

Lifespans of the Greatest Mathematician-cum-Physicists of the Modern Era in Europe

Arjun Tan*

*Department of Physics
Alabama A & M University
Normal, AL 35762, U.S.A.*

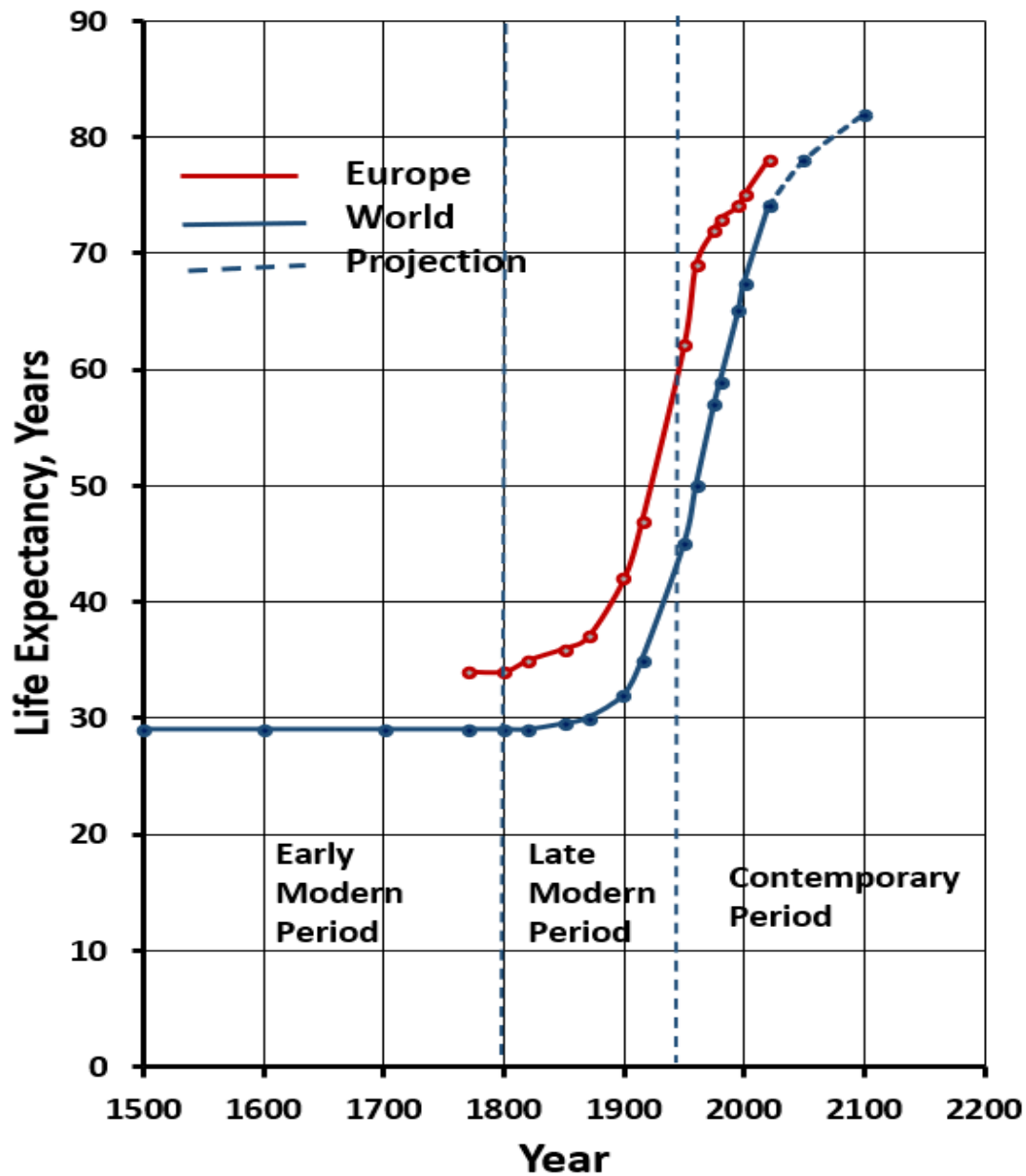
*E-Mail: arjun.tan@aamu.edu, arjun.tan@mail.com

Abstract

In much of human history, the average life expectancy was low. Even during the early modern period, the average life expectancy was flat and under 30 years. The life expectancy started to climb dramatically in the late modern period led by Europe and continued in the contemporary era. The life expectancy in Europe depended significantly on occupation, being the highest for the teaching profession. This study investigates the lifespans of the greatest mathematician-cum-physicists of Europe in the modern era. Curiously, the average lifespan was more than double the world life expectancy for most of this period. However, the lifespan was flat with no rise at the end of the period, due most probably to the two world wars occurring there. There was a great variance in this lifespan having a standard deviation of 13.868 years.

INTRODUCTION

Lifespan is the actual length of an individual's life from birth to death, whereas the **life expectancy** is the average lifespan of a group of people or an entire population (cf. [1]). In much of human history, the life expectancy was low. The average life expectancy in the world in the post Medieval age (from [2]) is shown in Fig. 1. The life expectancy during the entire **Early Modern Period** (1500 AD – 1800 AD) was flat and under 30 years. The life expectancy started to climb dramatically in the **Late Modern Period** (1800 AD – 1945 AD) and continued in the **Contemporary Era** (Post 1945 period). Also shown in Fig. 1 is the **life expectancy in Europe** (from [3]) from 1770 AD, which led the world life expectancy consistently.



Dependence of life expectancy on occupation has been observed. One study [4] shows that life expectancy was the highest for the teaching profession, followed by agriculture, care, administrative, general and transport, in that order. Another [5] shows a similar order as follows: teaching professionals, corporate managers and directors, financial, institutional and office managers, functional managers, business and public service professionals, and health professionals in that order.

OBJECTIVE

It has been said that “*Mathematics is the Queen and Servant of Science*” [6]. This is particularly true between **Mathematics** and **Physics**, the latter being the most fundamental and exact science of all. In the modern era, most of the greatest mathematicians (including statisticians) have also been great physicists (including astronomers) and vice-versa. Conversely, many great physicists also created new mathematics or mathematical methods in pursuit of their investigations. In this study, we investigate the lifespans of the greatest mathematician-cun-physicists of the modern era. This is a new category of people which did not fall into any of the groups of occupation in Refs. [4] and [5], but most closely resembled those belonging to the teaching profession. Therefore, the anticipation is that the average lifespan of this category would be higher than any of those from contemporaneous occupations. Amongst the likely reasons for this are academic freedom, lack of stress and lack of supervision.

ANALYSIS

Altogether 41 of the greatest mathematician-physicists of the Modern era whose names can be found in the undergraduate and graduate textbooks in mathematics and physics are chosen in this study (Table I). Their dates of birth and death are readily found in the World-wide-web (e.g., [7]) and entered in the table. As exact dates, especially of death are sometimes unavailable, the lifespans of these giants are taken to be the differences of their years of birth and death.

Table I. Greatest Mathematician-Physicists of the Modern Era in Europe

	Name	Nation	Born	Died	Lifespan
1	Tycho Brahe	Denmark	1546	1601	55
2	John Napier	Scotland	1550	1617	67
3	Galileo Galilei	Italy	1564	1642	78
4	Johannes Kepler	Germany	1571	1630	59
5	Pierre de Fermat	France	1601	1665	64
6	Christiaan Huygens	Netherlands	1629	1695	66
7	Robert Hooke	England	1638	1703	65
8	Isaac Newton	England	1642	1726	84
9	Gottfried Wilhelm Leibnitz	Germany	1646	1716	70
10	Jacob Bernoulli	Switzerland	1654	1705	51
11	Guillaume de l'Hôpital	France	1661	1704	43
12	Johann Bernoulli	Switzerland	1667	1748	81
13	Leonhard Euler	Germany	1707	1783	76
14	Jean le Rond d'Alembert	France	1717	1783	66

15	Joseph-Louis Lagrange	France	1736	1813	77
16	Pierre-Simon Laplace	France	1749	1827	78
17	Adrien-Marie Legendre	France	1752	1833	81
18	Joseph Fourier	France	1768	1830	62
19	Carl Friedrich Gauss	Germany	1777	1855	78
20	Friedrich Bessel	Prussia	1784	1846	62
21	Augustin-Jean Fresnel	France	1788	1827	39
22	Gaspard-Gustave de Coriolis	France	1792	1843	51
23	George Green	England	1793	1841	48
24	Carl Gustav Jacob Jacobi	Germany	1804	1851	47
25	Willian Rowan Hamilton	Ireland	1805	1865	60
26	George Gabriel Stokes	England	1819	1903	84
27	Charles Hermite	France	1822	1901	79
28	James Clerk Maxwell	Scotland	1831	1879	48
29	Edmond Laguerre	France	1834	1888	52
30	Hermann Hankel	Germany	1839	1873	34
31	Lord Rayleigh (John W Strutt)	England	1842	1919	77
32	Ludwig Boltzmann	Austria	1844	1906	62
33	David Hilbert	Germany	1862	1943	81
34	Tullio Levi-Civita	Italy	1873	1941	68
35	Karl Schwarzschild	Germany	1873	1916	43
36	Albert Einstein	Germany	1879	1955	76
37	Erwin Schrödinger	Austria	1887	1961	74
38	Wolfgang Pauli	Austria	1900	1958	58
39	Enrico Fermi	Italy	1901	1954	53
40	Werner Heisenberg	Germany	1901	1976	75
41	Paul Adrien Maurice Dirac	England	1902	1984	82

Figure 2 is a plot of the lifespan (y-axis) against the year of birth (x-axis). The equation of the *least-squares-error straight line* is given by:

$$y = mx + c \quad (1)$$

with the *slope* m and *y-intercept* c as:

$$m = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{n \sum x_i^2 - (\sum x_i)^2} \quad (2)$$

and

$$c = \frac{\sum y_i \sum x_i^2 - \sum x_i \sum x_i y_i}{n \sum x_i^2 - (\sum x_i)^2} \quad (3)$$

where the summation Σ runs from $n = 1$ to 41. The **Pearson's correlation coefficient** r is calculated as:

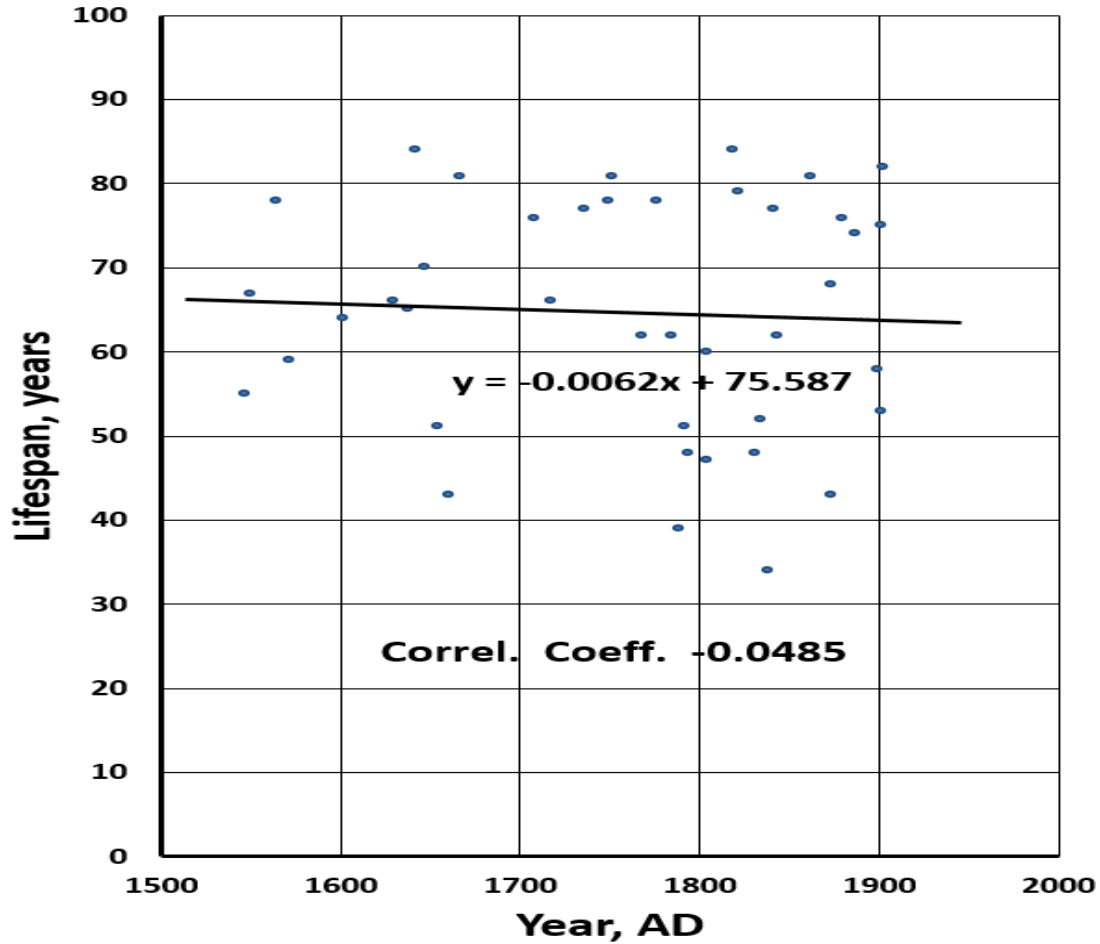
$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}} \quad (4)$$

where the averages of the variables are given by: $\bar{x} = \Sigma x_i / n$ and $\bar{y} = \Sigma y_i / n$.

The **standard deviation** of the lifespan is expressed as:

$$\sigma = \sqrt{\frac{\sum (y_i - \bar{y})^2}{n}} \quad (5)$$

which is the square-root of the **variance** σ^2 .



RESULTS AND DISCUSSION

The data from Table I yield: $m = -0.0062$; $c = 75.507$; $r = -0.0485$; $\sigma = 13.68643$; and $\sigma^2 = 187.318$.

The lifespan of the 41 greatest mathematician-physicists in the modern era ranged from a low of 34 (for Hankel) to a high of 84 (for Newton and Stokes) with an average of 64.73 years. This is more than double that of the world average life expectancy at birth in most of the modern era! The occupation of this group (mostly teaching and research) and the fact that all of them escaped infant mortality can only partially explain this great enhancement of lifespan.

The least-squares-error straight line was basically flat with no visible upward trend of the late modern period. This is most likely due to the two world wars occurring during this period.

There was a great variability in the lifespans of the great mathematician-physicists. The variance of the lifespan given by σ^2 was 187.3183 yr², whose square root yielded the standard deviation of $\sigma = 13.686$ years.

It is interesting to note that the modern period, during which most of the advances in mathematics and physical science were made did not witness any significant rise in the life expectancy of mankind. Medical advancements actually started well after the technical and industrial revolution.

REFERENCES

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