The Evolution of Human Intelligence

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Modern man appeared somewhere around 200,000 – 150,000 YBP as an already highly developed product of evolution.[1] From that point, he experienced evolutionary forces that further refined, enhanced, and diversified his mental prowess. The following discussion is a review of some aspects of this remarkable product of evolution.

The nature of work in fields such as archeology, paleontology, and anthropology is to collect evidence, organize it, analyze it, and to then offer explanations that fit the findings. When the evidence is thin or misunderstood, attempts to explain it will be nothing more than incorrect, educated guesses. But as more and more is understood about the input information and the science behind these items, the explanations become more convincing. In the case of the evolution of human intelligence, a good bit is known about the sequence of species appearance, from early life forms through hominids. Intelligence has been studied for about a century and has benefited greatly from recent technologies, such as those used for brain imaging and electroencephalography (used to record brain activity in the form of electrical potentials). The knowledge base and availability of experimental options is, however, sparse enough that most of the explanations that can be offered are at least open to alternative formulations. With that in mind, this text will explore the explanations offered by some of the most eminent researchers in the field.

Intelligence developing in various species

Any quick review of the evolution of animals immediately reveals a pattern of increasing complexity and intelligence. On a between species basis, lower life forms (invertebrates) display the least sophisticated intelligence with increasing mental development in vertebrates, especially in birds and mammals. In some regards, animal intelligence can be shown to be increasing over time, with gains when species of greater complexity have appeared.

Scientists have attempted to apply some order to the development of brainpower by looking at between-species brain size. As a rule, the species with the larger brain has more intelligent behavior, but not always. Small monkeys, for example, are more intelligent than typical grazing animals, but the monkeys have smaller brains. In order to correct for the body size differences, some researchers have opted to use the encephalization quotient (EQ), which is the ratio of brain size to body size.

When only primates are being considered, total brain size gives a good indication of cognitive ability. Deaner, et al. (2007) found that neither EQ nor neocortex measures were superior predictors of intelligence. This finding is not so surprising, since a wide range of animal species were not considered. As an example of the comparisons that have been considered, the following is from Jerrison (1973):

	EQ	
Chimp (male):	2.48	(56.7 kg body weight, 440 g brain weight)
Chimp (female):	2.17	(44.0 kg body weight, 325 g brain weight)
Gorilla (male):	1.53	(172.4 kg body weight, 570 g brain weight)
Gorilla (female):	1.76	(90.7 kg body weight, 426 g brain weight)
Human (male):	7.79	(55.5 kg body weight, 1361 g brain weight)
Human (female):	7.39	(51.5 kg body weight, 1228 g brain weight)

Hamilton (1935) selected rats for maze experiments, breeding bright and dull strains for 12 generations. The 12th generation maze bright and dull rats had brain weights that differed by 2.5 standard deviations. This experiment is a sort of accelerated test of evolutionary change, showing the dramatic association between brain size and cognitive ability.

EQ has become the measurement of choice for comparisons between species, but the correction for body mass does not work well at the extremes. Very large animals, such as the manatee and rhinoceros, have EQs that are obviously misleading. The opposite happens among small species. Whales and elephants have brains that are multiples of the size of the human brain, hence the desire to correct for body size. But based on body size, the mouse has a much larger portion of its total weight accounted for by the brain.

Lynn (2006) compiled EQs for living and extinct species, normalized against average living mammals. The following is taken from his larger list:

	EQ	
Fish and reptiles	.05	
Average mammals	1.00	
First birds	0.10	150 MYA
Average birds	.75	
First monkeys	1.00	30 MYA
Squirrel	2.80	
Rhesus	2.10	
Baboon	2.40	
Gorilla	2.00	
Orangutan	2.40	
Chimpanzee	2.60	
Homo habilis	4.30	4.3 MYA
Homo erectus	5.00	0.7 MYA
Homo sapiens	7.50	

[Anyone who has tried to keep squirrels out of a bird feeder can appreciate their high EQ. Whether it accurately places them relative to other species or not, the little critters are ingenious.]

The extinct species from the list (birds, monkeys, and hominids) had smaller EQs than their later counterparts. This is consistent with the general trend seen in many branches of the evolutionary tree.

Lee (2007) has compiled a list of species and estimated their rank order standing with respect to man. The list below includes only familiar species and their most recent common ancestor with man, as estimated by Goodman et al. (1999).

Genus	g*	MRCA**
Human	1	
Orangutan	2	14
Chimpanzee	3	6
Spider Monkey	4	40
Gorilla	5	7
Gibbon	12	18
Baboon	14	25
Ruffed Lemur	17	63
Bush Baby	21	63
Squirrel Monkey	22	40

* g is used here to signify general mental ability rank, relative to man
** most recent common ancestor with man (millions of years ago)

The above list shows the expected link between human intelligence and that of other primates and demonstrates the relatively wide range of dates for the most recent ancestors. The brain did not develop only by increasing size; it reconfigured, such that significant increases in relative size can be seen in the frontal and parietal lobes. The frontal lobes are associated with speech and gesture; the parietal cortex increased in size at the time more sophisticated tool use began (Geary, 2004).

Hominid EQ started to increase about 1 million YBP and reached a state of linear increase, starting about 500,000 YBP, peaking about 35,000 to 20,000 YBP (Geary, 2004). The decline in EQ after that point (3 to 4%) may be due to a change in selection pressures, or to brain development that was not volume dependent.

Modern man

The date of the origin of modern man (Homo sapiens sapiens) has been frequently revised to accommodate new discoveries, dating, and understanding. It was once believed that modern man first appeared about 30,000 YBP,[2] but each new number has pushed that date further back. It is common to see 200,000 YBP cited in various sources today; some put the date at 250,000 or more YBP.

Homo sapiens began to migrate northward, out of Africa, around 100,000 YBP. Migration branched in many directions, carrying humans to most regions of the globe. The details of the migration are relatively unimportant to the discussion of intelligence, except for the branch that took some Homo sapiens west to what is now Europe, and others east to what is now Asia. Over the course of the following years, humans who settled in various locations faced a variety of selection pressures, resulting in adaptive changes that affected the body as well as the brain.

The human brain evolved in both size and complexity. It is three times the size of the chimpanzee brain, but has only a 25% advantage in the number of neurons. Human brains have, however, much higher numbers of synapses and interconnecting branches (Jensen, 1998).

Modern man may have experienced unusually beneficial mutations that boosted intellectual

output on two occasions. The first was around the time of the cultural explosion around 35,000 to 40,000 YBP. The second may have been an ASPM variant, which is about 6,000 years old and is limited to European populations. ASPM is a gene that is a major determinant of brain size. It may or may not have boosted intelligence, but it appeared at a time of increased complexity in at least some population groups[3] (Cochran G. and Harpending, J., 2005b). In a recent study, Bates et al. (2008) examined four brain size related genes (ASPM, MCPH1, CDK5RAP2, and BRCA1) and found no connection with intelligence or language, perhaps implying that brain complexity (degree of arborization) is the dominant factor.

Language

It is difficult to define the role played by language in the development of human species, or to determine the role language may have played in the evolution of human intelligence. It is obvious that many animal species communicate with each other and that such communication is frequently an aid to survival. Animal communication can serve as a way to warn others of danger, to identify a food source, to assemble a scattered family, and to coordinate migration. But in humans, language became complex, as the brain evolved, allowing the transfer of specific information for group control, planning, and the transfer of learning. The role played by language as an evolutionary factor is probably indirect, for example as a means of enhancing survival by group efforts, as a superior teaching tool, and as a general aid towards the accumulation of survival related knowledge.

The anthropological record shows that as man passed through time, he acquired language, developed it into various increasingly complex forms, and invented means of writing his thoughts. In parallel with this, he devised the related vehicles of art and music and developed those into increasingly complex forms. In the least advanced population groups, much of this simply did not happen.

There are relatively few records of individuals who were denied language during maturation, but at least one well documented one is known as the case of Isabel. From birth to age six, she lived, locked in an attic with her deaf-mute mother. She received food and shelter, but no language and no mental stimulation (not a single toy). When she was found and tested, her mental age was 1 year and 7 months (IQ of about 30). Over the interval from age 6 to 8, she caught up with her age peers and reached a mental age of 8. Thereafter, she matured at the same rate as her age peers and maintained a normal intelligence throughout her life (Jensen, 1998). This unusual case demonstrated both the role of language in normal development and the underlying physiological basis of intelligence. Isabel developed the neural structures during the first six years, that enabled her to rapidly learn language and to use it to catch up to her age peers. Clearly, language is essential to the development of and use of the brain, but it is not the thing that forms the brain, such that it can function normally.

Selection pressures

Increasing intelligence has accompanied the development of higher order species and is especially obvious in primates. The factors that selected for intelligence presumably acted when higher intelligence was advantageous in sustaining successful reproduction cycles. Humans have been unusual among animal species in acting to alter their living conditions in order to survive, as opposed to conforming to the limitations established by various geographic ranges. When

human species were unable to overcome natural forces, they perished, but some managed to survive by using their intelligence to store food and create tools, shelter, and protective garments to increase their survival odds. Consequently, variations in weather patterns, food supplies, and threats from animals and other humans most likely acted to kill fewer individuals with high intelligence than those with low intelligence.

Cold as an evolutionary driver

Winter temperatures have been the focus of much research with respect to the differentiation of intelligence among various human population groups. As people migrated into colder regions, they faced numerous cognitive challenges with respect to planning for winter food needs, developing warm clothing and shelter, hunting under adverse conditions, etc. The presumption is that when migrating groups failed to deal with winter adversity they did not live to continue the struggle. This severe culling of people favored those with higher intelligence.

Beals, et al. (1984) examined 122 population groups on every continent and found a correlation of +.62 between cranial capacity and distance from the equator. One argument concerning the reason for the cranial capacity increase in colder climates is that the larger brain[4] was necessary to enhance survival under the extreme pressure of cold winters (Jensen, 1998). If this is the actual driver, it may be only an accommodation to higher intelligence, rather than a cause of it. There is a notable exception to the relationship between brain size and intelligence. Arctic peoples have the largest mean brain size of any population group, but have a mean IQ of 91. Lynn (1987, 2006), Rushton (2005) and others credit the cold climate for the large brain volume; Lynn reasoned that the small population size of the Arctic Peoples greatly reduced their chances for other mutations necessary for higher intelligence. This exception and a small difference between mean brain volumes between Australian Aborigines (IQ 62) and Bushmen (IQ 54), relative to sub-Saharan Africans, demonstrated that all of the variance between population groups is not accounted for by brain volume; other biological differences are present and account for significant additional variance. Lynn (2006) presented the following to illustrate the relationships between winter temperatures, brain size, and intelligence:

	degrees C Winter Temp	degrees C Wurm Temp	cc Brain size	IQ
Arctic peoples	-15	-20	1,443	91
East Asians	-7	-12	1,416	105
Europeans	0	-5	1,369	99
Native Americans	7	5	1,366	86
S. Asian and N. Africans	12	7	1,293	84

Wurm Temp = coldest winter monthly temperatures during the main Wurm glaciation, from approximately 28,000 to 10,000 YBP.

In warm climates, the relationship between IQ and temperatures becomes irregular. For example, the population groups in sub-Saharan Africa show mean IQ differences, but these are not consistent with the mean temperatures in the associated geographical areas. This is consistent with the expectation that temperature does not act as an evolutionary driver in relatively warm areas, where early man survived by foraging. It is cold that is lethal and which places a premium on cognitive ability.

A very strong marker for winter temperatures is skin color. Templer and Arikawa (2006) found that skin color (darkness) correlated at r = -0.85 between winter high temperatures and r = -0.75 with winter low temperatures (both at $p < 0.001$). The authors do not suggest that skin color is directly related to intelligence, although Jensen pointed out that the data may be a reflection of pleiotropy acting as at least a partial cause. In an earlier study, Jensen (1973) found a correlation of -0.20 between skin color and IQ on a within-group basis. Despite not attempting to imply causation, Templer and Arikawa did present the corresponding correlations between IQ and various other parameters. It is important to note that the correlations are on a nation by nation basis (129 countries), not on an individual basis:

	correlation with IQ
Skin color	-0.90
Real GDP per capita	0.74
Celsius temperature	
winter high	-0.74
winter low	-0.63
summer high	-0.30
summer low	-0.31

Intelligence of Mongoloids[5]

Various sources (Herrnstein & Murray, 1994; Lynn 1987, 2006; Jensen 1998; etc.) have reported estimates of mean Mongoloid intelligence at 3[6] to 5 points[7] above that of Caucasoids (European and of European descent). The early achievements of Mongoloids, especially in China, are well documented; one good example is Murray's (2003) review of Chinese early accomplishments in mathematics, astronomy, invention, maritime expeditions, medicine, architecture, art, literature, and philosophy. The early start of Chinese culture was followed by various starts and stops that are similar to those seen in European history. The early appearance of advanced civilization in China is exactly what would be expected on the basis of the relatively high intelligence of the people.

The Mongoloid intelligence advantage is due to high spatial ability, which offsets a low verbal ability. During the Wurm glaciation, Mongoloids were trapped between ice advancing from the Himalayas in the south and from the Arctic in the north. The severe cold acted as a strong survival filter, leaving subsequent generations physically and mentally changed in ways that reduced body heat loss and enhanced hunting skills and shelter building and other tasks that were necessary to survival.

Lynn (1987) shows a depression of about 4 points in verbal and an advantage of about 6 points in spatial abilities (relative to Caucasoids). He then proceeds to discuss possible evolutionary pressures which could account for this profile. He reasons that during the last ice age (Wurm), Mongoloids must have lived largely as hunters (in the manner of Eskimos). The hunting for survival put a premium on spatial abilities, acting as an evolutionary pressure, favoring that ability. Lynn speculated that the increase in spatial abilities may have taken place at the expense of verbal abilities, literally displacing portions of the verbal centers in the brain. He also pointed

out that there is a sex difference in spatial ability, favoring males, presumably due to the usual role of the male as hunter.

Comment: *The explanation offered by Lynn for the Mongoloid intelligence profile is obviously an idea that is difficult to prove. Since he published that idea in 1987, I asked him (in 2004) if there had been any work that confirmed or disproved the hypothesis. He said that there was nothing new, but was content that the idea was still reasonable. Interestingly, he did not mention the possibility of investigating the spatial and verbal abilities of Mongoloids via brain imaging.*

Intelligence of Ashkenazi Jews

Ashkenazi Jews from Western Europe and the United States[8] have the highest mean IQ of any population group. Various sources cite slightly different numbers, but Lynn's (2006) estimate of a 10 point advantage relative to the British mean is probably accurate, to within a point or two. This advantage is concentrated in verbal and math, while the group is lower in visual-spatial ability (essentially the reverse of the Mongoloid profile). The very high rate of accomplishment among Ashkenazi Jews has been documented repeatedly. One example:

"During the last three decades, Jews have made up 50% of the top two hundred intellectuals, 40 percent of American Nobel Prize Winners in science and economics, 20 percent of professors at the leading universities, 21 percent of high level civil servants, 40 percent of partners in the leading law firms in New York and Washington, 26% of the reporters, editors, and executives of the major print and broadcast media, 59 percent of the directors, writers, and producers of the fifty top-grossing motion pictures from 1965 to 1982, and 58 percent of directors, writers, and producers in two or more primetime television series." [Lipset and Raab (2005) pp 26-27]

The question naturally arises as to what accounts for this high mean. Weather is presumably not a factor, since there was no northward geographical separation relative to lower IQ groups with whom they lived. Several hypotheses have been argued: (1) the intentional practice of eugenics, (2) persecution, (3) genetic drift, and (4) a history of city life, as opposed to farming.

Item 1 – Various sources have cited the relative isolation of the Ashkenazi population group. The group has had a history of less reproductive mixing with other groups than is typical of other population groups, especially those found in Europe. MacDonald (1994), for example, sees a closed breeding group, separated from others on religious grounds, and extrapolates that this history was largely responsible for the emergence of a high group intelligence. He uses the same argument, but applied as less isolation to explain the failure of Sephardic Jews to evolve along the Ashkenazi line.

The problem with this hypotheses is that too little genetic mixing, over a long time period, is likely to reduce the probability of the population group gaining advantageous genes. Lynn (2006) argued that there has always been at least some inter-marriage outside of the group and that even a relatively small amount of exogamy is sufficient to introduce desirable non-Jewish genes into the breeding group. If this is correct, it may imply that there is an optimal range of

mixing and that the Ashkenazi history falls in that range.

Part of the eugenics hypotheses is that Jews encouraged the brightest to have more children and discouraged duller individuals from retaining the Ashkenazi identity. While the argument may be correct and may be a contributing factor, it is very difficult to build a strong case that this is the primary driver of high intelligence among Ashkenazi Jews.

Item 2 – It is common knowledge that Jews have been persecuted in various parts of the world for a very long time, up to and including the present. The argument that persecution was an evolutionary driver is quite similar to the winter temperature argument that is generally applied to Europeans and East Asians. If smarter individuals had a higher probability of successful reproduction than others, the end effect is the same for both weather and persecution. In that regard, this hypothesis is particularly strong.

Item 3 – Genetic drift is a driver of genetic composition when a small group is isolated and has a randomly selected set of genes. This may happen when a large fraction of the initial group is killed, or when a small subset of the initial group is geographically separated from the others. When an isolated group grows in numbers, the genes that were not present, as a matter of chance, will be lost, while those that were present will characterize the group as long as it remains isolated. No mutations are required, but a genetic bottleneck of sorts has to have occurred.

This path also tends to increase inbreeding by amounts that are related to the size of the isolated group. Inbreeding has the potential of causing higher frequencies of recessive genetic diseases and is well documented as having a deleterious impact on intelligence (Jensen, 1998; Rushton and Jensen, 2005). If the genetic drift were accompanied by significant inbreeding, there would be opposing forces that might prevent the large magnitude IQ gains that have happened.

Item 4 – This "city life" hypotheses argues that Ashkenazi Jews found themselves living in cities and performing jobs that were more mentally taxing than was typical of other groups which included large groups involved in farming and herding. It contends that this sustained history led Ashkenazi Jews to evolve in the direction of the intelligence requirements of their city jobs (mostly money lending – see Arkin, 1975). During the near famine conditions of the 10th and 11th centuries, Jews did not suffer and lived at the level of lower nobility (Roth, 2002).

This hypothesis is argued by Cochran, et al. (2005a) along with an attempt to link various genetic diseases that are found among Ashkenazi Jews to the genes that cause high intelligence. The "city life" idea has to meet the same requirements as any other evolutionary explanation—that it contributed to a higher probability of achieving successful reproduction. It could well do that, or at least contribute to it. This line of reasoning is opposite to the weather and persecution hypotheses in that it is a positive contributor, while the other two are literally killers.

One weakness of the "city life" explanation is that is assumes that there is a direction of causation from task to intelligence. If high intelligence was already present in a given group, that group might be expected to gravitate towards work that was complementary of the ability. That case applies in contemporary free markets, in which bright people are attracted to the challenges and rewards of high IQ jobs. But the situation that brought Ashkenazi Jews into

money lending was directly related to their group status as non-Christians. They benefited from the Christian prohibition against usury. In short, there was a demand for lending, but no supply. This presents a somewhat different motivation for entry into a business area; it was not a matching of intellectual ability to a challenging occupation, but one of adapting to a social niche that was created by dictate. So, the job as a filter may have some credibility. Weinryb (1972) makes a case that wealthy Jews had a very high level of reproductive success, with large families, as well as a high standard of living (possibly contributing to a higher survival rate for their children).

Intelligence of Caucasoids

The major sub-groups among Caucasoids are Europeans, South Asians, and North Africans. These groups were described by anthropologists and were later confirmed by analysis of their genetic markers (Cavalli-Sforza, et al., 1994). These three major groups evolved higher intelligence as a function of their latitude: Europeans, IQ 100; South Asians, IQ 90; and North Africans, IQ 85. [Lynn (2006) gives the most detailed account, to date, of the global distribution of intelligence.]

Much of the advancement in human civilization from the time of the Roman Empire to the past century has come from Caucasian groups, with increasing concentration in Europe. Sporre (1990) shows the progress of works of art, architecture, and science from the relatively barren paleolithic period to the present. The first large contributions appeared in early Egypt, spreading northward about 3,000 YBP and then flourishing in Europe for centuries. For whatever reasons, the largest number of significant developments no longer came from China, but were from Europe[9] and especially from four countries: Italy, France, England, and Germany. Murray (2003) attributes the flourishing of accomplishment to cultural and structural richness of principles, craft, and tools that was self-sustaining. Lynn (2006) speculated that this difference was the result of higher social conformity in East Asian countries. Such shifts in centers of innovation and creativity are related to the mean intelligence of the groups in question, but mostly in a *necessary but not sufficient* sense. Other factors, such as governmental structure (relative freedom to create, or pressure to comply with policy), the influence of religion, war, and general prosperity account for significant parts of what is seen historically as innovation and creativity.

Intelligence of Negroids

The populations that remained in Africa differentiated themselves geographically and genetically, as can be easily seen by comparing various sub-groups, such as Masai to Pygmies. Despite various between-group differences found among Negroids, none were subjected to the highly selective pressures of extreme cold and did not develop heat conserving body forms, large crania, or elevated intelligence. Lynn (2006) estimated that the mean IQ of sub-Saharan Africans is 67. Subgroups within this geographic area have reached various IQs that are associated with their breeding groups. Among the lowest of these, the Kalahari Bushmen have a mean IQ of 54 and have a slightly smaller brain size than other sub-Saharan Africans. Pygmies similarly have lower intelligence (IQ 54) than the other Negroid groups. Both Bushmen and Pygmies have lived as hunter-gatherers throughout their history.

r-K strategies

As animal species evolved and increased in complexity, the various species adopted different survival strategies, based on a trade-off between reproduction rates and survival rates. [E. O. Wilson (1975) first proposed what is now known as *r-K* Life History Theory.] This trade-off constitutes a spectrum that, at the extreme *r*-strategy end (considering vertebrates) is typified by fish and reptiles. These species survive by producing huge numbers of offspring, providing little or no care for them, and numerically overcoming the odds that all of them will be eaten or lost to the elements. At the opposite extreme, the *K*-strategy end, reproduction rates are very low, often consisting of one individual per reproductive cycle, but with a high survival rate that is enhanced by intense parental care and protection. The *K*-strategy is seen in vertebrates, where extreme examples include large mammals and primates. The terms *r* and *K* are taken from the equation for population growth:

$$dN / dt = rN (K - N) / K$$

N	population size
K	carrying capacity of the environment
r	rate of population growth

There does not appear to be a direct evolutionary driver associated with *r-K* theory, but Rushton has shown that it offers insight on how group traits evolved, when applied at the sub-species level. He applied Jensen's default hypothesis[10] to humans (an extreme example of the *K*-strategy) and found that the factors that operate over the entire spectrum of *r-K* are found between races and that the between-species traits are predictive of racial trait differences. Since his extension of *r-K* theory was limited to humans (a *K* selected species), he called the application "Differential *K* Theory" (Rushton, 2004).

Rushton (2004) examined traits of 234 mammalian species and found (via principal component analysis) a single life history factor, with the following loadings:

brain weight	.85	litter size	-.54
longevity	.91	age at first mating	.73
gestation time	.86	duration of lactation	.67
birth weight	.62	body weight	.61
		body length	.63

These same factors appear at the sub-species (race) level in humans. In each case, the ordering of the item being measured is such that Caucasoids lie between Mongoloids and Negroids. If there was any chance involved, at least some of the factors should align differently. They do not. Examples of ordered variables (Caucasoid values always lying between the two other races) from Table 1, Rushton (1995):

- **Brain size** -- all forms of measurement
- **Intelligence**
- **Decision times** -- chronometric measurements
- **Maturation rate** -- gestation, skeletal development, motor development, dental development, and age in reproduction measures
- **Personality measures** -- examples: aggressiveness, cautiousness, dominance, impulsivity, self-concept, etc.
- **Social measures** -- marital stability, law abidingness, and mental health
- **Reproductive effort** -- twinning, hormone levels, sex characteristics, permissive attitudes

Differential *K* Theory simply shows that the ordering of variables at the sub-species level can be predicted by the application of the degree to which each group is *K*-selected. It suggests that the evolution of racial groups was not random on a trait by trait basis, but instead followed the same general patterns seen between species.

Since Differential *K* Theory identifies different reproductive strategies on a within-group basis, the question might be raises as to which strategy is most effective. Arguing from one point of view, the population sizes of China and Japan (at various points in time) might imply that the more *K*-selective strategy has been dominant. But present population trends have favored less *K*-selective groups, especially as a result of very low fecundity in industrialized nations. Lynn and Harvey (2007) found a significant global dysgenic effect, such that the world correlation of IQ and fertility is – 0.73. This has resulted in an estimated loss of about .86 IQ points over the past half century[11] and is expected to produce a larger decline of 1.28 points over the next fifty years. The estimates from Lynn and Harvey suggest that global IQ is declining because the more *r*-selected population groups are increasing in numbers, while the more K-selected groups are declining; in a Darwinian sense, *r*-selection wins. When Lynn delivered a paper on this subject in 2007 (International Society for Intelligence Research, annual conference), he pointed to the rapid declines in fertility throughout Europe, standing at well below replacement level. Fertility in the United States stands at the replacement level.

Robust body

Among the ordered, between-group, factors in the list above are longevity and brain size. These, and some other factors, have emerged from the study of human intelligence, all connecting the more robust body to higher intelligence. General health, body symmetry, height, grip strength, and vital capacity all correlate positively with IQ.[12] Some of these correlates (height, for example) are believed to be entirely the result of selective mating.[13] Others are presumably intrinsic genetic factors that are in some way related to a robust body. A negative trait explanation might be offered, which would be that the presence of deleterious genes cause multiple disruptive consequences to the body. This latter explanation is more likely to fit at the low end of the intelligence distribution and would be less effective in explaining the correlation over the full distribution of intelligence.

One of the particularly interesting demonstrations of the robust body concept is the finding that more intelligent individuals have more symmetric bodies. The measurement used is known as "fluctuating asymmetry" (FA). It is derived by measuring finger length, and dimensions at the

ankle, wrists, etc. where there is little fatty tissue. Increasing FA means more body asymmetry.[14] Bates (2007) found FA correlations with IQ for two groups: -0.41 and -0.29; these are within the general range of other FA studies. Furlow et al. (1997) and Prokosch et al. (2005) both hypothesized that the variance in *g* is a consequence of the variance in a general fitness throughout the body and brain.

The presumption is that FA serves as an indicator of the degree of developmental instability in the individual. Developmental instability would reasonably stand to also account for some of the other physical correlates to intelligence, such as measures of strength, general health, longevity, etc. As of 2008, the causal relationship between FA and *g* has not been established. Thoma et al. (2005) found that FA and brain volume both correlated with *g*, but that they did not correlate with each other and Johnson et al. (2008) did not find a correlation between FA and *g*. Consequently, it is not possible to establish probable causation at this time. The thing that can be concluded is that multiple fitness related variables show correlations with intelligence. Whether greater fitness (per these variables) has played a role as an evolutionary driver (in the Darwinian sense) must remain speculative.

Conclusions

Intelligence increased throughout millions of years of evolution, showing increasing presence as animals became more biologically complex. This process is most apparent in brain size and the brain size to body size ratio. As various hominid species appeared, the same process of increasing brain size continued. Today human brain size remains predictive of intelligence for all population groups.

Although there were presumably numerous evolutionary filters that influenced the development of human intelligence along slightly different lines, winter weather stands out as the most salient single force, as is seen in the strong correlation between winter temperatures and the intelligence of various indigenous populations.

The factors that caused different developmental paths in separate races, follow the same *r-K* reproductive strategy that is found throughout the animal kingdom. The absence of exceptions to this process suggest an orderly relationship between races, as they adapted to various local environmental conditions. This underlying factor was mediated in large part by the severe demands of weather and other survival related environmental conditions.

Abbreviations

EQ	encephalization quotient
FA	fluctuating asymmetry
MYA	million years ago
YBP	years before present

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[1] There is a wide range of dates in the literature. Some extend the appearance of modern man to 250,000 YBP.
[2] Homo sapiens neanderthalensis is believed to have become extinct about 30,000 YBP. Now that Homo sapiens sapiens is believed to date back to around 200,000 YBP, a long period of overlap between the species is apparent and has been the source of research aimed at determining the nature of the interactions between the two species.
[3] Population groups are breeding groups.
[4] The brain metabolizes 20% of the total heat produced by the body. As a result, more spherical head shapes evolved in populations living in cold climates. This shape reduces heat loss and acts as a survival advantage under cold conditions.
[5] Mongoloids are East Asians (Japanese, Korean, Chinese, and Mongolian). Lynn has presented data for these nationalities, but reports no studies from Mongolia.
[6] On this subject, The Bell Curve has a discussion of the consequences of a 3 point difference at the mean. The impact is seen in the right tail of the Gaussian distribution curve, where it causes relatively large numerical differences in the number of individuals found in the highly intelligent range.
[7] Lynn (2006) cites 60 studies of Mongoloid intelligence and estimates that the mean IQs in Japan, China, and Korea are 105.
[8] The high IQs being referenced do not include Jews who are not Ashkenazi Jews, nor any Jews from Russia or Eastern Europe. The mean IQs of Sephardic/Oriental Jews, is about 12 points below that of Ashkenazi Jews. The Western European Ashkenazi Jews can be treated as a specific population group and as the source for most of the Ashkenazi Jews who live in the United States.
[9] Murray (2003) discussed the huge gap between scientific and cultural accomplishment in great detail. He assigned 97% of the total scientific accomplishment, throughout history, to Europe and North America. This gigantic difference is documented and subjected to tests of Eurocentric bias.
[10] The default hypothesis states that the factors which explain a variance on a within-group basis will also explain the same variance on a between-group basis. For example, brain size explains a portion of the variance in intelligence within each racial group; the same measure also explains (equally well) the between-group (different races) variance in intelligence.
[11] These estimates are based on the assumption that the heritability of intelligence in undeveloped nations is about half that of developed nations. If a larger heritability is assumed, the decline would be larger. Unfortunately, the data used to calculate heritability have not been collected in undeveloped countries. The authors also assumed a decline in fertility rates for the future estimate.
[12] These correlations have been reported for studies that do not always resolve the question of whether the correlations apply between groups.
[13] The explanation that is commonly offered is that more intelligent males reach positions of greater social standing and have some edge in mate selection. For aesthetic reasons, they pick women with long legs more frequently than those with short legs, thereby creating a height correlation. The height correlation is entirely due to leg length. Sitting height does not show an intelligence correlation. [Jensen, 1998]
[14] FA is used to study developmental instabilities on various non-human species. The application of FA to humans is, therefore, not a new measurement.