First, Best, and Last:

Creative Landmarks
Across the Career Course

Age and Creative Achievement: Antiquity of Topic

- Quételet (1835)
- Beard (1874)
- Raskin (1936)
- Lehman (1941-1966, esp. 1953)
- Dennis (1966)
- Zusne (1976)
- S. Cole (1979)

Age and Creative Achievement: My Own Long-term Preoccupation

- Simonton
  - 1970s (3): 1975, 1977(2)
  - 1980s (4): 1985, 1988, 1989(2)
  - 1990s (3): 1991(2), 1997
  - 2000s (4): 2000, 2004, 2007(2)

Empirical Issues Addressed

- The longitudinal relation between age and creative output
- The dependence of such output on
  - individual differences and
  - interdisciplinary contrasts
- The relation between quantity and quality of output
- The longitudinal location of one or more career landmarks

The Three Career Landmarks

- The first major creative product:
  - e.g., first musical composition to enter the repertoire
- The single best creative product
  - e.g., the most frequently cited scientific publication
- The last major creative product:
  - e.g., the last poem still to be frequently anthologized

First Investigation: Raskin (1936)

	120 Scientists	123 Writers
Age at first landmark	25.2	24.2
Age at middle landmark	35.4	34.3
Age at last landmark	59.4	55.0
Age at death	68.6	63.4

First Investigation: Raskin (1936)

- If only the 25 most eminent in each domain taken, then
  - Age at first landmark decreases to 22
  - Age at middle landmark stays unchanged
  - [Age at last landmark?]
  - Age at death increases to 72 years for the scientists and 64 for the writers

Lehman (1953): *Age and Achievement*

- Concentrated on middle landmark: single best work
- But also included first and last high-impact works
- Showed that career peak was contingent on discipline (e.g., poetry versus novel)

My Own First Contribution: Simonton (1975)

TABLE 1
Regression Analysis: Mean Modal Productive Age of Creative Writers

Independent Variable	b	β	STD Error	F
Constant				
(Western Imaginative Prose)	42.713		9.866	
Imaginative Poetry (P)	-3.910	-0.161	1.228	10.141[b]
Informative Prose (I)	1.858	0.063	1.870	0.987
Near East (N)	0.872	0.016	4.634	0.035
Far East (F)	-0.917	-0.022	2.767	0.110
Eminence (E)	0.767	0.216	0.285	7.226[b]
Longevity (L)	0.279	0.339	0.064	19.153[b]
Time (T)	0.282	0.162	0.150	3.518

P x N	4.904	0.052	7.139	0.518
I x N	5.434	0.072	5.875	0.856
P x F	6.009	0.080	4.079	2.171
I x F	9.790	0.088	6.211	2.485
P x L	0.011	0.010	0.078	0.020
I x L	0.050	0.024	0.115	0.188
P x E	-0.402	-0.079	0.344	1.363
I x E	-1.404	-0.166	0.527	7.106[b]
N x T	-0.209	-0.013	1.140	0.034
F x T	-0.740	-0.090	0.440	2.825
N x L	0.491	0.128	0.231	4.519[a]
F x L	0.087	0.020	0.188	0.211
N x E	-1.040	-0.069	1.113	0.872
F x E	0.026	0.003	0.470	0.003
P x T	-0.110	-0.044	0.180	0.373
I x T	0.374	0.110	0.220	2.897

NOTE: Both unstandardized (b's) and standardized (β's) regression coefficients are given, along with the standard errors and the F-tests. $R^2 = 0.368$, $F = 10.004$ with 23 and 396 df.

a. $p < .05$.

b. $p < .01$.

Zusne (1976): 213 Psychologists

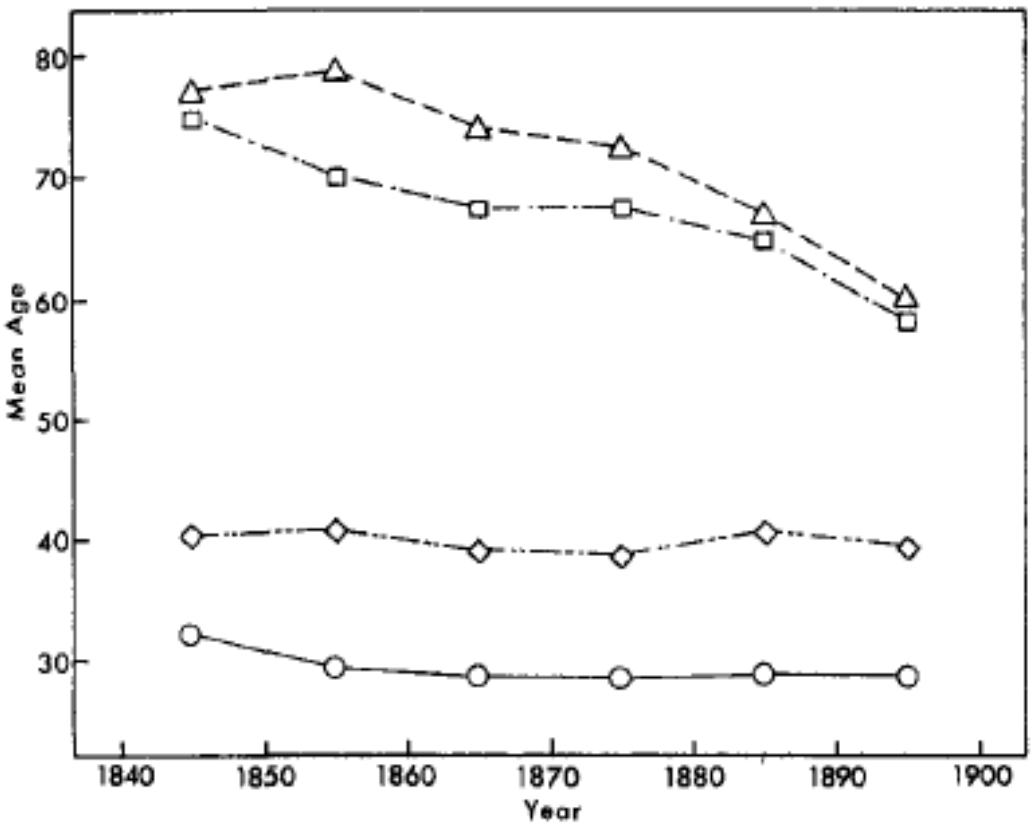
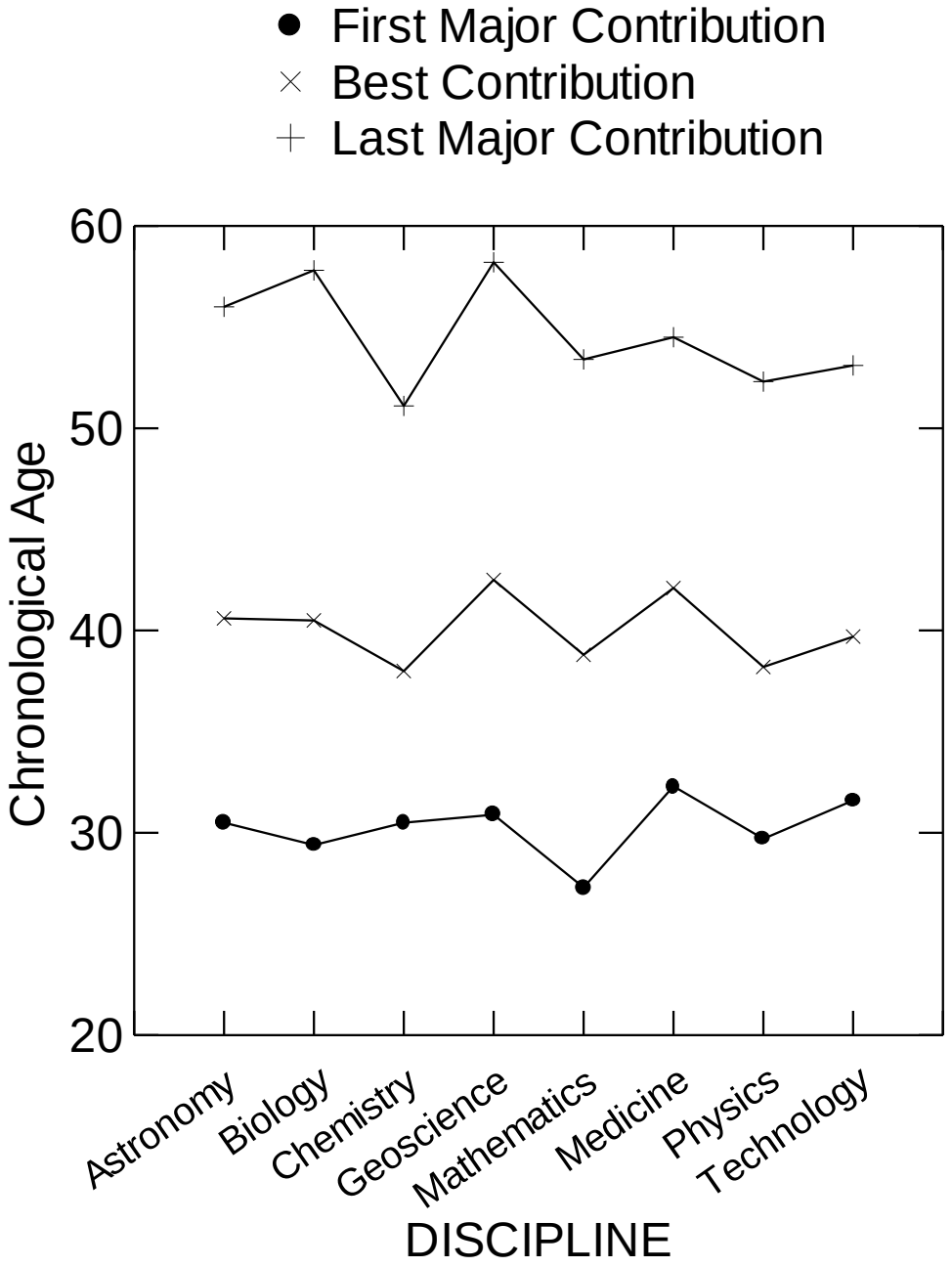


Figure 1. Age at first publication (circles), one most significant publication (diamonds), last publication (squares), and death (triangles) of 213 eminent psychologists born in the 19th century.

Simonton (1991): 2026 Scientists


First Major Contribution
Best Contribution
Last Major Contribution
60
50
40
30
20
Chronological Age
Astronomy
Biology
Chemistry
Geoscience
Mathematics
Medicine
Physics
Technology
DISCIPLINE

Simonton (1991): 120 Composers

- *Themes Measure*
- First hit: 26.28
- Best hit: 39.68
- Last hit: 51.74
- Max output: 39.58

- *Works Measure*
- First hit: 30.76
- Best hit: 40.78
- Last hit: 50.99
- Max output: 37.46

Simonton (2007): 78 Cinema Composers

Table 4
Variable Means, Standard Deviations, and Minimum-Maximum Values

	M	*SD*	Minimum	Maximum	*n*
Substantive variables					
Age first nomination	40.15	8.24	21	63	78
Age first award	42.69	9.38	29	63	51
Age last award	46.94	10.35	29	66	51
Age last nomination	52.28	11.24	32	80	78
Total nominations	6.42	8.29	1	45	78
Age first hit	40.46	8.11	26	64	78
Age best hit	42.45	8.46	26	64	69
Age last hit	45.87	10.79	26	72	78
Control variables					
Birth year	1927.31	21.52	1885	1961	78
Living	0.58	0.50	0	1	78

Theoretical Explanation

- The two-stage cognitive model
  - Initial level of creative potential transformed into actual creative products via
    - ideation
    - elaboration
  - Interdisciplinary contrasts in ideation and elaboration rates
  - Individual differences in age at career onset

$$p(t) = c(e^{-at} - e^{-bt})$$

where $p(t)$ is productivity at career age t (in years),

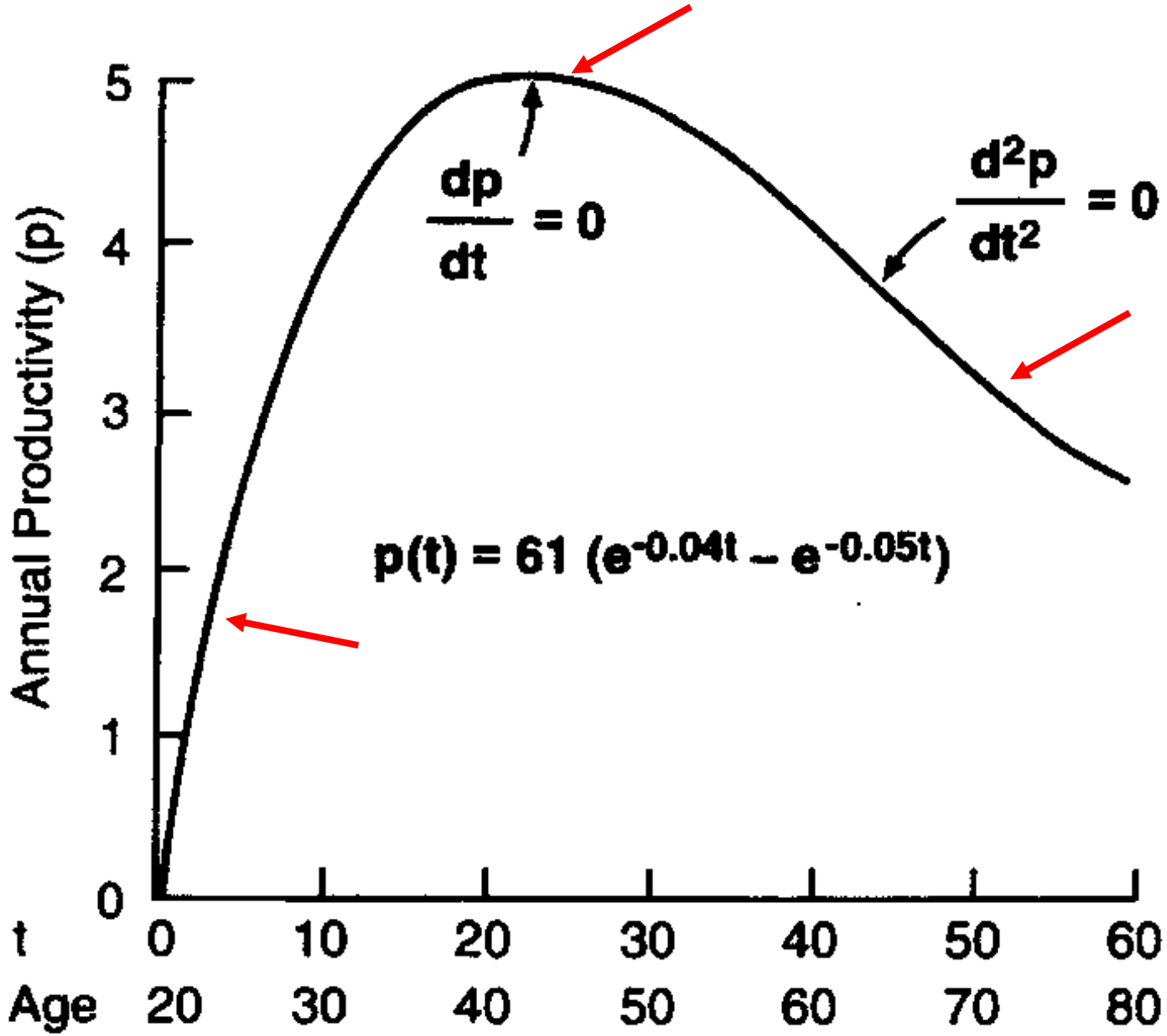
e is the exponential constant (~ 2.718),

a the typical ideation rate for the domain ($0 < a < 1$),

b the typical elaboration rate for the domain ($0 < b < 1$),

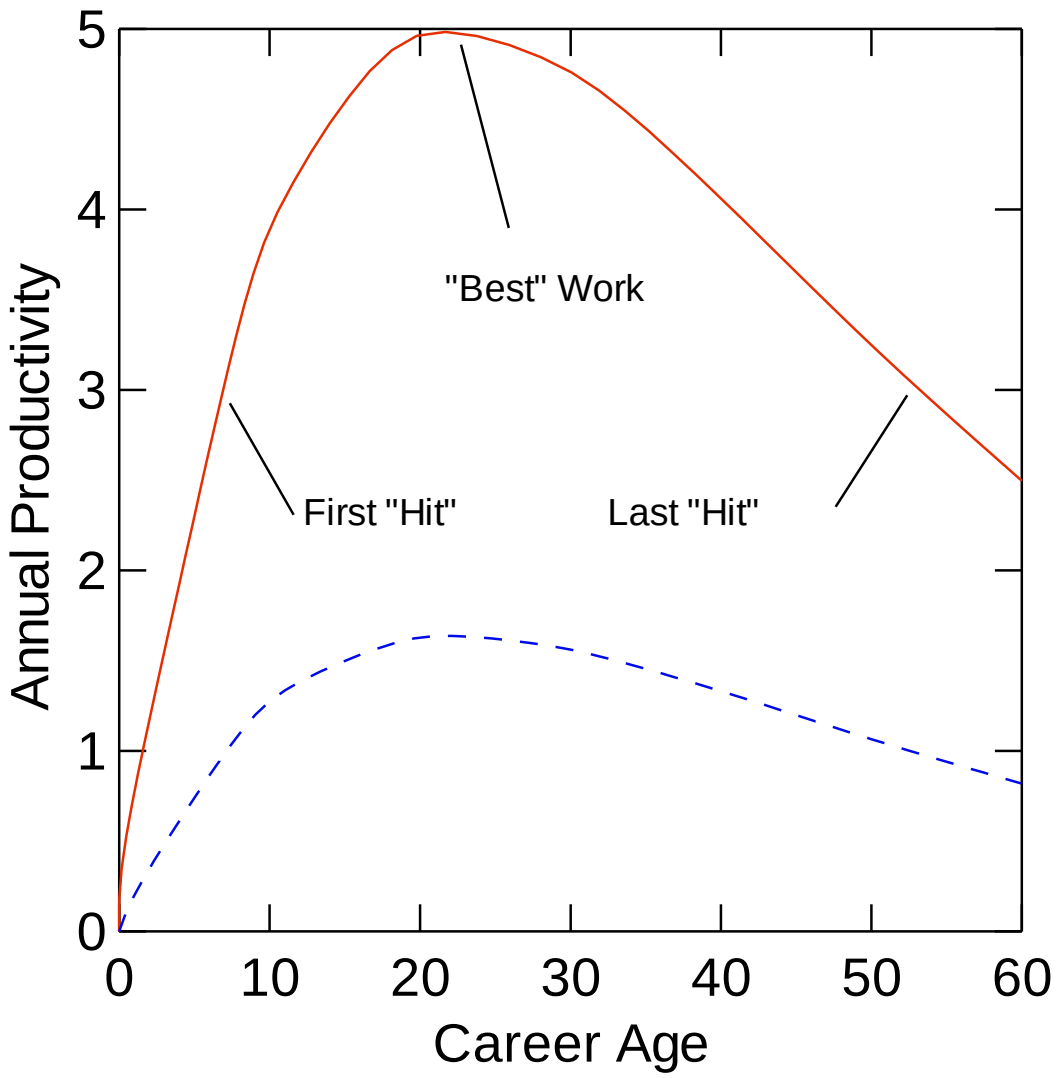
$c = abm/(b - a)$, where m is the individual's *creative potential* (i.e. maximum number of publications in indefinite lifetime).

[N.B.: If $a = b$, then $p(t) = a^2mte^{-at}$]


Annual Productivity (p)
5
4
3
2
1
0
dp/dt = 0
d²p/dt² = 0
p(t) = 61 (e^-0.04t – e^-0.05t)
t 0 10 20 30 40 50 60
Age 20 30 40 50 60 70 80

Career Landmarks

- The “best work” is most likely to appear near or a little after the age at maximum output (depending on the specific curve)
- The first major work will appear sometime after the onset of output: The steeper the slope the sooner its appearance
- The last landmark major work will appear sometime before the termination of output: The less steep the slope the later its appearance


Annual Productivity
5
4
3
2
1
0
0
10
20
30
40
50
60
Career Age
"Best" Work
First "Hit"
Last "Hit"

Interdisciplinary Contrasts

- Small changes in
  - ideation rates or
  - elaboration rates or
  - both
- can produce substantial changes in
  - the location of the career peak and
  - the slope of the post-peak decline

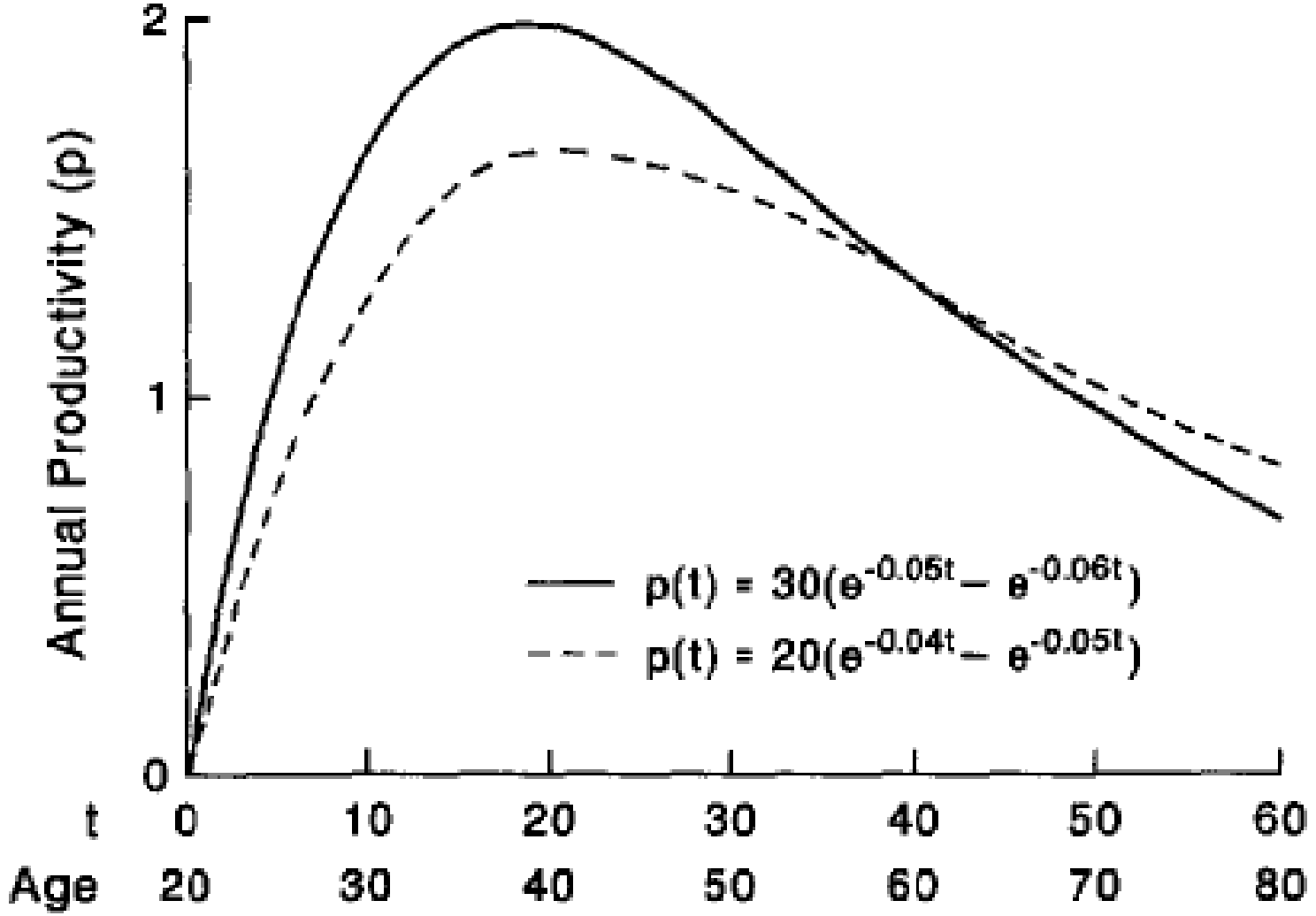
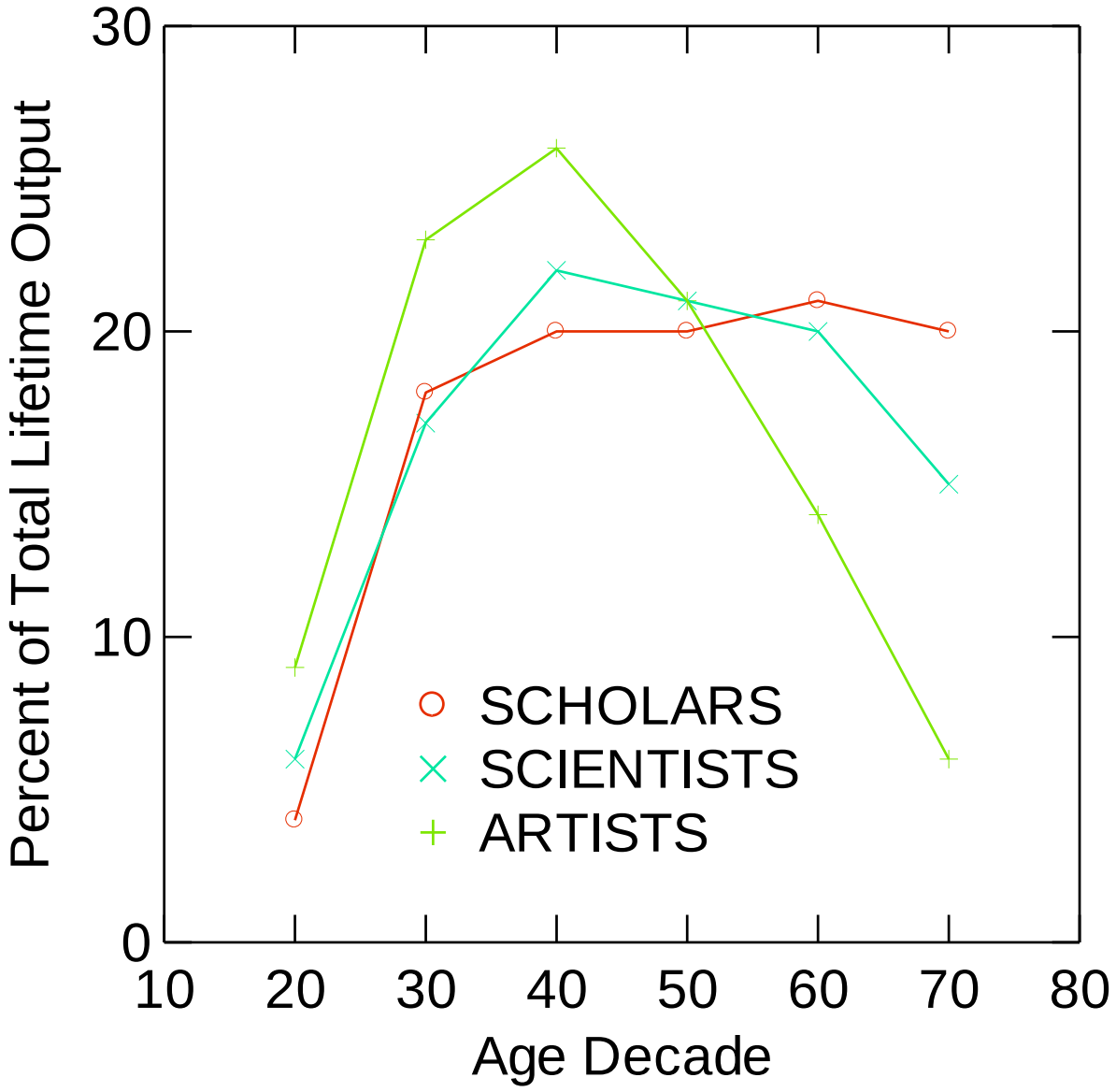


Figure 1. Two hypothetical curves depicting annual productivity as a function of career age, assuming that creative potential equals 100 but with different rates of ideation and elaboration, using Equation 1.


Percent of Total Lifetime Output
30
20
10
0
10
20
30
40
50
60
70
80
Age Decade
SCHOLARS
SCIENTISTS
ARTISTS

Estimates for Three Disciplines

			Peak Age	*Peak Age*	
Domain	*a*	*b*	*Career*	*Chrono-logical*	*Half-life*
Chemists	.042	.057	20.4	40.4	16.5
Biologists	.033	.052	23.9	43.9	21.0
Geologists	.024	.036	33.8	53.8	28.9

Individual Differences

- Holding discipline constant, individual career trajectories vary according to two orthogonal parameters
  - initial creative potential
  - age at career onset
- Because these two parameters are usually orthogonal, we obtain a fourfold typology

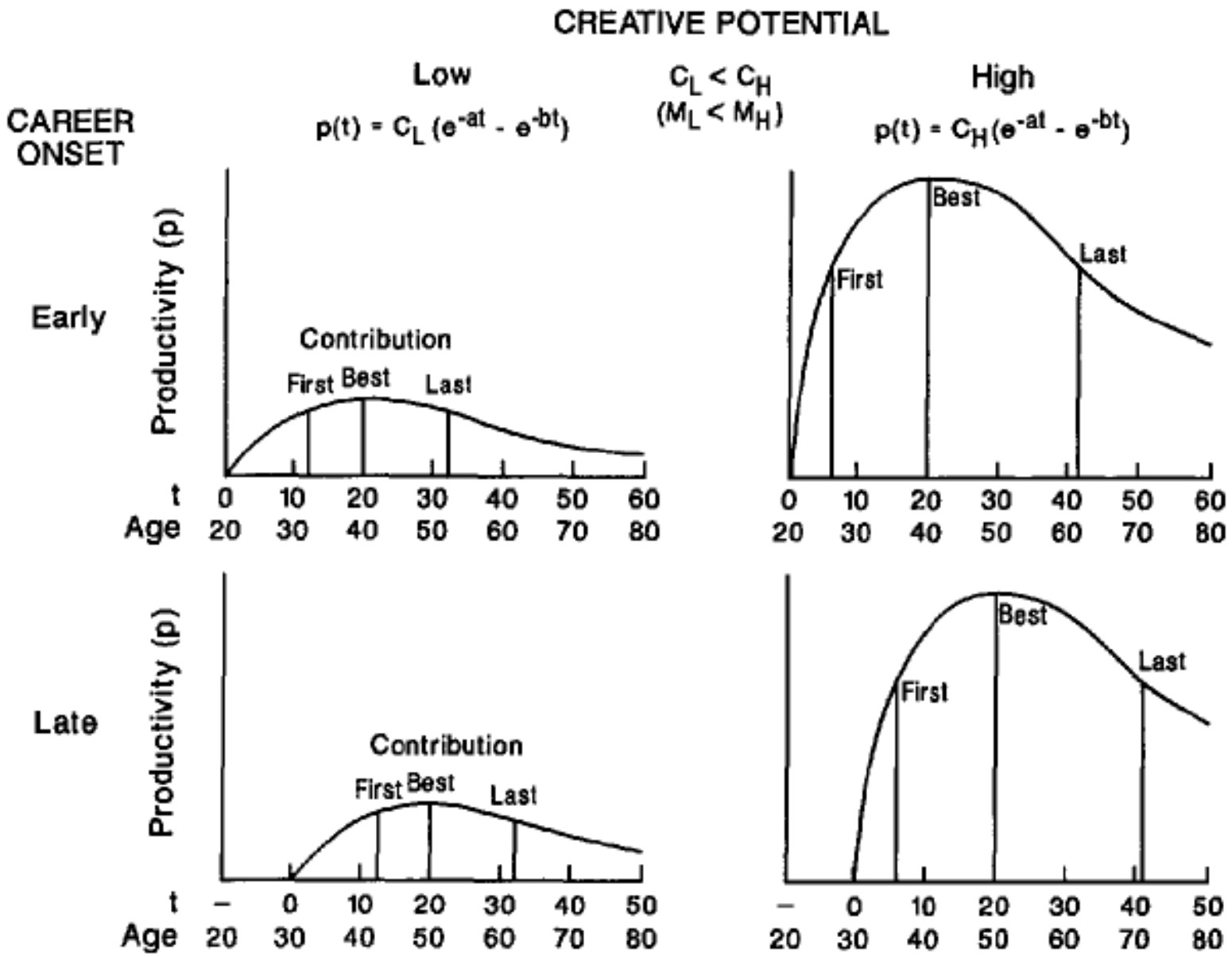


Figure 2. Four hypothetical curves expressing annual productivity as a function of career age, with ideation and elaboration rates held constant, but with individual variation in initial creative potential (high or low) and in career onset (early or late).

Implications

- Lifetime productivity and maximum output rate each correlate positively with age at first hit, negatively with age at last hit, but zero with age at best hit
- Controlling for age at best hit or age at maximum output, age at first hit will correlate negatively with age at last hit

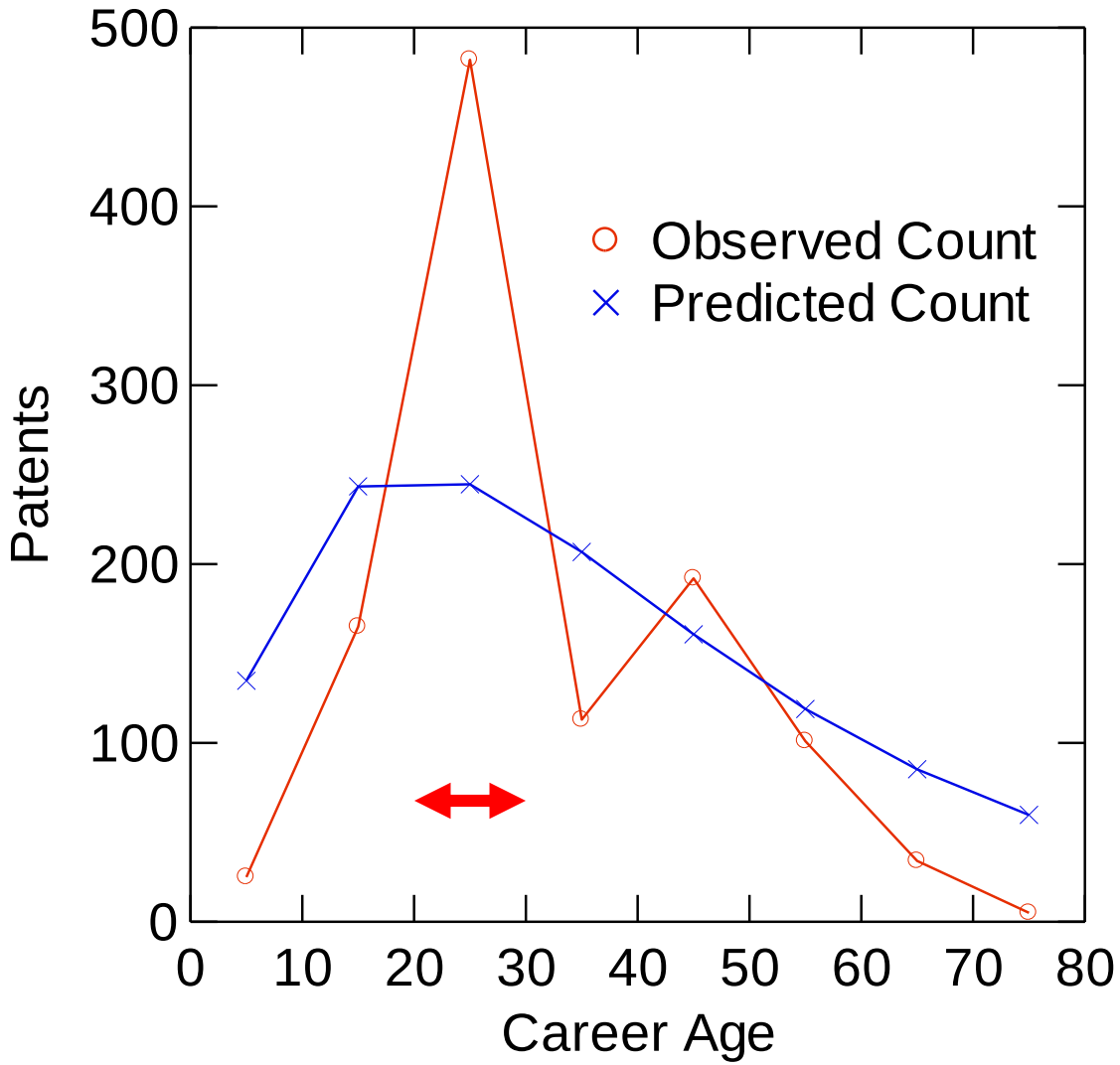
Caveat

- The model is designed to handle aggregate level data: On the average, where are the career landmarks given the parameters of the model
- Individual data will depart from the overall expectation (e.g., first = best or last = best)
- Nonetheless, the model should provide a reasonable approximation to the majority of prolifically creative careers

e.g., the career of Thomas Edison

$$C_{Edison}(t) = 2.60\times10^{3}(e^{-.044t} - e^{-.058t})$$

$$r = .74$$



Phonograph, incandescent light bulb, Edison effect, Kinetoscope

Table 2
Typology of Creative Life Cycles in Literature: Predicted and Observed Career Peaks

Style	Poets	Novelists
Conceptualists (finders)	Predicted: 28 Eliot (1888 − 1965): 23 Cummings (1894 − 1962): 26 Plath (1932 − 1963): 30 Pound (1885 − 1972): 30 Wilbur (1921−): 34 Williams (1883 − 1963): 40	Predicted: 34 Fitzgerald (1896 − 1940): 29 Hemingway (1899 − 1961): 30 Melville (1819 − 1891): 32 Lawrence (1885 − 1930): 35 Joyce (1882 − 1941): 40
Experimentalists (seekers)	Predicted: 38 Bishop (1911 − 1979): 29 Moore (1887 − 1972): 32 Lowell (1917 − 1977): 41 Stevens (1879 − 1955): 42 Frost (1874 − 1963): 48	Predicted: 44 James (1843 − 1916): 38 Faulkner (1897 − 1962): 39 Dickens (1812 − 1870): Woolf (1882 − 1941): 45 Conrad (1857 − 1924): 47 Twain (1835 − 1910): 50 Hardy (1840 − 1928): 51

Note. The predicted career peak (age at single best work) was generated from Model 2 in Table 1 (rounded off to the nearest integer). Within each type are listed the writers in Galenson (2003, 2004) according to their observed career peaks (given after the colon).