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Chronology and Historical Lifespans of the Great Mathematicians of Europe

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Abstract:

Most of the mathematical discoveries in human history, including the tools and techniques, were developed in the continent of Europe. In this paper, 99 great mathematicians of Europe are chronicled together with their lifespans from the Hellenistic era to the modern era. The long medieval period was devoid of any significant mathematical development. This was followed by the modern era, during which the greatest mathematical development took place. It began in the early modern period, but then rapidly accelerated in the late modern period. However, the average lifespans of the great mathematicians of Europe remained fairly constant. In the modern period, the individual lifespans fluctuated greatly between 21 and 98 years. The least-square-error trendline on a scatterplot of lifespan against year of birth showed a marginally upward trend with an average lifespan of 65.88 yr and an average deviation of 15.55 yr. The average lifespan was the highest amongst all different occupations of that period.

1. Introduction:

Mathematics is a vast subject area which pervades all studies of natural and behavioral sciences. A precise and unambiguous definition of mathematics is difficult and is best left unattempted. But one thing that is universally accepted is that mathematics itself is not science. Yet, it is employed in the analyses of all scientific studies. Thus, it is called the 'queen and servant of science' [1]. It can be said without the fear of controversy that much of the mathematical discoveries, including the tools and techniques, were developed in the continent of Europe. In this paper, we compile the names and nationalities of the great mathematicians of Europe in chronological order, based upon their mathematical contributions and name recognition. Altogether 99 such mathematicians in European history are gathered, largely from References [1] and [2], and also from many other references, too numerous to mention. They are listed in Table I together with their nations of origin and years of birth and demise. Of these, 27 were French; 26 German; and 16 Englishmen. The lifespans of these mathematicians are deduced from subtracting the year of birth from that of demise (Table I). The process of rounding off the lifespan to the nearest year ensures that the error in calculating the mean is minimized.

2. Chronology and Lifespans of Great European Mathematicians:

Much of human history consisted of dark ages as far as science and mathematics were concerned. The earliest discoveries of results of plane geometry took place independently in several early civilizations across the world. However, the formal structural developments of geometry were developed in the Hellenistic era in Greece [3]. This was followed by a long medieval period when no significant development of mathematics took place [4] until the modern period beginning 1500 CE [5]. From then on, the world witnessed the explosive growth of mathematics, mostly in Europe which continued up to the end of the Second World War. Figure 1 is a scatterplot of the lifespans of the great European mathematicians against the year of birth in Common Era (CE) and Before Common Era (BCE), which captures the chronology and lifespans of the great European mathematicians discussed above. Figure 1 further reveals that the frequency of great mathematician born increased dramatically from the early modern period ending in 1800 CE to the late modern

period beginning at 1800 CE [5]. Interestingly, the average lifespan of the mathematicians did not display much variation over the period of 2000 years with an overall average of 65.8788 yr. The average lifespan of for the different eras are as follows: Hellenistic period: 61.0000 yr; Early modern period: 65.2903 yr; Late modern period: 66.2063 yr; Overall modern period: 65.8788 yr.

3. Frequency of Great Mathematicians Born in Modern Era:

Figure 2 is a histogram of the number of great mathematicians born in each decade of the modern era in Europe (from Table I). In the early modern period, from the decades of 1550 to 1770, the frequency was low, limited to 2 per decade. That frequency climbed sharply in the late modern period. There was a broad Gaussian distribution with an amplitude of 9 around the 1820s decade; and another narrower distribution with a peak of 11 round the 1870s decade. Within the latter distribution were born many of the mathematical physicists who had to invent new mathematical methods in pursuit of their investigations of modern physical phenomena discovered during that period.

4. Analysis of Lifespans of Mathematicians in the Modern Era:

Figure 3 is a scatterplot of the lifespan of the great European mathematicians born in the modern era (y-axis) against the year of birth (x-axis). The equation of the least-squares-error straight line is given by:

$$y = mx + c \tag{1}$$

with the slope m and y-intercept c as:

$$m = \frac{n\Sigma x_i y_i - \Sigma x_i \, \Sigma y_i}{n\Sigma x_i^2 - (\Sigma x_i)^2} \tag{2}$$

and

$$c = \frac{\Sigma y_i \Sigma x_i^2 - \Sigma x_i \, \Sigma x_i y_i}{n\Sigma x_i^2 - (\Sigma x_i)^2} \tag{3}$$

where the summation Σ runs from $n = 6$ to 99. The Pearson's correlation coefficient r is calculated as:

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

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

The standard deviation of the lifespan is expressed as:

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

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

The data from Table I yield: $m = 0.018$; $c = 33.733$; $r = 0.011$; $\sigma = 15.5458$ yr; and $\sigma^2 = 241.6724$ yr^2. The lifespans of the great European mathematicians varied tremendously from a low of 21 yr (for Galois, who lost his life in a duel) to a high of 98 yr (for Bertrand Russell) for an overall average of 65.8788 yr for the entire modern era. The average deviation of the individual lifespans was 15.5458 yr or 23.598% of the average lifespan. The least-squares-error straight line had a small positive slope of 0.018 which signifies that the lifespan only increased marginally during the entire modern period. This is quite surprising given the fact that renaissance and reformation in Europe happened during the same modern period. It has been suggested that medical advancements actually lagged behind the technical, industrial and intellectual revolution during the same period [6].

5. Remarks:

Dependency of life expectancy on occupation during the modern period in Europe has been observed. One study shows that life expectancy was the highest for the teaching profession, followed by agriculture, care, administrative, general and transport, in that order [7]. Another study 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 [8]. The great mathematician of this study can be identified as belonging to the first categories in both of these studies. It can be inferred that the life expectancy of the whole population in Europe in the modern period would have been considerably lower than our figure of 65.88 yr.

Table I. Great Mathematicians of Europe					
	Name	Nation	Born	Died	Lifespan
1	Pythagoras	Greece	-570	-500	70
2	Eudoxus	Greece	-390	-340	50
3	Euclid	Greece	-330	-270	60
4	Archimedes	Greece	-287	-212	75
5	Apollonius	Greece	-240	-190	50
6	John Napier	Scotland	1550	1617	67
7	Johannes Kepler	Germany	1571	1630	59
8	Marin Mersenne	France	1588	1648	60
9	Girard Desargues	France	1591	1661	70
10	Renē Descartes	France	1596	1650	54
11	Pierre de Fermat	France	1601	1665	64
12	Blaise Pascal	France	1623	1662	39
13	Christiaan Huygens	Netherlands	1629	1695	66
14	Robert Hooke	England	1638	1703	65
15	Isaac Newton	England	1642	1726	84
16	Gottfried Wilhelm Leibnitz	Germany	1646	1716	70
17	Jacob Bernoulli	Switzerland	1654	1705	51
18	Edmond Halley	England	1656	1742	86
19	Guillaume de l'Hôspital	France	1661	1704	43
20	Johann Bernoulli	Switzerland	1667	1748	81
21	Christian Goldbach	Prussia	1690	1764	74
22	Pierre Louis Moreau deMaupertuis	France	1698	1759	61
23	Leonhard Euler	Germany	1707	1783	76
24	Jean le Rond d'Alembert	France	1717	1783	66
25	Joseph-Louis Lagrange	France	1736	1813	77
26	Pierre-Simon Laplace	France	1749	1827	78
27	Adrien-Marie Legendre	France	1752	1833	81
28	Jean-Baptiste Joseph Fourier	France	1768	1830	62
29	Carl Friedrich Gauss	Germany	1777	1855	78
30	Friedrich Wilhelm Bessel	Prussia	1784	1846	62
31	Augustin-Jean Fresnel	France	1788	1827	39
32	Augustin-Louis Cauchy	France	1789	1857	68
33	August Ferdinand Möbius	Germany	1790	1868	78

Table I. (Continued)

	Name	Nation	Born	Died	Lifespan
34	Gespard-Gustave de Coriolis	France	1792	1843	51
35	Nikolai Ivanovich Lobachevsky	Russia	1792	1856	64
36	George Green	England	1793	1841	48
37	Jacques Charles François Sturm	France	1803	1855	52
38	Carl Gustav Jacob Jacobi	Germany	1804	1851	47
39	Peter Gustav Lejeune Dirichlet	Germany	1805	1859	54
40	Willian Rowan Hamilton	Ireland	1805	1865	60
41	Hermann Grassmann	Germany	1809	1877	68
42	Joseph Liouville	France	1809	1882	73
43	Urbain Jean Joseph Leverrier	France	1811	1877	66
44	Évariste Galois	France	1811	1832	21
45	Duncan Farquharson Gregory	Scotland	1813	1844	31
46	Eugène Charles Catalan	Belgium	1814	1894	80
47	James Joseph Sylvester	England	1814	1897	83
48	George Boole	England	1815	1864	49
49	Karl Theodor Wilhelm Weierstrass	Germany	1815	1997	82
50	George Gabriel Stokes	England	1819	1903	84
51	Arthur Cayley	England	1821	1895	71
52	Pafnuty Lvovich Chebyshev	Russia	1821	1894	73
53	Charles Hermite	France	1822	1901	79
54	Rudolf Julius Emanuel Clausius	Germany	1822	1888	62
55	Ferdinand Gotthold Max Eisenstein	Germany	1823	1852	29
56	Leopold Kronecker	Germany	1823	1891	68
57	Gustav Robert Kirchhoff	Germany	1824	1887	63
58	Georg Friederich Bernard Riemann	Germany	1826	1866	40
59	Elwin Bruno Christoffel	Germany	1829	1900	71
60	Julius Wilhelm Richard Dedekind	Germany	1831	1916	85
61	James Clerk Maxwell	Scotland	1831	1879	48
62	Edmond Nicolas Laguerre	France	1834	1886	52
63	Camille Jordan	France	1838	1922	84
64	Hermann Hankel	Germany	1839	1873	34
65	Marius Sophus Lie	Norway	1842	1899	57
66	Lord Rayleigh/John William Strutt	England	1842	1919	77

Table I. (Continued)					
	Name	Nation	Born	Died	Lifespan
67	Ludwig Boltzmann	Austria	1844	1906	62
68	Georg Cantor	Russia	1845	1918	73
69	Felix Klein	Germany	1849	1925	76
70	Gregorio Ricci-Curbastro	Italy	1853	1925	72
71	Jules Henri Poincare	France	1854	1912	58
72	Alfred North Whitehead	England	1861	1947	86
73	David Hilbert	Germany	1862	1943	81
74	Hermann Minkowski	Germany	1864	1909	45
75	Jacques Hadamard	France	1865	1963	98
76	Élie Cartan	France	1869	1951	82
77	Bertrand Arthur William Russell	England	1872	1970	98
78	Edmond Taylor Whittaker	England	1873	1956	83
79	Tullio Levi-Civita	Italy	1873	1941	68
80	Karl Schwarzschild	Germany	1873	1916	43
81	Henri Lebesgue	France	1875	1941	66
82	James Hopwood Jeans	England	1877	1946	69
83	Godfrey Harold Hardy	England	1877	1947	70
84	Edmund Landau	Germany	1877	1938	61
85	Marcell Grossmann	Switzerland	1878	1936	58
86	Renē Maurice Frēchet	France	1878	1973	95
87	Albert Einstein	Germany	1879	1955	76
88	Luitzen Egbertus Jan Brouwer	Netherlands	1881	1966	85
89	Arthur Stabnley Eddington	England	1882	1944	62
90	Hermann Klaus Hugo Weyl	Germany	1885	1955	70
91	John Edensor Littlewood	England	1885	1977	92
92	Erwin Schrödinger	Austria	1887	1961	74
93	Stefan Banach	Poland	1892	1945	53
94	Wolfgang Pauli	Austria	1900	1958	58
95	Enrico Fermi	Italy	1901	1954	53
96	Werner Heisenberg	Germany	1901	1976	75
97	Paul Adrien Maurice Dirac	England	1902	1984	82
98	John von Neumann	Hungary	1903	1957	54
99	Kurt Gödel	Germany	1906	1978	72

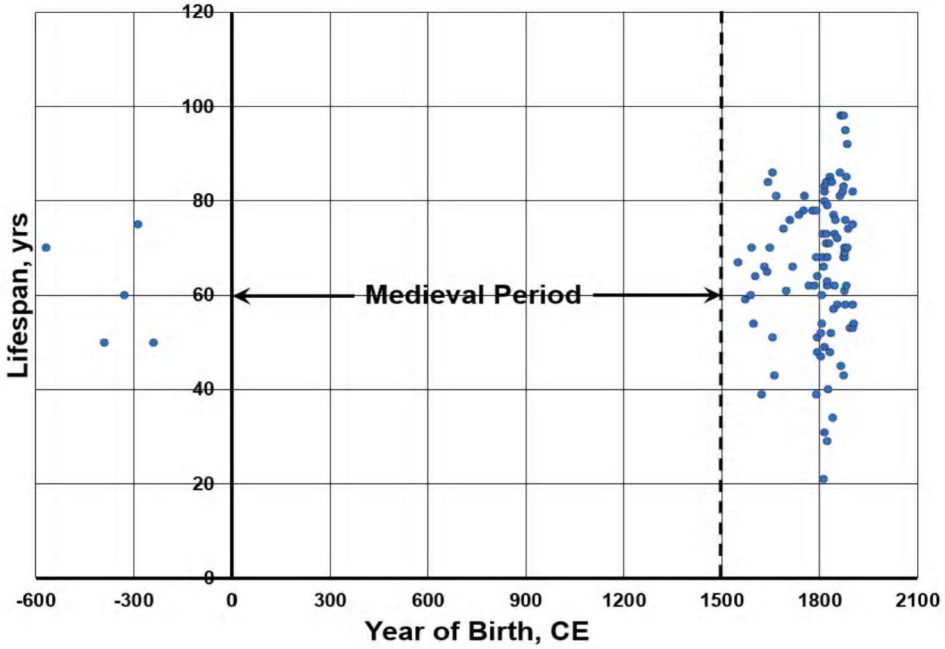
Lifespan, yrs
120
100
80
60
40
20
0
Medieval Period
-600
-300
0
300
600
900
1200
1500
1800
2100
Year of Birth, CE

Fig. 1

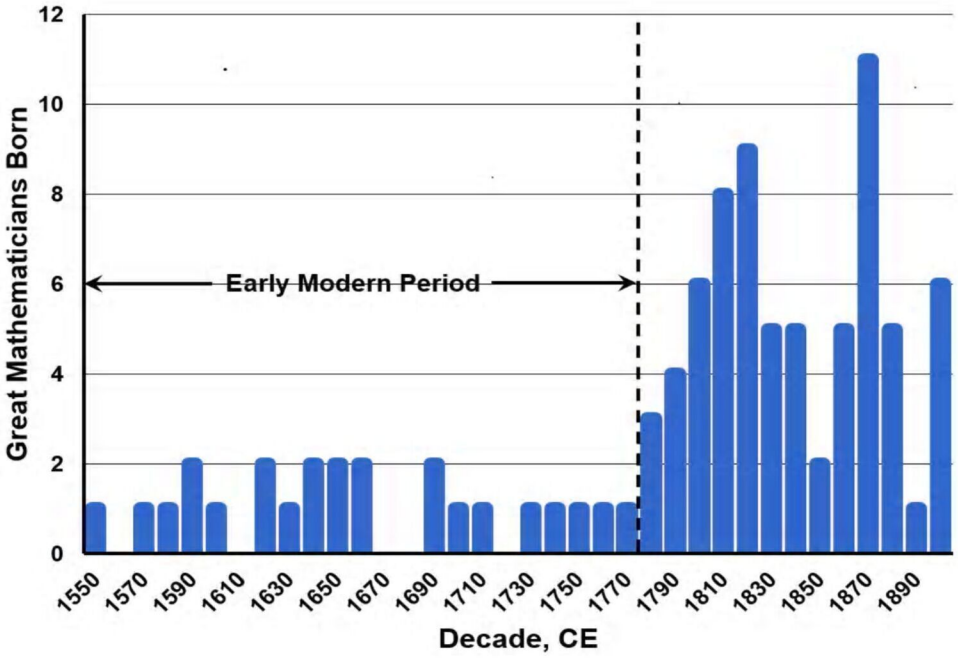
Great Mathematicians Born
12
10
8
6
4
2
0
Early Modern Period
1550
1570
1590
1610
1630
1650
1670
1690
1710
1730
1750
1770
1790
1810
1830
1850
1870
1890
Decade, CE

Fig. 2

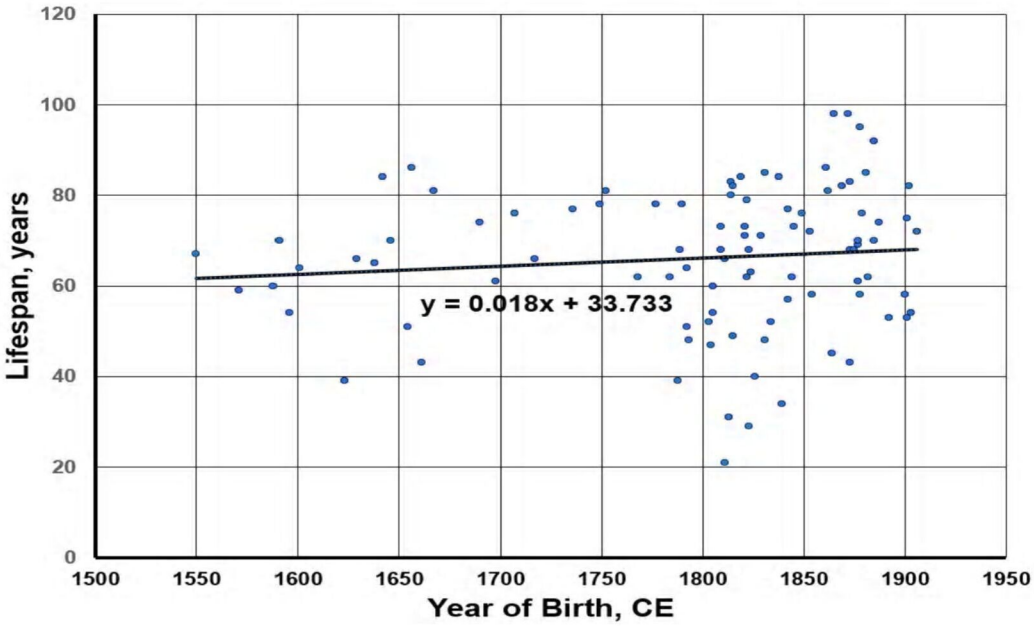

Fig. 3

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