the play by the British/American audience of that time was moderately positive. The play was produced several times from 1922-1930, then ceased production and revived only in 1947 in London and 1958 in New York (according to Internet Broadway database).

The importance of such data is that it throws additional light on a topical question in the sociology of science, namely whether well-established/older or less-established/younger scholars are more likely to adopt and promulgate “risky” ideas (David Rier, “Lifecycle and Publication Decisions,” *Social Studies of Science*, 33, 2003). According to Planck’s principle, less established/younger scholars are more likely to be risk-takers. For Metchnikoff and Shaw, the opposite seems to be the case: their far-reaching life-extensionism came at a very well-established stage of life. In

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the history under consideration, the connection between age and enthusiasm is quite unclear: For example, the followers of Metchnikoff (such as Alexander Bogomolets and Sergey Metalnikov), were at that time young and poorly established, though highly self-reliant. The elucidation of this question will require further biographical research. The receptiveness (like-mindedness) of the contemporary community may have been a crucial factor in the dissemination of life-extensionist ideas.

<sup>24</sup> Metchnikoff's acidified dairy diet became adopted world-wide. However, its reception by the medical establishment was not always favorable. It was listed among other rejuvenation fads that abounded in the beginning of the century. See Morris Fishbein, 1927, *The new medical follies; an encyclopedia of cultism and quackery in these United States, with essays on the cult of beauty, the craze for reduction, rejuvenation, eclecticism, bread and dietary fads, physical therapy, and a forecast as to the physician of the future* (Boni and Liveright, NY). Steward Holbrook in *The Golden Age of Quackery* (Macmillan Co., NY, 1959) demarcates the period 1850-1930 as an age of rampant rejuvenative folk medicine in the US, with a peak in 1906. "Cures" ranged from the "Indian Lukutate", a laxative alcohol solution of buckthorn and cascara sagrada, to opotherapy or glandular extracts, to magnetic garments. To stall the dissemination of unproved remedies, in 1906, the first national food and drug regulation laws were passed in the US, enhanced in 1938.

The influence of Metchnikoff's ideas in intellectual circles was very considerable. Metchnikoff was a foremost authority on anti-aging of that period. The Czech novelist Karel Capek, in an introduction to *The Makropoulos Secret* (1922), admits that it was Metchnikoff's work that made him ponder the future ethical implications of life-extension. Metchnikoff's work is also referenced in *Back to Methuselah*, though in a slightly ironic context, valorizing the idealistic over materialistic methodology. Of interest is the criticism of Metchnikoff's work by Leo Tolstoy. Metchnikoff reports on his meeting with Tolstoy in 1908, where Tolstoy, then highly skeptical of the ideas of progress, expressed understanding of Metchnikoff's aspirations but questioned their feasibility (Elie Metchnikoff, "The Meeting With Tolstoy" In *Ilia Illich Metchnikoff's Collected Works*, The USSR Academy of Medical Sciences State Press, Moscow, 1955, Vol. 16). This meeting took place in 1908, when Metchnikoff, after receiving the Nobel Prize, was welcomed back to Russia for an extensive tour of lectures. The reception by the wide Russian Intelligentsia was ecstatic (Olga Metchnikoff, *The Life of I.I. Metchnikoff*, Moscow, Literatura, 1926).

The reception of Shaw's *Back to Methuselah* is briefly annotated above (note 23). The general awareness and practice of "spiritualist" techniques for life extension was wide, as evidenced by the emergence of Ferdinando Cazzamalli's circle in Italy (1910), or the "Tym club for Universal Life" in the US (1905).

Thus, at the beginning of the century, there is clear evidence of the public acceptance of rudimentary anti-aging medicine. However, there is little evidence of massive affiliated membership groups. These appeared much later (from the 1960s on, see Chapters 3,4).

<sup>25</sup> Besides the above-mentioned advances in Europe, of note were several land-marks in the development of life-extensionism in the more affluent US in the 1910s-1920s: the establishment of the geriatric movement by Ignatz Nascher (*Geriatrics: the Diseases of Old Age and their Treatment*, Blakiston's Son and Co., Philadelphia, 1916); the ground-breaking bio-gerontological studies by Raymond Pearl (Raymond Pearl and Sylvia Parker, "Experimental Studies on the Duration of Life," I-V, *American Naturalist* LV – LVIII, 1921-1924); and the immortalism of the Nobelist Alexis Carrel (J.A. Witkowski, "Dr. Carrel's Immortal Cells," *Medical History*, 24, 129-142, 1980). Based on the model of John Harvey Kellogg's Sanatorium at Battle Creek MI ("Dr. John Harvey Kellogg," Battle Creek Historical Society Publications), other rejuvenation centers opened for the rich across the US, with a special concentration in the state of California (Henry Splitter, "Health in Southern California," *Journal of the West*, 8, 526-558, 1969). There is an indication of the emergence of popular life-extensionist groups in the US at the beginning of the century. Such, for example was the Tym club (*The Tym Club, Otherwise known as two Hundred Year Club, founded On Plan of Universal Life as Evolved in the Two Hundred Year Method*, Ralston Company, Washington, 1905).

<sup>26</sup> The Russian archiving projects "Voennaya Literatura" ("Military literature" [www.militera.lib.ru](http://www.militera.lib.ru)) or "Historical Sources" (<http://www.hrono.ru>) contain hundreds of such heroic calls. On the German side, the leitmotif of individual sacrifice is ubiquitous: from propaganda posters to Goebbels speeches to biology textbooks (German Propaganda Archive, Calvin College [www.calvin.edu](http://www.calvin.edu)). Notably, not only was there the demand to literally lay down one's life, but also to give up rest and leisure in favor of production and war effort (in Russia and Germany as well as in the US).

<sup>27</sup> A comprehensive history of racial hygiene and Nazi medicine is given in Paul Weindling's *Health, Race and German Politics between National Unification and Nazism. 1870-1945* (Cambridge University Press, Cambridge, 1993). It includes accounts of the most monstrous human experiments conducted on the "inferiors" to test survival techniques to be used by the "superiors" (as revealed in the Nuremberg medical trials).

<sup>28</sup> Robert N. Proctor, *The Nazi War on Cancer*, Princeton University Press, Princeton, 1999.

<sup>29</sup> J. Steudel, "Zur Geschichte der Lehre von den Greisenkrankheiten" (On the history of the diseases of old age), *Sudhoffs Arch. Gesch. Med.*, 35, 1-27, 1942; G. Venzmer, *Lang leben und jung bleiben!* (Live long and stay young), Franckh, Stuttgart, 1941.

<sup>30</sup> Ludwig Roemheld, *Wie verlängere ich mein Leben?* Ferdinand Enke Verlag, Stuttgart, 1941. This last edition appeared at the height of Nazi expansion and is accompanied by an introduction, basically saying that the German people have to be fit and vigorous to demolish/outlive their enemies.

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By the 1940s, Life-extensionism has had a long association with the Western eugenics movement. Several prominent life-extensionists promoted positive eugenics, encouraging differential reproduction for longevity (to be necessarily distinguished from “negative eugenics” involving euthanasia and sterilization). Among the leading life-extensionist thinkers who espoused eugenics were Bernard Shaw, the American demographer Irving Fisher, the American biologist Raymond Pearl, and the French/American physician and biologist Alexis Carrel. Carrel became a prominent figure in French scientific establishment under Vichy regime. A classical biography of Alexis Carrel is William Edwards and Peter Edwards, *Alexis Carrel: Visionary Surgeon*, (Charles C. Thomas, Springfield IL, 1974). For these thinkers, eugenics represented a most practical method for increasing the longevity of future generations. As exemplified in the present materials, in the 1950s there appears a transition in the discourse of possible methods for life prolongation. In the first half of the century, the discussions largely centered on eugenics, neo-Lamarckism, maintenance of chemical homeostasis, and sex gland stimulation. From the 1950s on, many sources start focusing on biotechnology, genetic mechanisms, dietary supplementation, bio-replacements, bionics and cryonics, as will be elaborated in the next chapters.

<sup>31</sup> A forceful account of these persecutions is given in Jacob Rappoport’s, *On the Verge of Two Epochs, The Doctors’s Case 1953*, Kniga, Moscow, 1988. As the book exemplifies, the attitude of Stalin’s regime to science was quite complex and selective. Certain lines of research were favored (especially in physics and engineering), while others were forcefully suppressed. The most famous cases of repression were “the sabotage trials” of Donbass’ engineers (1928), the arrest and death of the geneticist Nikolay Vavilov (1942) and the massive practice of imprisonment of scientists and engineers in the so called “sharaga’s” or “scientific labor camps” (especially during 1941-1945). The last years of Stalin’s rule (1948-1953) were notorious for the agitation against cybernetics in the press, the “Doctors case” and the thriving of Lysenkoism (See Yuri Spezovski, *The History of Soviet Repressions*, Moscow 1997). Longevity research, as I would show, was generally favored by the authorities.

<sup>32</sup> Some of the research could appear quite unorthodox even today, such as the use of placental tissues for wound healing by Feofilov, or animal head transplantations by Demichov.

<sup>33</sup> Ivan Sarkizov-Serazini, *The Way to Health, Strength and Long Life*, Fizkultura i Sport, 1987 (reprints of Prof. Serazini’s writings from the 1930s-1940s).

<sup>34</sup> This connection is evident in Sarkizov-Serazini’s writings on life-extensionist hygiene which, according to him, could truly flourish only under socialism. Cases of fabulous longevity were celebrated, especially those from the Caucasus area, Stalin’s birthplace (Evgeny Trenkel, *Udlinenie Zhizni I Dejatelnaja Starost* [The Prolongation of Life and Active Old Age], Moscow, Nauka, 1949). Generally, hard-core idealistic life-extensionism, or a direct influence of the mind over the body, without the mediation of labor, science or art, would be unacceptable by Soviet materialism. However, pronounced behaviorist, neo-Lamarckist, and vitalist tendencies can be observed in the Soviet life-extension research of the period (Lepeshinsky 1949). Another important case to consider is that of Porfiry Ivanov, whose teachings advocated a rigorous ascetic regimen, the power of the spirit and the strife toward unlimited longevity. Even though arrested, hospitalized and evicted many times (in the period from 1936 to 1953), he gradually acquired massive following (Levshinov, *Russian Health Improvement Systems*, Olma Press, Moscow, 2002).

<sup>35</sup> Bogomolets’s work became an essential link in the succession of life-extensionist scientists. His methods (the application of anti-reticular cytotoxic serum, ACS) were largely based on Metchikoff’s work (a self-acknowledge influence). In the 1940s, the ideas of Bogomolets became widely popular in the West (especially in the US). His book, *The Prolongation of Life* (translated by Peter Karpovich and Sonia Bleeker, Essential Books, Duel, Sloan and Pearce, NY, 1946) was a best-seller. Bogomolets’s work inspired Denham Harman (father of the free radical theory of aging) to embark on the field of aging research (self-admitted in an interview to *Life Extension Magazine*, January 1998). Denham Harman’s work will be examined in the following chapter.

<sup>36</sup> In 1938, Bogomolets’s *The Prolongation of Life* was first published in Russian and the First National Conference on the Problems of Senescence was convened in Kiev under his leadership. These events lay the grounds for the institutionalization of biogerontological research in the USSR, with an explicit aim of radical life-extension (Konferenzia po Problemam Geneza Starosti Organizma - Proceedings of the Conference on Senility, Kiev, 1938).

According to Vadim Rogovin, *Stalinski NeoNEP (Stalin’s Revival of the New Economic Policy)*, Iskra-Research, Moscow, 1994, Ch.1 “Economic Liberalization in the USSR”, Ch.2. “World Capitalism in the 1930s” -- the year 1938 was characterized by massive purges, yet also marked a peak in Soviet pre-war industrialization and prosperity.

<sup>37</sup> During the war, the proclaimed purpose of Bogomolets’s treatments (use of the “anti-reticular cytotoxic serum”) shifted from “life-extension” to “wound healing” to expedite soldiers return to the front (Bogomolets, *The Influence of ACS on Wound Healing*, The Ukrainian Academy of Science Press, Kiev, 1944; N.N. Sirotinin, A.A. Bogomolets, Vyshaya Shkola, Moscow, 1967). Anecdotally, when Bogomolets died in 1946 at the age of 65, Stalin felt grossly deceived. Chrushev too felt profound respect for Bogomolets’s work (Nikita Chrushev, *Vremya, Lyudi, Vlast (Time, People, Power - Memoirs)*, Moskovskie Novosti, Moscow, 1999 [1969]). After that, Bogomolets’s name disappeared from the headlines and there have been no recent attempts to research his activities.

<sup>38</sup> Hoffman B, “Health Care Reform and Social Movements in the United States.” *Am J Public Health*, 93(1), 75-85, 2003; Stewart J, “Socialist proposals for health reform in inter-war Britain: the case of Somerville Hastings,” *Med Hist*, 39(3), 338-357, 1995; Robert Whaples, “Hours of Work in U.S. History,” *EH.Net Encyclopedia*, edited by Robert Whaples, August 15, 2001.

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<sup>39</sup> Milton Wainwright, *Miracle Cure: The Study of Penicillin and the Golden Age of Antibiotics* (Blackwell, Cambridge MA, 1990); A.G. Natradze, "Medizinskaya Promyshlennost" (Medical Industry), In *The Encyclopedia of Medicine*, vol. 2, Sovetskaya Encyclopeida, Moscow, 1989.

<sup>40</sup> In the dissertation, the amount of relevant writings in specific periods will be more rigorously estimated based on classified William Bailey's and Nathan Shock's bibliographies (note 8).

<sup>41</sup> James Hilton's *Lost Horizon* (1933) romanticizes life-extension, however western technology is largely irrelevant to this quest. Famous dystopias were Aldous Huxley's *Brave New World* (1932) and *After Many a Summer Dies the Swan* (1939). In *Brave New World*, biotechnology is used by the society for pleasure (not for the prolongation of life or intellectual growth - people commit suicide at the age of 60). In *After Many a Summer*, the pursuit of longevity is criticized: it comes at the expense of morality, while the immortal is a mindless monkey (in the vein similar to Swift's *Gulliver's Travels* 1726). Notably, there are very few fictional treatments in this period, in contrast to the explosion of interest in the 1920s and 1960s (see notes 14 and 60).

<sup>42</sup> Eugene Steinach and John Loebel, *Sex and Life; Forty Years of Biological and Medical Experiments*, Faber, London, 1940.

<sup>43</sup> Hamilton, L. A. and H. S. Olcott, *Antioxidants and The Autoxidation of Fats*, New York, 1937; Pearson, R. B., *The Prolongation of Life Through Diet*, Col. Health Inc, Denver, 1941.

<sup>44</sup> Brierley, J., *An Exploratory Investigation of the Selective Value of Certain Genes and Their Combinations in Drosophila*, Lancaster Press Inc, Lancaster, 1938; Ansari M.A., *Regeneration in Man*, Taraporevala Sons, Bombay, 1935; De la Torre T., *Physical Regeneration and Longevity*, San Francisco CA, 1938.

<sup>45</sup> Dingle, E. J., *Breathing Your Way to Youth: Harmony and Happiness - Rejuvenation and the Art of Living: Complete Course in Scientific and Spiritual Breathings*, Mental Physics School of Wisdom, NY, 1931; Ballinger, R. J., *Brain Waves: Healing and Rejuvenation by Magnetic Currents of Brain Waves*, Meador, Boston, 1946.

<sup>46</sup> Raymond Pearl, *The Rate of Living, Being an Account of Some Experimental Studies in the Biology of Life Duration*, A.A. Knopf, NY, 1928; Clive McCay, "The Effect of Retarded Growth Upon the Length of Life Span and upon the Ultimate Body Size," *Journal of Nutrition*, 10, 63-79, 1935.

A correspondence appears between the terms and dates of these theories and the contemporary ups and downs in the rates of socio-economic growth. More investigation will be needed to examine if there is indeed such a relation, including funding allocated for by government agencies, work done in the universities, circulation of popular publications, and Pearl's and McCay's biographies.

<sup>47</sup> In an authoritative (yet, unfortunately, only 5 pages long) chapter on the "Modern Geriatric Movement" the famous historian of medicine Mirko Grmek notices the phase of "rapid expansion and international cooperation ... starting after the Second World War" -- Mirko Grmek, *On Aging and Old Age, Basic Problems and Historic Aspects of Gerontology and Geriatrics, Monographiae Biologicae*, 5, 2, Den Haag, 1958. Ch. "Modern Geriatric Movement." His assessments are given with reference to several "gerontological superpowers": Austria, Germany, France (which he notes as the birth-place of the movement) and the US, the UK, the USSR, Yugoslavia and Rumania, which picked up the torch. Another attempt at periodization is given in V.N. Anisimov and M.V. Soloviev, *Evoluzia Concepcy v Gerontologii (The Evolution of Concepts in Gerontology)*, Asclepius, Saint Petersburg, 1999 (reprinted in the Russian Biomedical Journal [www.Medline.ru](http://www.Medline.ru), vol.3). According to these Russian gerontologists, the immediate postwar period marks the transition from "quantitative analytic" to "cybernetic systemic" models in gerontology. In both cases, the 1950s are recognized as a time of rapid expansion of anti-aging/life-extensionist efforts worldwide (even though in the latter work a greater weight is attributed to Russian scientists/cyberneticists and in the former to Yugoslavia, Grmek's birthplace). However, no attempt is made in these works to relate the research expansion to social backgrounds.

<sup>48</sup> The works of at least two prominent life-extensionists make this motivation explicit, those of the American biochemist Linus Pauling (*How To Live Longer And Feel Better*, 1986) and of the British biologist Alexander Comfort (*Ageing: The Biology of Senescence*, Routledge & Kegan Paul, London, 1964). See notes 52, 61.

<sup>49</sup> Perhaps the most famous show-cases of scientific achievement were the discovery of DNA (Watson& Crick, 1953), cybernetics and the first computers (Norbert Wiener *Cybernetics* 1948, ENIAC-1946) and space exploration (Sputnik-1957).

<sup>50</sup> Milton Wainwright, *Miracle Cure: The Study of Penicillin and the Golden Age of Antibiotics* (Blackwell, Cambridge MA, 1990). A.G. Natradze, "Medizinskaya Promyshlennost" (Medical Industry), In *The Encyclopedia of Medicine*, vol. 2, Sovetskaya Encyclopeida, Moscow, 1989.

<sup>51</sup> By the early 1980s, natural and synthetic hormones (thymosin, melatonin, testosterone, progesterone/estrogen, thyroid, DHEA, growth hormone), vitamins (vitamins C and E) and other anti-oxidants (e.g. lipoic acid and N-acetylcysteine) became massively used to combat aging. In the early 80s there appeared several highly influential books advertising these treatments and instigating hundreds of thousands of westerners to embrace "life-extension": Allan L. Goldstein, "Thymosin, Can it Retard Aging by Boosting Immune Capacity?" In *Intervention in the Aging Process*, Edited by W. Regelson and F.M. Sinex, Alan R. Liss, NY, 1983; Durk Pearson and Sandy Shaw, *Life Extension. A Practical Scientific Approach. Adding Years to Your Life and Life to Your Years*, Warner Books, NY, 1982; Saul Kent, *The Life Extension Revolution: The Definitive Guide to Better Health, Longer Life, and Physical Immortality*, NY, 1980; Roy Walford, *Maximum Lifespan*, WW Norton & Co., NY 1983; or Linus Pauling, *How To Live Longer And Feel Better*, W.H. Freeman and Company, NY, 1986. In 1980, Saul Kent founded the Life

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Extension Foundation (LEF) in the US, which has since grown to become the world's largest grass-roots life-extensionist organization (now including over 100,000 members). LEF has been sponsoring basic anti-aging research and publishing the partisan Life Extension Magazine. However, its main distinctive feature is the promotion of dietary supplementation. Throughout the century, the dominant model of the life-extensionist movement was "top down": After publication of elite scientific research, certain suggestions became adopted or propagandized by the public. The wider lower-income populace could implement less costly regimens (such as Metchnikoff's pro-biotic dairy diet, Bogomolets's exercise or Shaw's meditation), while the wealthy could afford more expensive interventions (such as Voronoff's, Niehans's and Steinach's operations). However, there is little evidence of affiliated public life-extensionist organizations until early 80s. The publication of the books by Pearson, Kent and Pauling, and the establishment of LEF mark an important development in the life-extensionist movement. Here emerges a branch which is characterized by massive affiliated membership, a practical approach to health regimens and dietary supplementation, and commercialization. The recent politics and the relation of this popular wing with other bodies concerned with aging – such as the more academic National Institute on Aging, the more cautious Food and Drug Administration, or the more radical Immortalist/Cryonics movement – will be investigated in the following chapter.

<sup>52</sup> The case of Linus Pauling is especially telling. The recipient of two Nobel Prizes (in Chemistry and Peace), Pauling's writings and activities inseparably involved anti-war efforts, optimism, struggle for social justice and prosperity, and life-extensionism. His earlier academic works on anti-aging – such as "Observations on Aging and Death," *Engineering and Science Magazine*, California Institute of Technology, Pasadena CA, May, 1960; "The relation Between Longevity and Obesity in Human Beings," *Proceedings of the National Academy of Science USA*, 44, 619-622, 1958; *Vitamin C and the Common Cold*, Bantam Books, NY, 1971 – culminated in the popular book *How To Live Longer And Feel Better* (W.H. Freeman and Company, NY, 1986). In that book, Pauling advocates vitamin supplementation, extols the absolute life valuation as a common ground for pacifism and life extension, and calls for public support. Although often rejected by the medical establishment, he became a hero figure among proponents of dietary supplementation (as, for example, can be seen from numerous articles in his praise in *The Life Extension Magazine*).

The biography of Denham Harman, the Nobel nominee and the father of the "free radical theory of aging" attests more to the power of an inspired individual to recruit resources and work a change in medical establishment. Leonard Hayflick, the world-renowned gerontologist, admitted that in the early 60s "I would have been unwise to identify myself as a gerontologist doing basic research" (address to the Select Committee on Aging, Washington, Feb, 1978). Denham Harman helped to change the academic attitude. His research on anti-oxidants became classic, e.g. "Aging: a theory based on free radical and radiation chemistry," *Journal of Gerontology*, 1956, 11(3), 298-300; or "A biologic clock: the mitochondria?," *Journal of the American Geriatrics Society*, 1972, 20(4), 145-147. In 1970 he became a founder of the American Aging Association (AGE) which was a society of scientists focused on aging research and advocacy; and in 1985 he founded the International Association of Biomedical Gerontology (IABG).

<sup>53</sup> Hans Selye, *The Stress of Life*, McGraw-Hill, NY, 1956. In 1970, Seyle publishes an article "Stress and Aging," *Journal of the American Geriatrics Society*, 18, 669-680, 1970, where he examines the use of anabolic steroids as an anti-aging treatment. Selye's work continued the line of thought of Ivan Sechenov and Walter Cannon who believed that longevity is to be achieved by balancing biological economy as to increase productivity while minimizing "wear and tear" (*Sechenov I.M. (1829-1905), Biographia. Glavnie Trudy (Biography and Major Works)*, Dean, Moscow, 2004; Walter Cannon, *The Wisdom of the Body*, Norton, NY, 1932).

<sup>54</sup> The regenerative effect of sleep and rest became actively investigated, emphasizing the possible harmful impacts of sleep deprivation or overwork (Lauphlin HP, "Research in sleep deprivation and exhaustion; an invitation to further observation and study," *Int Rec Med Gen Pract Clin*, 166(8), 305-10, 1953; Biancani H, "Preventive measures against overwork," *Bull Acad Natl Med*, 140(19-20), 329-31, 1956; Bennett RL, Knowlton GC, "Overwork," *Arch Phys Med Rehabil*, 38(1), 18-20, 1957). One of the most interesting and logical outcomes of that research was that the hormone melatonin, known to modulate sleep, allegedly could also prolong life. Numerous reports on melatonin have been published and supplements developed since the seminal work of the Nobelist Julius Axelrod and Richard Wurtman in the late 50s - early 60s (Axelrod Axelrod Wurtman RJ, Axelrod J. The Formation, Metabolism, and Physiological Effects of Melatonin in Mammals, *Prog Brain Res*, 1965;10:520-9. Review). On the other hand the importance of exercise was emphasized. Articles on the benefits of exercise notably proliferated in the 70s. An interesting study was conducted by Charles Rose and Michel Cohen ("Relative Importance of Physical Longevity", *Annals of the New York Academy of Sciences*, 301, 671-702, 1977). Blue-collar workers (physical laborers) were found to live shorter than white-collar workers (sedentary). The suggested causes of longevity were the mental activity, ample rest and the opportunity to engage in non-strenuous exercise of the "white-collar" population.

<sup>55</sup> Over the course of his scientific career (starting in the late 50s), Walford published over 340 papers, mainly concerned with calorie restriction for life-extension and the immunological theory of aging. However, one of his most influential works was the popular *Maximum Life Span* (W.W. Norton & Co, NY, 1983). Shortly following its publication, in 1984, Walford founded the Calorie Restriction Society, which exists to the present day, aiming to practically implement calorie restriction regimens. Roy Walford died in 2004, at the age of 79 of amyotrophic lateral sclerosis (Lou Gehrig's disease).

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<sup>56</sup> Robert Ettinger's programmatic *The Prospect of Immortality* was privately published in 1962 and then published commercially in 1964 (Doubleday, NY, 1964). In the same time Evan Cooper expressed very similar ideas in his *Immortality, Scientifically, Physically, Now* (1962) which however hasn't been as widely disseminated as *The Prospect of Immortality*. In 1963, Evan Cooper founded the first cryonics/immortalist organization – The Life Extension Society. In 1965, the future co-founder of the Life Extension Foundation, Saul Kent established (together with Karl Werner and Curtis Henderson) the LES New York branch, which later became the Cryonics Society of New York. In 1967, Ettinger founded the Cryonics Society of Michigan, which later grew to become the Cryonics Institute and the Cryonics Association (since 1976). The CA then changed the name to “The Immortalist Society” (since 1985). Since 1970, *The Immortalist* magazine has been published by this community. In 1972, the cryonics organization Alcor Society for Solid State Hypothermia was founded (by Fred and Linda Chamberlain) which then changed its name to Alcor Life Extension Foundation (since 1977). Alcor, together with the Cryonics Institute, became major providers of cryonic services and research, receiving partial funding from the Life Extension Foundation. Thus, the Cryonics/Immortalist movement was formed: Its proponents have been involved in financing and building cryonics facilities, increasing public awareness of life-extension, and sponsoring cryobiological and anti-aging research. These techniques, that were at that time extremely faulty and available only to the wealthy, have since gradually improved and become more affordable. The cryonics movement is inherently related, but not synonymous to either immortalism or life-extensionism and represents one of the various branches of the wider movement. Data on cryonics is now available from the major cryonics institutions [www.alcor.org](http://www.alcor.org), [www.cryonics.org](http://www.cryonics.org), [www.cryonet.org](http://www.cryonet.org).

<sup>57</sup> Even at the time of Ettinger, these methods proved their ability to significantly extend human life. Hormone replacement therapies became widely used (Robert Wilson, 1966). Bone marrow, kidney, liver, lung, and heart have been successfully transplanted (owing in a large extent to advances in immunology, in subduing tissue rejection). Even brain transplantation has been suggested as a way of personal immortalization (Vladimir Demichov 1962, David Gilboe 1964, Robert White 1965). The possibility of engineering tissues and organs for transplantation has been raised. The strengthening from without was also made possible by artificial organs and tissues. Prosthetics rapidly developed into bionics, producing artificial blood (Clark 1962), limbs (Ysidro 1970), kidney (Kolf 1955), heart and lung (Gibbon 1953, Kolf 1957). Within the “technological” branch of life-extensionism, advocating life enhancement through “man-machine” synergy, a special prominence was attributed to improving physiological conditions by the effects of electromagnetic fields, or a special “biological field.” Various electromagnetic devices have been used to regenerate or activate tissues, stimulate nerve function, increase the blood flow, improve sleep, etc. – with the ultimate aim to “reenergize”, “regenerate” and “reinforce” the body for prolonged existence (Robert Becker 1985, Vladimir Frolkis 1982).

<sup>58</sup> The term “cyborgization” was coined by Clynes and Kline in 1960 (Manfred E. Clynes and Nathan S. Kline, “Cyborgs and space,” *Astronautics*, September 1960).

<sup>59</sup> The development of this idealistic movement in the 1960s-1980s is sympathetically described in Marilyn Ferguson, *The Aquarian Conspiracy. Personal and Social Transformation in Our Time*, (Putnam, NY, 1980).

<sup>60</sup> Wilson's *The Philosopher's Stone* (Crown Publishers, NY, 1971) propagandizes the power of meditation and intellectual activity in fostering individual vitality. In this novel, the life-extension device was initially conceived as an electrode implant, but such a contrivance was then considered unnecessary, as the same effects could be produced directly by the “power of the mind.” It can be thus shown that the “humanistic, mind-over matter” line of life-extensionist thought persists in literary fiction throughout the century: from Shaw to Wilson, and later to Chopra.

The “biomaterialistic” and “technological” thought lines were also represented in science fiction. In Robert Heinlein's *Methuselah's Children* (1958) and *Time Enough for Love* (1973), extreme longevity is achieved by conscious biomedical interventions (eugenics and biotechnology), and the prospects are quite optimistic. Isaac Asimov's *Robot Novels – The Caves of Steel* (1954), *The Naked Sun* (1957), and *The Bicentennial Man* (1976) – explore cybernetic/technological immortality. In Arthur Clarke's *2001: A Space Odyssey* (1968), immortality is achieved either through personality uploading or ascendance to a disembodied (ethereal) state. An opposition between the biotechnological and cybernetic paths to immortality is exemplified in Frank Herbert's *Dune* (1965), where computer technology is banned and humanity evolves solely through biological enhancement.

There seems to be a sizable increase of interest in the 60s. In several works, the noble quest for physical immortality and Herculean feats performed after its attainment, motivated the plot. Such were the schemes of Robert Zelazny's *This Immortal* (1966), Tezuka Osamu's *Phoenix* (a Japanese comics series started in 1966) or *Perry Rhodan* (the world's most prolific German science fiction novel series, created in 1961 by Karl-Herbert Scheer and Clark Darlton). Yet, ethical and psychological problems contingent on radical life-extension continued to haunt fiction writers: Jorge Luis Borges' *The Immortal* (1962) and Natalie Babbitt's *Tuck Everlasting* (1975) reiterate the “eternal boredom” argument. John Wyndham's *Trouble with Lichen* (1960) shows an interplay of greed and magnanimity, secrecy and altruism, surrounding the scientific discovery of an elixir. Yet the ending seems to be optimistic: the remedy will not be used only to make profit for its creators, will not be reserved for financial tycoons, but is promised to all humanity.

<sup>61</sup> Several distinguished biogerontologists became household names: Johan Bjorksten (author of the “cross-linkage” theory of aging), Caleb Finch and Donner Denckla (proponents of the neuro-endocrine theory of aging), Allan Goldstein (the discoverer of “thymosin”, the first widely available anti-aging drug), Denham Harman (author of the

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“free radical theory” of aging), Leonard Hayflick (discoverer of the cell division limit, “the Hayflick limit”), George Sacher and Bernard Strehler (investigators of DNA repair), Richard Cutler (developer of the evolutionary theory of aging), or Roy Walford (proponent of “the immunological theory of aging” and calorie restriction). Numerous coverages appeared in newspapers (based on partial search of *Times Magazine* and *New York Times*, 1960-1980). An excellent popular account on the contemporary advances in life-extension science was given in Albert Rosenfeld, *Prolongevity*, Alfred Knopf, NY, 1976. A somewhat earlier and more authoritative account is given in Alexander Comfort, *Ageing: The Biology of Senescence*, Routledge & Kegan Paul, London, 1964. Alexander Comfort too is a very interesting figure in the history of the life-extensionist movement. This prolific British novelist, poet and biologist fits the proposed profile of a typical life-extensionist thinker: of high socio-economic status, polymath, atheist, liberal (to the point of anarchism) and pacifist.

<sup>62</sup> On the Soviet side, there appeared such propagandistic works as Prof. Alexander Apanasenko’s, *Borba za Prodlenie Zhizni v SSSR* (Efforts made in the USSR to prolong human life), Stavropol, 1956, or Academician Alexander Kuprevich’s “Priglasenie k bessmertiu” (An Invitation to Immortality), *Technika Molodezhi*, Jul 1966. With “Khrushchev’s Thaw” (start of political liberalization), interest in life-extension was on a rise: In 1957 a network of regional scientific gerontological societies was formed. In 1958, the Institute of Gerontology of the USSR Academy of Medical Sciences was established in Kiev, which spawned the USSR AMS Scientific Committee on Gerontology. In 1963, the first National Conference on Gerontology and Geriatrics was held in Kiev. The first president of Kiev Institute of Gerontology was Bogomolets’s pupil, Academician Nikolay Gorev. Later on, a leading role in this institute was played by Academician Vladimir Veniaminovich Frolkis. Frolkis offered the term “vitaut” parallel to English “anti-aging” and until the turn of the century he was a major popularizer and leader of Russian life-extensionism (Vladimir Frolkis, *Aging and Life Prolonging Processes*, Springer-Verlag, NY, 1982; A tribute to Frolkis is given in V.V.Bezrukov and U.K. Duplenko, “Vydayuchiysia Ukrainski Phisiolog I Gerontolog V.V.Frolkis” *Uspechi Gerontologii (Successes of Gerontology)* 2000, vol. 4, Reprinted in *Rossiyski Biomedizinski Zhurnal - The Russian Biomedical Journal. Vol.3, 2002* [www.medline.ru](http://www.medline.ru)). Another fertile ground for life-extensionism in the Communist bloc was Romania. There, in 1951 the world’s first Institute of Geriatrics was formed, directly aimed at finding rejuvenation substances (such as “Gerovital” or low concentration novocaine solutions). The institute was lead by Profs. Constantin Ion Parhon and Ana Aslan. “Gerovital” became widely advertised in the West (Leake, C.D. “Russian and Iron Curtain Proposals for Geriatric Therapy”, *Geriatrics* 14(10):670-673 (1959). Reprinted in Geraldine Emerson (Ed.). *Benchmark Papers in Human Phisology. Vol. 11. Aging*. Dowden, Hutchinson and Ross, Stroudsburg PA, 1977).

In the United States there were parallel developments. The American Geriatrics Society and the Gerontological Society of America were formed earlier: in 1942 and 1945, respectively (notably, before and immediately after US participation in WWII in Europe). In mid-50s there was again a surge of interest: The US Surgeon General decreed the establishment of 5 Centers of Geriatric research, including Duke University Center for the Study of Aging and Human Development in Durham, North Carolina, and the Gerontology Research Center in Baltimore, Maryland, under the leadership of Prof. Nathan Shock. Significant advances in promoting life-extensionist ideas were made during Nixon’s administration. After a serious political advocacy campaign lead by Denham Harman, Robert Butler and other elite gerontologists, in 1974, The US National Institute on Aging was established, with an emphasis on basic biological research (Public Law 93-296, 93<sup>rd</sup> Congress, 2<sup>nd</sup> Session, 1974. “Research on Aging Act of 1974” In *United States Code Congressional And Administrative News, 93<sup>rd</sup> Congress-Second Session, 1974*). Notably, the same administration also declared “war on cancer,” ended the Vietnam war, achieved normalization with the USSR and China, expanded space exploration, and enacted social and economic reforms (See *US History*, Wiki Books, 2005, or Thomas Greer and Gavin Lewis, *A Brief History of the Western World*, Sixth Edition, Harcourt Brace Jovanovich, Fort Worth, 1992). The NIA founding director was Dr. Robert Butler, who has remained at the forefront of research and public advocacy, having founded the American Association for Aging Research (1979), The Alliance for Aging Research (1986) and The International Longevity Center (1990).

In searching for fertile grounds for life-extensionism, it will also be important to consider relevant instances of life-extensionists’ emigration to more receptive and affluent countries, such as that of the gerontologist Zhores Medvedev from the USSR to the UK in 1973 due to Brezhnev’s anti-dissident repressions, or the assimilation in the US of the Iranian transhumanist philosopher Fereydu M Esfandiari in times of unrest in Iran in the early 50s.

<sup>63</sup> Anthony Warnes, “The Aging of Populations,” In *Human Aging and Later Life. Multidisciplinary Perspectives*, Anthony Warnes (Ed.), Edward Arnold, London, 1989; Gregory JW, Piche V, “Inequality and mortality: demographic hypotheses regarding advanced and peripheral capitalism,” *Int J Health Serv*, 13(1), 89-106, 1983; Grosse RN, Perry BH, “Correlates of life expectancy in less developed countries,” *Health Policy Educ*, 2(3-4), 275-304, 1982.

<sup>64</sup> In the last years, several books have been published on the prospects of radical life extension, as part of the millennial expectations. The overlap of materials discussed in these works is very significant and their arguments can be easily schematized: Such works recount recent scientific developments and provide arguments why life extension is desirable and principally possible. However the emphasis is on *recent* advances, while the earlier history and social backgrounds of present scientific developments are largely obscured and require careful detection. Among such books are: Michael West, *The Immortal Cell, One Scientist’s Quest to solve the Mystery of Human Aging*, Doubleday, NY, 2003; Stanley Shostak, *Becoming Immortal, Combining Cloning and Stem-Cell therapy*, State

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University of New York Press, NY, 2002; Jay Olshansky and Bruce Carnes, *The Quest for Immortality, Science At the Frontiers of Aging*, WW Norton and Co., NY, 2001; Ray Kurzweil and Terry Grossman, *Fantastic Voyage. Live Long Enough to Live Forever*, Plume, NY, 2005; Stephen Hall, *Merchants of Immortality, Chasing the Dream of Human Life Extension*, Houghton Mifflin, Boston, 2003; Bruce Klein (Ed.), *The Scientific Conquest of Death*, LibrosEnRed, Buenos Aires, 2004.

<sup>65</sup> Carol Greider, "Telomeres, telomerase and senescence," *Bioessays*, 12(8), 363-9, 1990, Review; Michael Rose, "Pharmacology, genomics, and the evolutionary biology of ageing," *Free Radic Res*, 36(12):1293-7, 2002, Review; Leonard Guarente, "Sir2 links chromatin silencing, metabolism, and aging," *Genes Dev*, 14(9), 1021-6, 2000, Review; Cynthia Kenyon et al., "A *C. elegans* mutant that lives twice as long as wild type," *Nature*, 366(6454), 461-4, 1993; Ian Wilmut, "The moral imperative for human cloning," *New Sci*, 181(2435), 16-7, 2004. These contemporary leaders of aging research do not assume an unalterable cutoff of life and health and have openly expressed the desire to achieve biological immortality.

<sup>66</sup> SENS suggests testing specific interventions against "The Seven Deadly Things" causing senescence damage: cell loss or atrophy, nuclear mutations and epimutations, mutant mitochondria, cellular senescence, extracellular cross-links, extracellular junk, and intracellular junk (Aubrey de Grey, "Challenging but essential targets for genuine anti-ageing drugs," *Expert Opinion on Therapeutic Targets*, 37(1), 1-5, 2003). De Grey vigorously popularizes his ideas on internet fora (such as Immortality Institute or LiveScience) and in public media (recent interviews include CBS 60 Minutes, BBC, New York Times, Fortune Magazine and Popular Science). Largely thanks to these popularization efforts, Aubrey de Grey has become one of the most influential leaders of the immortalist movement. He is the editor in chief of the scientific journal *Rejuvenation Research* (previously *Journal of Anti-Aging Medicine*, with Michael Fossel as the editor in chief). Besides leading the SENS project at the Department of Genetics, Cambridge, de Grey has recently founded The Methuselah Prize Foundation, dedicated to finding radical life-extending interventions in mice. Promoting SENS and the Methuselah Prize has become a popular life-extensionist enterprise. A serious controversy erupted after the MIT *Technology Review* ridiculed de Grey's ideas (Sherwin Nuland, "Do You Want to Live Forever?" and Jason Pontin's editorial "Against Transcendence," *Technology Review*, February 2005). Following these publications, a challenge was issued by Technology Review and Methuselah Prize, offering \$20,000 to anyone who will conclusively prove that SENS is "so wrong that it is unworthy of learned debate." As of now, the "SENS challenge" prize remains unclaimed.

<sup>67</sup> Eric Drexler, *Engines of Creation, The Coming Era of Nanotechnology*, Anchor Books, New York, 1986; Ray Kurzweil, *The Age of Spiritual Machines*, Viking, NY, 1999; Kevin Warwick, *Cybernetic organisms: our future?* *Proceedings IEEE*, 87(2), 387-389, 1999; Eliezer Yudkowsky, *Creating Friendly AI*, Singularity Institute, 2001; James Hughes, *Citizen Cyborg: Why Democratic Societies Must Respond to the Redesigned Human of the Future*, Westview Press, London, 2004.

<sup>68</sup> Such "technologically oriented" public groups include: Artificial Intelligence [www.kurzweilAI.net](http://www.kurzweilAI.net), Singularity Institute [www.singinst.org](http://www.singinst.org), Foresight Nanotech Institute [www.foresight.org](http://www.foresight.org), The Extropy Institute [www.extropy.org](http://www.extropy.org) (recently suspended its activity) and The World Transhumanist Association [www.transhumanism.org](http://www.transhumanism.org). It is important to note that the area of discussions in these "think tanks" is not restricted to "cyborgism", but also involves ethics and a wide spectrum of biological interventions. Many prominent members are associated with The Libertarian Party (including Ray Kurzweil and Ronald Bailey).

<sup>69</sup> For example, in Russia (where conventional bio-gerontological research has, since the collapse of the Soviet Union, become dramatically under-funded, note 78), there emerged the theories of "wave genetics" and "bio-information fields" (Peter Garyaev, *Volnovoy Genome (The Wave Genome)*, Dep. VINITI, Moscow, 1993; Sergey Konovalov, *Preodolenie Starenia. Informazionno-Energeticheskoe Uchenie (Overcoming Aging. The Information-Energy Theory)*, Prime Euroznak, Saint Petersburg, 2004).

<sup>70</sup> Deepak Chopra, *Ageless Body, Timeless Mind. The Quantum Alternative to Growing Old*, Harmony Books, NY, 1993 (written as a popular medical treatise) or Deepak Chopra, *The Way of the Wizard*, Harmony Books, NY, 1995 (written as a novel/philosophical dialogue). Louise Hay has expressed similar ideas in *Heal Your Body* (Hay House, NY, 1993). Chopra's books have sold millions of copies, their sales are many fold greater than, for example, for Kurzweil's books or any other "materialist" author (Based on Amazon Sales Ranks).

There have been quite a few life-extensionist communities of "spiritualist" orientation: "People Unlimited" (previously "People Forever," better known in Israel as "Physical Immortality," founded in 1971 in Scottsdale, Arizona, since then headed by Bernadeane Brown, Charles Paul Brown and James Strole [www.peopleunlimited.biz](http://www.peopleunlimited.biz)) or "The International Physical Immortality Project" headed by Robert Hedges, <http://www.anycities.com/immortality/physical921immortality.html>. Other groups include Jhershierra's board [www.jhershierra.com](http://www.jhershierra.com) or "Personal Tao" <http://www.personaltao.com>. The latest craze with this broad denomination has been Alex Chiu's magnetic "Immortality rings" [www.magneticdiscovery.com](http://www.magneticdiscovery.com). The massive promotion of the "immortality devices" has become a sub-movement in and of itself. The "spiritual" or "electromagnetic" means are usually either ignored or criticized by members of "materialist" groups, though some attempt to synthesize (based on analysis of the Immortality Institute forums [www.imminst.org](http://www.imminst.org)).

<sup>71</sup> Notable among the critics are Leon Kass (GW Bush's advisor on bioethics), Daniel Callahan (researcher of medical ethics and public policy, president of the Hastings Center for Bioethics), Michael Shermer (famous psychologist and philosopher, founder of the Skeptics Society and *Skeptic* magazine), Leonard Hayflick (world-

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renowned biogerontologist), William Hurlbut (a member of the President's Council on Bioethics), Koichiro Matsuura (Director General of UNESCO) or Reverend Jerry Falwell (the famous televangelist, founder of the Moral Majority movement). These authors tend to rationalize mortality using a standard available panoply of ideations (transition to an afterlife, injustice of physical immortality, overpopulation, etc.). See "Bioethicist William Hurlbut on the dangers of radical lifespan extension," US News and World Report, 5/28/04; Leon Kass, "L'Chaim and Its Limits: Why Not Immortality?" First Things, 113, 17-24, May 2001; Leonard Hayflick, "'Anti-Aging' Is an Oxymoron," Journal of Gerontology, 59, B573-B578, 2004.

Such views have been branded by life-extension enthusiasts as "conformism," "apologism," "anti-longevity" and even "deathism." See Ronald Bailey, "Forever Young. The New Scientific Search for Immortality," *Reason*, August 2002; Nick Bostrom, "The Fable of the Dragon Tyrant," *Journal of Medical Ethics*, 31(5), 273-277, 2005; John Harris, *Clones, Genes and Immortality. Ethics and the Genetic Revolution*, Oxford University Press, Oxford, 1998; Aubrey de Grey, "Gerontologists and the media: the dangers of over-pessimism," *Biogerontology* 1(4), 369-370, 2000; James Hughes, *Citizen Cyborg: Why Democratic Societies Must Respond to the Redesigned Human of the Future*, Westview Press, London, 2004.

<sup>72</sup> Under Clinton's administration, during the generally acknowledged economic boom ("The Clinton-Gore Economic Record: Strong and Sustained Economic Growth," The White House Office of the Press Secretary, Press Release of Jan 27, 2000, <http://clinton4.nara.gov>), the budget of the National Institute of Health in general, and of the National Institute on Aging in particular, grew dramatically (Sage Crossroads, March 10, 2003, May 19, 2003 [www.sagecrossroads.net](http://www.sagecrossroads.net)). Under Bush, during the present period of economic slow-down ("Fact Sheet. The Bush Recession," Senate Budget Committee, July 31, 2003 [www.senate.gov](http://www.senate.gov)), the NIA budget growth has been slowed as well (Sage Crossroads, March 10, 2003, May 19, 2003 [www.sagecrossroads.net](http://www.sagecrossroads.net)). Presently, out of the ~\$27 billion NIH budget, NIA receives ~1 billion. Moreover, within the NIA, only ~\$150M go to the "Biology of Aging" program, dealing with basic research (see Sage Crossroads, March 10, 2003, and <http://www.aau.edu/budget/06nihtables.pdf>). Bush's administration seems to be particularly concerned with ethical implications of stem cell research, the kind of study vehemently applauded by life-extension enthusiasts (see note 74). In 2001, Bush restricted stem cell research only to cell lines previously available. In July 2006, he used the first veto of his presidency to reject a Congress bill that was to expand federal funds for medical embryonic stem cell research ("Fact Sheet: President Bush's Stem Cell Research Policy," White House Press Release of July 19, 2006 [www.whitehouse.org](http://www.whitehouse.org)). In passing, it might be interesting to note that the current US military budget stands at \$450 billion, according to CIA World FactBook [www.cia.gov/cia/publications/factbook](http://www.cia.gov/cia/publications/factbook).

<sup>73</sup> Most Christian groups are principally opposed to radical physical life extension, to therapeutic cloning or other kinds of far-reaching "meddling" with human nature, however not to life-prolongation per se. Brown's spiritualist "People Unlimited" express a strong "Christian sentiment." A pro-longevitist stance is also apparent in the activities of the "Priests for life" movement ([www.priestsforlife.org](http://www.priestsforlife.org)) or Pope John Paul II's encyclicals calling to "reaffirm the culture of life." Religious differences came to the fore in the International Symposium "Extended Life – Eternal Life" March 2000 Philadelphia ([www.extended-eternallife.org](http://www.extended-eternallife.org)). Russian journalist Michael Ettinghoff nicely summarized the conference discussion: "Christians are against immortality. Jews are for it." (*Argumeny I Fakty*, 41/322, 2000).

<sup>74</sup> Beside the scientists mentioned above, among prominent life-extension advocates are Ben Bova (science fiction writer, president of US Science Fiction and Fantasy Writers), William Haseltine (CEO of Human Genome Sciences), Arthur Caplan (bioethicist, Pennsylvania University), Prof. John Harris (School of Law, University of Manchester), Philip Emeagwali (a Nigerian scientist, one of the fathers of the Internet), Gregory Pence (a leading cloning rights expert), Robert Freitas (prominent nano-tech researcher), Ralf Merkle (nano-tech researcher and Alcor director) and others.

It might be safe to assume that few people in the world would oppose healthy life extension *per se* (though some authors have expressed statements to that effect). The difference is in the degree of hopefulness, efforts, funds and methods. An ideological struggle has been waged between extreme sceptics and extreme enthusiasts (see note 71). Moreover, among the enthusiasts, disagreements are wide: "spiritualists" scorn what they perceive as inaptitude of modern medicine and science, while "materialists" despise what they see as unscientific quackery. Even within the "materialistic" brach, there is much controversy: The more academic life-extensionists argue between themselves on theories, "limits" and funds, and all together attack unproved remedies. In 2002, a position statement on anti-aging medicine was formulated by NIA gerontologists Jay Olshansky, Leonard Hayflick, and Bruce Carnes ("Position statement on human aging," *The Journals of Gerontology, Series A: Biological Sciences and Medical Sciences* 57 (8), B292–B297, 2002). It was signed by 51 leading gerontologists, including Robert Butler, Aubrey de Grey, James Fries, Tom Kirkwood, David Gershon, Carol Greider, Jerry Shay, Raj Sohal, Christofer Heward and Richard Sprott. This position statement accused anti-aging medicine as being fraudulent by and large, peddling ineffectual remedies. On the other hand, it strongly advocated massive investments in basic aging research as our only hope to find effective anti-aging interventions. American Academy of Anti-Aging Medicine (A4M) retaliated, asserting the value of supplements and accusing NIA of not having come with any real therapies for decades (The American Association of Retired Persons (AARP) Bulletin, June 2002). The "petition battles" continue ([www.cureaging.org](http://www.cureaging.org), <http://www.agingresearch.org/longevitydividend/overview.pdf>).

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<sup>75</sup> The juxtaposition of skeptical, idealistic, biomaterialistic and cybernetic visions of life extension is clearly reflected in science fiction of this period. Bruce Sterling's cyberpunk novel *Schismatrix* (1985) envisions a direct confrontation between "shapers" or proponents of genetic engineering and "mechanists" or supporters of technological/cybernetic enhancement. In Sterling's *Holy Fire* (1996) life extension is achieved through intrusive technological replacements. In David Grin and Gregory Benford's *Heart of the Comet* (1986), the "programmer," the "doctor" and the "spacer" represent three lines of scientific development. On the other hand, Tom Robbins's *Jitterbug Perfume* (1984) sides with the "spiritualist/alternative medicine" branch. Dystopic visions are clearly present, such as Phylis Dorothy James's *The Children of Men* (1992), where the prevalence of longevity research is a sign of a dying out civilization. Arkady and Boris Strugatsky's *Five Spoons of Elixir* (1985) and Kim Stanley Robinson's *The Mars Trilogy* (1992, 1992, 1996) again raise the specter of prolonged ennui. However, there are now more works that view the prospect of radical longevity optimistically as an opportunity to learn and mature: Such are James Halperin's *The First Immortal* (1998) and Poul Anderson's *The Boat of a Million Years* (1989). Other works are quite "neutral", both with respect to technology and to its ethical implications. Such is Dan Simmons's *Hyperion Cantos* (1989, 1990, 1996, 1997). This is soft science fiction/space opera: specific methods towards achieving longevity are of minor importance, and obtaining the "elixir" is just a tool for plot development and a means of impunity in cosmic battles. Thus, science fiction reflects the trends present in the general intellectual discourse, and serves as a means of attenuating "future shock." Science fiction fans may be considered as yet another stratum of people interested in prospects of radical life extension.

<sup>76</sup> The link between practical and radical life-extensionism is believed to lie in Kurzweil's saying: "Live long enough to live forever" – that is, do everything practically possible to stay alive until ground-breaking anti-aging technologies arrive and, if possible, aid in their arrival.

<sup>77</sup> A partial list of large "biomaterialistic" grass-roots life-extensionist organizations includes: Life Extension Foundation [www.lef.org](http://www.lef.org) (since 1980 led by Saul Kent and William Faloon), The American Academy of Anti-Aging Medicine (A4M) [www.worlhealth.net](http://www.worlhealth.net) (founded in 1992 by Ronald Klatz and Robert Goldman), National Rejuvenation Foundation (founded in 2001, [www.nrfnews.com](http://www.nrfnews.com)), Immortality Institute [www.imminst.org](http://www.imminst.org) (founded in 2002 by Bruce Klein), World Transhumanist Association [www.transhumanism.org](http://www.transhumanism.org) (since 1998 led by Nick Bostrom, David Pearce and James Hughes), Extropy Institute [www.extropy.org](http://www.extropy.org) (since 1988 led by Max More and Natasha Vita-More, ceased operation in 2006), Terasem Movement (since 2002 presided by Martine Rothblatt), Immortality International [www.immortalityonline.org](http://www.immortalityonline.org) (founded in 2001 by Mitch Ronco). These new groups reinforced the earlier establishments, such as Alcor Life Extension Foundation, [www.alcor.org](http://www.alcor.org) or The Immortalist Society [www.cryonics.org](http://www.cryonics.org) (see note 56 above). These groups are international and/or US incorporated. In Europe, there are now few comparable memberships, except for the UK, e.g. The British Longevity Society (advised by Dr. Marios Kyriazis [www.anti-age.org.uk/](http://www.anti-age.org.uk/)). Some groups are largely concerned with selling supplements, while others are pure "think tanks." For "technologically" and "spiritually" oriented communities see notes 68 and 70.

Several relevant scientific journals have been published, such as the veteran *Journal of American Geriatrics Society*, *Journal of Gerontology*, *The Gerontologist*, *Mechanisms of Aging and Development*, and the new *Rejuvenation Research* (previously *Journal of Anti-Aging Medicine*). Several popular magazines have been published, dedicated almost exclusively to research and advocacy of life extension: *The Longevity Meme* [www.longevitymeme.org](http://www.longevitymeme.org), *Betterhumans* [www.betterhumans.com](http://www.betterhumans.com), *Life Extension Magazine*, *The Immortalist*, and *SAGE Crossroads* [www.sagecrossroads.net](http://www.sagecrossroads.net) (recently stopped publications due to lack of funding).

<sup>78</sup> The World Transhumanist Association (WTA) may provide a representative demographic sample: it includes about ~4000 members, comparable in size to the other societies mentioned above. According to the WTA statistics (*WTA News*, September 2006), the US has the largest membership (>1,500), followed by the UK (250), Canada (220), Finland (130) and Australia (120). Then follow India (78), Germany (66), Sweden (56), Italy (49), and Israel (28). Interestingly, France, which was a center of the life-extensionist movement in the 1920s (see Ch. 1), is rather low in the list (25); the presence of the French is extremely low in most transhumanist/immortalist societies. New Transhumanist movements are now emerging in several third world countries, experiencing a relative economic prosperity: UAE (38), Venezuela (25). The increasing membership from China is also notable (25).

Russia represents an interesting case. Immortalist views have been traditionally strong in the USSR (see Chs. 2, 3). Yet with the collapse of the Soviet Union, Russian economy and science was in shambles including life-extensionist enterprises (Michael S. Bernstam and Alvin Rabushka, *From Predation to Prosperity: How to Move from Socialism to Markets*. Ch. 2 "Free and Not So Free to Charge: The Pendulum of Russia's Economy, 1992-2004", Russian Economy, 2006; Sergey Kapitza "Nastoyashee i budushee nauki v Rossii" (The past and present of Russian science), *Svobodnaya Mysl* (The Free Thought), 4, 1994; Elena Vodopianova, "Sudby Rossiyskoy Nauki" (The Fate of Russian Science), *Svobodnaya Mysl*, 21, 2005 - reprinted in the archives of the Russian Academy of Science [www.ras.ru](http://www.ras.ru)). Presently, concomitantly with an apparent economic stabilization (Bernstam and Rabushka, 2006), life-extensionism is resurfacing: Transhumanist/immortalist groups emerge (e.g. the Russian Transhumanist Association) and, generally, scientific research is getting a stronger support ("Plan Reformirovania Rossiyskoy Akademii Nauk" (Governmental Decree on Reforming the Russian Academy of Science), 27 December 2007 (archive of the Russian Academy of Science). With specific reference to life-extension, the research of Academician Victor Skulachev on super-antioxidants is widely publicized (Skulachev "Starenie – atavizm, kotory sleduet preodolet" (Aging is an

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atavism which must be overcome), Moscow University Seminar, 21.02.2005; Skulachev "Chelovek budet Zhit Sotni Let" (Man will live hundreds of years), *Izvestia*, 28.11.2003). Occasional funding is thrown at this research by Russian nouveau-riches (in Skulachev's case, a ~\$100K grant was issued in 2005 by the Russian billionaire aluminum magnate Oleg Deripaska). The dependence of modern western life-extensionism on philanthropy (e.g. Ellison foundation or Sperling foundation) will be also considered.

<sup>79</sup> Robert M Veatch, *Death, Dying, and the Biological Revolution. Our Last Quest for Responsibility*, Yale University Press, London, 1977; John Harris, *Clones, Genes, and Immortality. Ethics and the Genetic Revolution*, Oxford University Press, Oxford, 1998; Aubrey de Grey, "Life extension, human rights, and the rational refinement of repugnance," *J Med Ethics*, 31(11), 659-663, 2005; James Hughes, *Citizen Cyborg: Why Democratic Societies Must Respond to the Redesigned Human of the Future*, Westview Press, London, 2004. An important argument is that life-extensionism is based on the absolute and indiscriminate life valuation, thus future sharing of technology is part of the general optimistic program.

<sup>80</sup> Boris Hessen, "The Social and Economic Roots of Newton's Principia (1931)," Reprinted in *Science at the Crossroads: Papers from the Second International Congress of the History of Science and Technology*, 1931. Frank Cass & Co., 1971; Carl Becker, *The Heavenly City of Eighteenth-Century Philosophers*, New Haven, 1932; Robert Merton, "The Protestant Spur to Science," from *Science, Technology and Society in Seventeenth-Century England*, Howard Fertig, NY, 1970. Reprinted in Robert K. Merton, *The Sociology of Science: Theoretical and Empirical Investigations*, University of Chicago Press, Chicago, 1973; Joseph Needham, *Science and Civilization in China*, Cambridge University Press, Cambridge, 1954; Garland E. Allen, "Life Sciences in the Twentieth Century," *History of Science Society Newsletter*, 17, 5 (Supplement) 1988.

<sup>81</sup> Clifford Clogg, "The effect of personal health care services on longevity in an economically advanced population," *Health Services Research*, 14, 5-32, 1979; Robert Butler, *Why Survive? Being Old in America*, Harper and Row, NY, 1975; Hornell Hart and Hilda Hertz, "Expectation of life as an index of social progress," *American Sociological Review*, 9, 609-621, 1944; Georgi Pitshelauri, *The Longliving of Soviet Georgia*, Human Sciences Press, NY, 1982; Djordje Kozarevic, "Life Extension. International Perspectives," In Gari Lesnoff-Caravaglia (Ed.), *Realistic Expectations for Long Life*, Human Sciences Press, NY, 1987; Vladislav Bezrukov, "Longevity Around the World" In Robert Butler and Claude Jasmin (Eds.), *Longevity and Quality of Life*, Kluwer, NY, 2000.

<sup>82</sup> The "Endowment Theory" may be especially relevant (Richard Thaler, "Towards a positive theory of consumer choice," *Journal of Economic Behavior and Organization*, 1, 39-60, 1980). Simply put, when the quality of life is satisfactory, life extension may be desired, while under adverse conditions, hopefulness may diminish. The underlying principle might be interpreted as "The more one has, the more one wants." In this view, a preservation of well being may be desired. A contrary argument may be raised, based on the "denial defense mechanism" (the theory expounded by Anna Freud -- Richard Ekins and Ruth Freeman (Eds.), *Anna Freud: Selected Writings*, Penguin Books, London, 1998). According to the "denial" theory, adverse circumstances may induce overly hopeful expectations, when the person is unable to cope with calamity. However, even if assuming that far reaching hopes may be a reaction to strenuous social conditions, the subject then may not have the necessary resources to act on or disseminate his/her optimism. The data I have collected so far seem to indicate that life-extensionist ideals become more prominent under conditions of prosperity. A "push and pull" mechanism may also be involved.

In assessing the backgrounds for life-extensionist ideas, there might be an additional significance to the theories of rationalization, cognitive dissonance and the "status quo bias" (Leon Festinger, *A theory of cognitive dissonance*, Stanford University Press, Stanford CA, 1957; Samuelson and Zeckhauser, "Status quo bias in decision making," *Journal of Risk and Uncertainty*, 1, 7-59, 1988). Both the views of skeptics and enthusiasts may be interpreted based on these theories. The skeptics often employ the "sour grapes" bias (perceiving the impossibility of radical life extension, they rationalize for its undesirability). Enthusiasts, on the other hand, tend to shut off thoughts of impending mortality. Moreover, an effort to preserve the status quo, may explain both the desire to prolong one's existence (life-extensionism) and aversion to new interventions (bioconservatism). Thus, the notions of economic and psychological homeostasis may gain additional relevance for the discussion of life-extension.

<sup>83</sup> The continuation of the Evolution of Prolongevity Hypotheses, which Gruman planned to title *Death and Progress: The Rise of Secular Salvation*, has never appeared.

<sup>84</sup> Mark Bloch, *The Royal Touch*, Routledge, London, 1973 (1924); Peter Burke, *History and Social Theory*, Cornell University Press, Ithaca, 2005; Peter Brown, "Society and the Supernatural," *Daedalus*, 104, 133-147, 1975; Mannheim, Karl, Turner, Bryan S, Wirth, Louis, *Ideology And Utopia: Collected Works*, London, Routledge, 1998 (1936); Canguilhem, Georges, *Ideology and Rationality in the History of the Life Sciences*, translated from French by Arthur Goldhammer, Cambridge MA, The Massachusetts Institute of Technology Press, 1988; Gruman, Gerald, *A History of Ideas about the Prolongation of Life. The Evolution of Prolongevity Hypotheses to 1800*, Transactions of the American Philosophical Society, Volume 56 (9), Philadelphia, 1966; Kristeva, Julia. *Desire in Language: A Semiotic Approach to Literature and Art*. New York, Columbia University Press, 1980; Michel Foucault, *The Archeology of Knowledge*, Routledge, London, 1972; Mikhail Bakhtin, *The Dialogic Imagination*, Manchester, 1981.

<sup>85</sup> Gert Brieger, "The Historiography of Medicine" In W.F. Bynum and Roy Porter (Eds), *Companion Encyclopedia of the History of Medicine*, Routledge, London, 2001, pp.24-45; J.P. Goubert, "Twenty Years On: Problems of Historical Methodology in the History of Health," In Roy Porter and Andrew Wear (Eds.) *Problems and Methods in*

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*the History of Medicine*, Croom Helm, London, 1987; Roy Porter, *The Greatest Benefit to Mankind. A Medical History of Humanity from Antiquity to the Present*, Harper Collins, London 1997.

<sup>86</sup> Daniel M Fox, "The Medical Institutions and the State," In W.F. Bynym and Roy Porter (Eds), *Companion Encyclopedia of the History of Medicine*, Routledge, London, 2001, pp.1204-1231; Shapin, Steven, *The Scientific Revolution*, Chicago, the University of Chicago Press, 1996; Shapin Steven and Schaffer, Simon, *Leviathan and the Air-Pump*, Princeton, Princeton University Press, 1985; Latour, Bruno, *The Pasteurization of France* (translated from French by Alan Sheridan and John Law), Harvard University Press, Cambridge Massachusetts, 1988.

<sup>87</sup> The opposition between the heroic and a-heroic approaches to history dates further back. For example, Thomas Carlyle in *On Heroes, Hero Worship and the Heroic in History* (1840), argues for the crucial importance of hero figures in society. In contrast, Tolstoy in the "Second Epilogue" to *War and Peace* (1869), denies the existence of a "hero factor," and considers "heroes" as mere name tags of massive interactive events (Ilia Stambler, "Heroic Power in Thomas Carlyle and Leo Tolstoy," *The European Legacy*, 11(7) 737-751, 2006).

<sup>88</sup> By examining the distribution of publications according to time (as they, for example, appear in William G. Bailey's bibliography *Human Longevity from Antiquity to the Modern Lab* (Greenwood Press, Westport CN, 1987) or Nathan Shock's *Classified Bibliography of Gerontology and Geriatrics* (Stanford University Press, Stanford CA, 1951, 1957, 1963) - I will attempt to establish temporal and local "surges of interest". Examples of such publication distributions, complementing the qualitative discussion, are given in Toby Gelfand, "The *Annales* and Medical Historiography: *Bilan et Perspectives*," In Roy Porter and Andrew Wear (Eds.) *Problems and Methods in the History of Medicine*, Croom Helm, London, 1987 and in Bruno Latour, *The Pasteurization of France*, Harvard University Press, Cambridge Massachusetts, 1988.

<sup>89</sup>

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