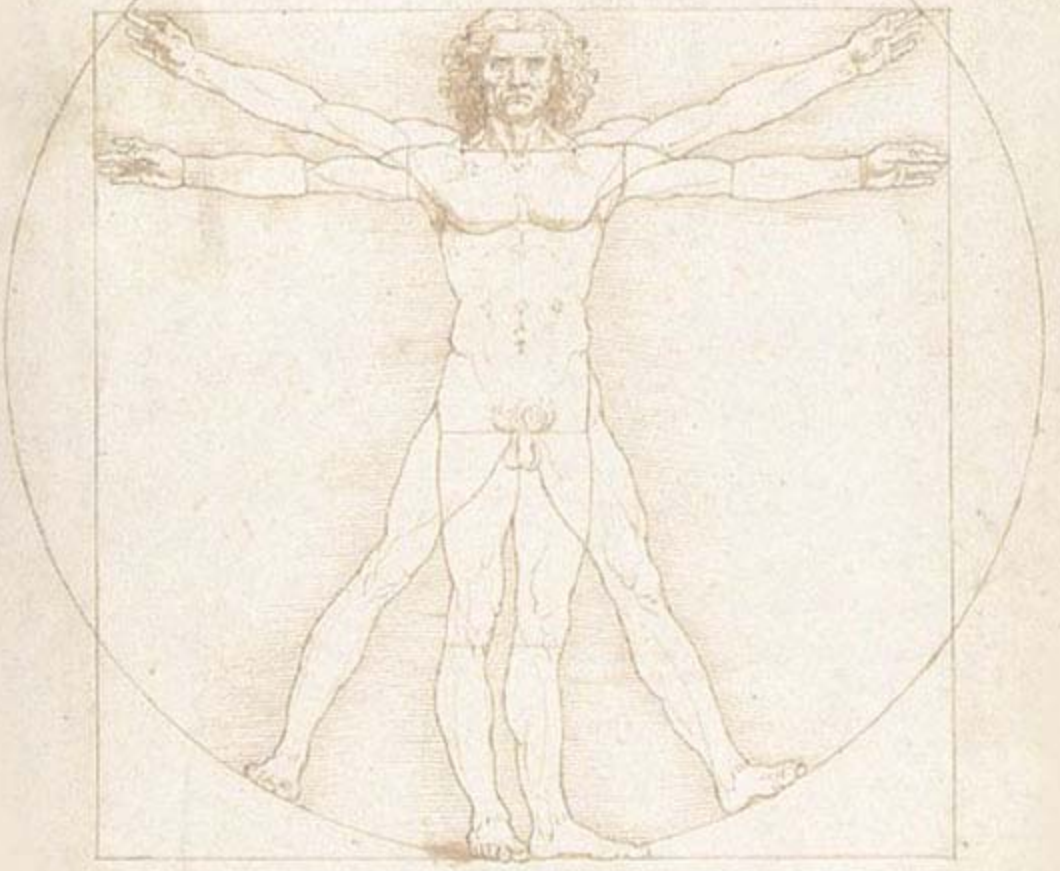
Discussions on Genius and Intelligence



Mega Foundation Interview with Arthur Jensen

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with Arthur Jensen

Christopher Langan and Dr. Gina LoSasso
and Members of the Mega Foundation,
Mega International and the Ultranet

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Forward

Arthur R. Jensen is a prominent educational psychologist who received his PhD from Columbia in 1956. He did his postdoctoral research in London with Hans J. Eysenck, author of the absorbing HIQ must-read *Genius: The Natural History of Creativity*. Jensen is best known for a very controversial essay on genetic heritage that was first published in the February, 1969 issue of the ***Harvard Educational Review,*** in which his research on individual differences in intelligence led him to conclude that intelligence is 80% due to heredity and 20% due to environmental influences. Even more controversial were his findings regarding robust and replicable ethnic differences in fluid intelligence. Coming on the heels of Herrnstein & Murray's controversial bestseller *The Bell Curve*, the extremely well-conceived and well-executed research findings that Jensen revealed in *The g Factor: The Science of Mental Ability* (1998) finally moved the heritability debate into an arena

where it could be satisfactorily explored and challenged in the light of day.

We contacted Dr. Jensen in May, 2001 and introduced him to the Mega Foundation, our work, and our communities, asking him if we might forward to him a few of our members' questions on the topic of intelligence. Although he was in the process of writing a new book, Dr. Jensen very kindly took the time out of his busy schedule to answer all of our questions. (Special thanks to Dr. Robert N. Seitz, Andrea Lobel, Bob Williams and our other members, for contributing questions, ideas and feedback.) This extensive and fascinating interview, as transcribed by Kelly Self and edited by Christopher Langan and Dr. Gina LoSasso, was excerpted in Noesis-E prior to its publication of this electronic book. Those who wish to print out the interview may prefer the single-spaced excerpts available at the **UltraHIQ website.**

Question #1

Christopher Langan for the Mega Foundation: It is reported that one of this century's greatest physicists, Nobelist **Richard Feynman**, had an IQ of 125 or so. Yet, a careful reading of his work reveals amazing powers of concentration and analysis...powers of thought far in excess of those suggested by a z score of well under two standard deviations above the population mean. Could this be evidence that something might be wrong with the way intelligence is tested? Could it mean that early crystallization of intelligence, or specialization of intelligence in a specific set of (sub-g) factors – i.e., a narrow investment of g based on a lopsided combination of opportunity and proclivity - might put it beyond the reach of g-loaded tests weak in those specific factors, leading to deceptive results?

Arthur Jensen: I don't take anecdotal reports of the IQs of

famous persons at all seriously. They are often fictitious and are used to make a point - typically a put-down of IQ test and the whole idea that individual differences in intelligence can be ranked or measured. **James Watson** once claimed an IQ of 115; the daughter of another very famous Nobelist claimed that her father would absolutely "flunk" any IQ test. It's all ridiculous. Furthermore, the outstanding feature of any famous and accomplished person, especially a reputed genius, such as Feynman, is never their level of g (or their IQ), but some special talent and some other traits (e.g., zeal, persistence). Outstanding achievement(s) depend on these other qualities besides high intelligence. The special talents, such as mathematical, musical, artistic, literary, or any other of the various "multiple intelligences" that have been mentioned by **Howard Gardner** and others are more salient in the achievements of geniuses than is their typically high level of g. Most very high-IQ people, of course, are not recognized as geniuses, because they haven't any very outstanding creative achievements to their credit. However, there is a threshold property of IQ, or g, below which few if any individuals are even able to develop high-level complex

talents or become known for socially significant intellectual or artistic achievements. This bare minimum threshold is probably somewhere between about +1.5 sigma and +2 sigma from the population mean on highly g-loaded tests. Childhood IQs that are at least above this threshold can also be misleading. There are two famous scientific geniuses, both Nobelists in physics, whose childhood IQs are very well authenticated to have been in the mid-130s. They are on record and were tested by none other than **Lewis Terman** himself, in his search for subjects in his well-known study of gifted children with IQs of 140 or above on the Stanford-Binet intelligence test. Although these two boys were brought to Terman's attention because they were mathematical prodigies, they failed by a few IQ points to meet the one and only criterion (IQ>139) for inclusion in Terman's study. Although Terman was impressed by them, as a good scientist he had to exclude them from his sample of high-IQ kids. Yet none of the 1,500+ subjects in the study ever won a **Nobel Prize** or has a biography in the **Encyclopedia Britannica** as these two fellows did. Not only were they gifted mathematically, they had a combination of other traits

without which they probably would not have become generally recognized as scientific and inventive geniuses. So-called intelligence tests, or IQ, are not intended to assess these special abilities unrelated to IQ or any other traits involved in outstanding achievement. It would be undesirable for IQ tests to attempt to do so, as it would be undesirable for a clinical thermometer to measure not just temperature but some combination of temperature, blood count, metabolic rate, etc. A good IQ test attempts to estimate the g factor, which isn't a mixture, but a distillate of the one factor (i.e., a unitary source of individual differences variance) that is common to all cognitive tests, however diverse.

I have had personal encounters with three Nobelists in science, including Feynman, who attended a lecture I gave at Cal Tech and later discussed it with me. He, like the other two Nobelists I've known (**Francis Crick** and **William Shockley**), not only came across as extremely sharp, especially in mathematical reasoning, but they were also rather obsessive about making sure they thoroughly understood the topic under immediate discussion. They at times transformed my verbal statements into graphical or mathematical forms and

relationships. Two of these men knew each other very well and often discussed problems with each other. Each thought the other was very smart. I got a chance to test one of these Nobelists with Terman's **Concept Mastery Test**, which was developed to test the Terman gifted group as adults, and he obtained an exceptionally high score even compared to the Terman group all with IQ>139 and a mean of 152.

I have written an essay relevant to this whole question: "**Giftedness and genius: Crucial differences**." In C. P. Benbow & D. Lubinski (Eds.) Intellectual Talent: Psychometric and Social Issues, pp. 393-411. Baltimore: Johns Hopkins University Press.

Question #2

Chris Langan: For practical purposes, psychologists define "intelligence" as problem-solving ability. But there are many kinds of problem, and some of them appear to involve factors not measured by standard IQ tests. For example, the "problem" of how to execute a complex series of dance steps or athletic maneuvers clearly involves a cerebellar "factor". Some experts would object that intelligence implies a level of abstraction not required to solve kinesthetic "problems". But if problems must be abstract in order to qualify for inclusion in intelligence tests, why the correlation of IQ with chronometric indices involving sensorimotor components and virtually no abstraction, e.g. simple reaction time?

Arthur Jensen: This is the trouble with defining "intelligence." If IQ tries to estimate g, it's not going to estimate every particular ability, because g is a factor common

to all mental abilities. "Mental abilities" is a more useful term and the various mental abilities measured by all sorts of tests can classified hierarchically by means of factor analysis in terms of their generality, that is, the amount of variance they have in common with other tests and other factors. The factor called g (for general) is at the top of the hierarchy only because it is the one factor that all other mental abilities have in common (this is explained in detail in Chapters 3 and 4 of my book **The g Factor**).

The g loading of a given test or of some lower-order factor in the factor hierarchy isn't a measure of importance of the given ability but of its generality. Pitch discrimination is an ability with a low g loading i.e., (it is correlated only about .30 with), but it is a crucially important ability for a musician and is totally unimportant for a mathematician. The ability to discriminate hues also has a g loading of about .30 and it is very important for an artist, but not at all for a musician or a mathematician. Various abilities differ markedly in g loading, but one of the interesting things about g that can't be said about other ability factors, is that to succeed in almost any kind of intellectual pursuit, some minimum threshold level of

g ability is necessary, though it may not be sufficient. A high level of some special ability combined with very low g describes an idiot savant, but not a mathematician, musician, or artist in any socially important sense. For many types of subject matter and intellectual skills, achieving a high level of facility or mastery depends upon a fairly high g threshold. Abstract types of problems are usually included in IQ tests because they tend to be more highly g loaded than simpler or less abstract problems, and it is more efficient in terms of test length to include high-g items in IQ tests that are intended to estimate an individual's standing on g in some reference population. However, it is possible to measure g without using abstract test items or even anything that seems very "cognitive". The **inspection time** (IT) paradigm is a good example. IT is the average the speed (visual or auditory exposure time) with which a person can correctly make an exceedingly simple discrimination. This measure correlates about + .50 with IQ as measured by complex and abstract test items. A combination of several such sensory-speed tests will rank-order people about the same as does the conventional IQ. But these chronometric tests are less efficient for most

practical purposes, because they require individual testing with special laboratory equipment and require a longer testing session. One can get essentially the same result with a 15-minute paper-and-pencil test that can be administered to a large number of people at the same time. Psychometrics has two main aspects: (1) theoretical and research-oriented, and (2) practical and applied. They are related, of course, but often look very different and are usually engaged in by different personnel.

The key question is why are reaction times and simple sensory-motor types of performance correlated at all with IQ derived from tests composed entirely of complex, abstract problems. The simple answer is that such different types of tests are correlated because they all reflect g to some extent. It is the next question to which we still have no good answer: What is this g? There are theories and hypotheses, but none that has proved entirely convincing, empirically proved, or generally accepted by experts in the field. It has to be some property (or properties) of the brain that enters into every kind of behavior that involves a conscious discrimination, choice, or decision. The main focus of present-day research on

intelligence is the discovery of the nature of this property of the brain that accounts for the empirical fact of g. It is already known that a number of different physically measured brain variables are correlated with g; but how they work together to cause individual differences in abilities and their intercorrelations is still mysterious. Several chapters of **The g Factor** are devoted to this subject. Another recent book devoted entirely to this question is excellent, but quite technical: Deary, I. J (2000). Looking down on human intelligence: From psychometrics to the brain. Oxford University Press.

Question #3

Chris Langan: As already observed, intelligence is the ability to solve problems. But while one psychologist talks about fluid g, a general intelligence factor that affects the solution of any problem at all, another talks about multiple intelligences applying to different kinds of problem. To some extent, the distinction between intelligence factors and multiple intelligences appears to be semantic; as you have observed, it is easy to overlook with regard to the kinds of problem found on IQ tests, e.g. verbal problems, spatial problems and quantitative problems. So aside from the fact that the multiple-intelligences school effectively expands the meaning of intelligence by expanding the meaning of "problem" to include those encountered by (e.g.) athletes and dancers, what (if any) is the difference between the two approaches...which, as you point out in **The g Factor** (p. 128), rely equally on the "threshold nature" of g? In your conversations or

correspondences with **Gardner**, has he ever explicitly repudiated the mathematics of factor analysis?

Arthur Jensen: It would be better to call "multiple intelligences" multiple factors. Some of the "multiple intelligences" named by **Howard Gardner** haven't yet been included along with a variety of other tests in any large-scale factor analyses, so we don't know if they would show up on already establishes factors or would add new factors to the overall map of the factor structure of human abilities. In any case, several of Gardner's "multiple intelligences" would at best qualify as lower-order factors (most probably first-order factors) in the well establishes 3-stratum hierarchy of human ability factors (Carroll, J. B [1993] Human cognitive abilities: A survey of factor analytic studies. Cambridge University Press). They are not measured by IQ tests (although they may have low correlations with IQ) because IQ tests are intended to assess the g factor and therefore they include mainly test items that best reflect g. There's something to be said for measuring g in as pure a form as possible and using other tests to measure various other factors as purely as possible,

although it turns out that no tests known, so far, exclude some degree of correlation with g. The g factor, however can be mathematically "regressed out" of a measure of some other factor that one wishes to measure independently of g. Because the basic musical aptitudes (e.g., discrimination of pitch, duration of tones, timbres, and memory for rhythms) are all correlated with g, one may be interested in measuring these independently of an individual's level of g. This would be done, for example, in a study of the heritability of musical aptitudes. Because g is highly heritable, the investigator would want to know if the musical aptitude variables are heritable independently of g and would use the statistical techniques of regression or partial correlation to answer this question. As far as I know, Gardner doesn't measure his proposed "multiple intelligences" in any psychometric fashion, but I would bet that the development of any of them to a degree that would make for expert or professional levels of performance requires an above-average threshold level of g. The children who attended **Yehudi Menuhin's** school for musically talented students and had been selected solely on the basis of their demonstrated musical talent on some

musical instrument, for example, had an average IQ of 127. Does anyone want to bet that you could find a concert violinist or pianist with a low IQ? The talent without the g ingredient to go with it results at best in an idiot savant kind of performance, not a "musically intelligent" performance. The same goes for art, and most probably dance, although that has not been tested, to my knowledge.

I have taken part in two symposia with Howard Gardner and have also had correspondence with him regarding g. His position at that time (and also probably today) is that although he believes in the existence of psychometric g, he simply doesn't think it is very interesting or important. I, and many others, on the other hand, think that discovering the nature of g is one of the scientifically most interesting and important subjects in the quest to understand human nature. Others, such as Professor **Linda Gottfredson** are especially interested in the "sociology of intelligence," or the effects of individual and group differences on educational, social, and economic aspects of the human condition.

I should add that I do enjoy reading Gardner's books. I especially recommend Creating Minds (1993) as of special

interest to members of the **Mega Foundation**. This book also reinforces my view that eminence depends very much on other factors besides *g*. Gardner admits, however, that just on the basis of IQ alone at least 90% of the general population would be excluded from the category of the creative geniuses he writes about in his book. To then try to minimize the importance of g and its critical threshold property is, I think, a serious mistake. That is my chief complaint with Gardner, along with his disregard for any form of quantitative treatment of the variables he discusses but which is necessary if his claims are to be objectively tested by himself or by other researchers.

Question #4

Chris Langan: Given that intelligence is problem-solving ability, scant attention is paid to perhaps the most important problem of all: selecting a problem worthy of one's time. Historically, the term "genius" has been associated with people who have solved this problem, and having solved it, went on to solve the very urgent, very complex problem(s) they had chosen. Indeed, many of our best minds consider themselves too busy with important problems to bother with the relatively trivial items in IQ tests. This suggests that a more realistic measure of genius might be obtained by studying a brilliant subject in his or her "natural habitat", analyzing the importance and computational complexity of the real-world problems that he or she has solved or failed to solve (and with further research, perhaps even the intelligence factors required). What do you think of this alternative?

Arthur Jensen: This is a very important point and it is most important in the up bringing and development of intellectually gifted children. I know of true prodigies - children with IQs in the 170-190 range - who were able to graduate from major universities, with majors in math and science, when most children their age are in junior high school, yet their early adult lives have been spent in trivial, but often quite lucrative, activities. It is interesting to note that not one of the four financially most successful adults who as children had been selected for Terman's study of gifted children (IQs>139) ever went to college. The moral of this story seems to be that if you are really very bright and your main aim in life is to make loads of money, you should get started early and don't waste your time going to college. But I surely wouldn't say that **J. D. Rockefeller**, **Henry Ford**, **Bill Gates** and their lives are not of great value to society. They are geniuses in their way, and they have made great contributions to the society.

No one really knows why some children never acquire or develop the important kinds of values, ambitions, and goals that we consider laudable and most beneficial to society,

while others of comparable or even lesser intelligences may do so. And those who do so in the extreme (e.g., **Beethoven**, **Darwin**, **Gandhi**, **Einstein**, and other stars of the last millennium) are an exceptionally rare minority among any cohorts with a comparable level of sheer cognitive ability.

It is known that interests and values, as assessed by questionnaires and inventories, have considerably high heritability, as shown by the high correlations between parents and their biological as compared with the lower correlations between adoptive parents and their adopted children, and by comparing the correlations between full siblings with the correlations between unrelated children reared together. Most of us feel disappointed to see individuals with conspicuously high innate abilities accompanied by a set of interest and values that scarcely correspond to what we would deem the best fulfillment of the individual's potential for achievement. The issue boils down to the question of to what degree interests and values can be inculcated in young people. It may well be that what we would consider "greatness" is such a unique constellation of abilities and traits that it would be virtually impossible to

inculcate all the necessary qualities of the particular constellation in any given individual picked on the basis of just one of these qualities, such as a high IQ, or special ability such as musical talent. This is an example of what behavioral geneticists now refer to as emergenesis: the exceptional achievement results from a particular constellation of traits (including interests and values), and does not emerge if any one of them is lacking. Thus, for example, the difference between **Richard Wagner** and his son **Siegfried Wagner** (also a composer and conductor, though light-years from his father's level of creativity) could have been Siegfried's lack of one or two traits in the rare constellation that permitted Richard Wagner to become recognized as one of the world's great geniuses. It might well have been Richard Wagner's notably high level of the trait "psychoticism," which was not evident in his son's relatively normal, low-key, mild-mannered, and modest character (see the reference in my answer to **Question #1** and my answer to **Question #11**). The kind of study you propose is, in effect, the biographical analysis of persons of great accomplishment. There are a number of such biographical studies in the literature. The

leading researcher on this topic is Professor Dean K. Simonton in his three fascinating books Scientific Genius, Greatness, and Origins of Genius (also of interest: Genius, Creativity, and Leadership: Histriometric Inquiry - *Editors*). The subject is treated in a much more biographical and anecdotal, though very insightful, way in Howard Gardner's Creating Minds (1993).

Question #5

Chris Langan: The study of neural networks suggests that as soon as we can explore the microscopic structure of the human brain and its sensory pathways, including neural connectivity and neurotransmitter concentrations, in vivo – e.g., through new medical scanning procedures – we can achieve what amounts to a purely biological measure of intelligence. Do you think that such a measure will ever be wholly sufficient, or do you think that refinement by performance-based tests will always be necessary?

Arthur Jensen: I'm not at all sure about "intelligence," which is a poorly defined term, but the g factor, I believe, will eventually be explainable completely in terms of brain physiology along the lines suggested in your question. Given the present technology and with a concerted effort this could probably be accomplished within the next two or three

decades. And it will be possible to measure g physically in terms of brain variables. The practical measurement of abilities, however, may remain at the psychometric level, because of its demonstrated practical validity and ease of obtaining measures, as compared with MRI brain scans, PET scans, evoked potentials, laboratory tests of brain chemistry, etc. Performance-based tests will always be necessary for assessing learned skills and achievements (for which the rate and depth of acquisition will inevitably be related to g as well as to motivational and personality variables and environmental circumstances). But much of what is now under the purview of psychometric assessment will be taken over by chronometric measurement, which will have more scientifically meaningful links to brain physiology than do conventional psychometric tests (see my answer to **Question #31**).

Question #6

Chris Langan: Certain high-ceiling intelligence tests, generically called “power tests”, are composed of extremely difficult items requiring higher levels of problem-solving ability than the items on ordinary IQ tests. Since these items usually have no known algorithms, their solutions cannot be looked up in a textbook, and where subjects do not know each other, one must rely on intrinsic problem solving ability. However, by virtue of their difficulty, these problems take longer to solve... sometimes days or even weeks. Accordingly, power tests are untimed and unsupervised. This opens the door to factors like motivation and persistence, which are not among the factors primarily measured by standard IQ tests. On the other hand, virtually every significant intellectual achievement of mankind has involved these factors in great measure. So why does the psychometric community still pay no attention to power tests or the statistics derived from them?

Arthur Jensen: There are many power tests (i.e., non-speeded or untimed tests) in psychometrics, although not of the kind described in this question. Such tests would have little practical use, although they could be of scientific interest in studying the nature of high-level problem solving. But people even capable of taking such tests could be identified with some conventional tests, such as a combination of the **Advanced Raven Matrices** and Terman's **Concept Mastery Test**. People with high scores on such tests can demonstrate their problem solving ability in their careers. What is the need for prior selection? They can make it into college and graduate school if they've got high IQs, and it will be their virtually unique constellation of traits (g + special abilities + motivation + character, etc.) that will determine whether the will, first of all, identify important problems, and secondly, be able to solve them or at least materially contribute to their eventual solution. Solving problems, or even thinking up problems, for which there are presently no algorithms, takes us into the realm of the nature of creativity. There are as yet no psychometric tests for creativity in a nontrivial sense. We can't (yet) predict creativity or measure it as an individual trait, but

can only examine its products after the fact. At present, there are much more tractable problems for research in the realm of human abilities, the most important of which, I believe, is discovering the physical basis of g.

Question #7

Chris Langan: In science, theories and the definitions comprising them are required to have models, and these models are required to fit into an overall model of reality. For example, in physics, the predicate "velocity" must be semantically connected to real physical objects in relative motion, which must in turn be embedded in a model of space and time supporting a mathematical definition of "motion" (e.g. the analytic geometry of classical mechanics). But this becomes problematic with respect to psychological predicates with subjective components for which we lack objective models, e.g. consciousness, qualia and emotions. Intelligence, which is studied strictly in terms of its effectual correlates, is to some extent such a predicate. Can we achieve a true understanding of intelligence without a model of reality transcending the absolute separation of mind and body associated with **Cartesian dualism**?

Arthur Jensen: This is a profound question and gets right at the heart of many of the problems of psychology and making it truly a natural science. Of the important variables in psychology, "intelligence" is one of the few that may lend itself to being researched strictly as a natural science. Much of present-day psychology is, at best, a kind of applied technology, some of it highly useful. But even more of psychology is a kind of shamanism, which will always be here in one form or another, with a relationship to science much like that of alchemy and astrology. Unfortunately this pseudo-scientific kind of psychology, is the only side of psychology known to the general public, and it is something of an embarrassment to those who are striving to advance psychology as a natural science.

A Serious part of the problem is the importance of measurement in the sense of measuring the behavioral phenomena of interest by means of true physical scales, i.e., a ratio scale that is standardized to be invariant across earthly time and space, so that something measured in, say, Bombay in the year 2001 can be directly compared with something

measured in New York in the year 2050, just as we can say that the average height of 18-year old male U.S. Army recruits in 1916 was, say, 5′9″ and in 2000 was 5′10″. There are almost no psychological variables that can be measured on such a true scale on which values can be expressed as ratios or on which nominally equal differences between pairs of values in different ranges of the scale can be treated as truly equal intervals. The mathematical and statistical treatment of data without these true scale properties is thereby seriously handicapped. The most natural scale of true measurement for some psychological variables, e.g. mental abilities, is in units of time. It is now well established that certain kinds of timed performance, measured in seconds or milliseconds, are correlated with scores on psychometric tests, which are the best ordinal (i.e., rank-order) scales of performance. I believe further developments in the use of time-measured psychological variables, such as various reaction time and inspection time paradigms (see Chapter 8 in **The g Factor**), can help to advance truly scientific research on individual differences in mental abilities. (See my answer to **Question #31**.) Of course, psychology as a natural science can have no

use for mind-body dualism. I think I was born opposed to that notion.

Question #8

Chris Langan: As academic performance falls, there is a growing tendency among educational theorists to claim that there is no such thing as a bad student, only bad teachers (common sense, of course, says that there are both). Learning theory, currently the vogue among educators, distinguishes the different "learning styles" of students and offers various prescriptions for helping students perform up to capacity. I was recently told by several graduating teachers that (1) IQ is rapidly becoming a forbidden topic in educational curricula, and (2) the current vogue is a combination of "brain-based learning" (inspired by the **Multiple Intelligences** model) and "cooperative learning", in which students with different "learning styles" (e.g. graphic, visual, auditory or kinesthetic) contribute to each other's learning process. What is your take on these strains of learning theory? Do they constitute a valid approach to the problem of declining scholastic achievement?

Arthur Jensen: The purported decline in academic performance in schools and colleges is a terribly complex phenomenon to get a handle on for serious discussion. It undoubtedly has many causes, mainly associated with the very concept of universal education and the difficult transition from different kinds and levels of education for different segments of society and an increasing uniformity of education for the entire population. Individual differences in abilities are largely ignored by the educational system and the conspicuously continuing effects of their presence in the educational process therefore has given rise to forms of denial that blames teachers, curricula, and institutions. It has also given currency to theories that deny or minimize the reality of individual differences or attributes their causes to supposed faults of the schools and of society in general. The now known scientific facts about individual differences (and I emphasize the word "individual" here) have to be faced and dealt with in the design of education. (Group differences basically are simply aggregated individual differences.) In general, a much more highly diversified educational system is called for. It is still too early to give up trying different approaches to

discover just how the required diversity can be accomplished. But each of the proposed approaches must be clearly described and its results assessed in the nature of a true experiment. Educational practices tend to be a parade of fads and we see new ones come around every year to replace last year's. Few if any of these trial balloons face the real problems confronting public education. In the whole scene, I believe the individual classroom teachers are the least deserving of blame.

Question #9

Chris Langan: The founders of **Mensa**, regarded by many as the original high IQ club, complained that the group had forsaken its original purpose...that instead of pooling its intellectual talent to solve the most urgent problems of society, it had fallen into aimless socializing and dilettantism. Since then, a small number of more rarified groups, known collectively as the **UltraHIQ Community**, have advocated a return to the original vision. What is your opinion regarding the concept of a pool of intellectual talent based strictly on high levels of g and dedicated to finding solutions for some of society's more urgent problems?

Arthur Jensen: It's hard to imagine how a group of high-IQ people with little else in common besides their IQ and probably differing in many other ways perhaps even more than a random sample of the population can do much to effect

social change or carry out a large project with a unified aim. On the other hand, a group of persons with a wide range of IQs from average to very high who have come together as a group because they all have a similar philosophy and some realistic goal based on it could be a force for some concerted kind of achievement. If there were a subgroup of UltraHIQ individuals all with a similar vision, aim, and dedication to achieve their common purpose, that would be something!

But I wouldn't apologize in the least for any High-IQ society that was intended as a purely social organization that qualified people could join simply because the find each others' company more congenial than that of most of the people they would be apt to meet in other social groups. I suspect that the "zone of tolerance" for the intelligence levels of one's friends and spouses is probably, at the outside, about one's own IQ +/- 20. People in the upper-half of the IQ distribution are more closely assortative in this respect than are those in the lower half. In the general population, spouse similarity in IQ is about the same as full-sibling similarity. Assortative mating for a given trait has the effect of increasing the genetic variance in that trait in the offspring generation. It

is estimated that some 15 to 20 percent of the population variance in IQ is attributable to the effect of assortative mating.

Question #10

Chris Langan: Intelligence is about solving problems. Because problems consist of constraints to be satisfied by their solutions, those with high IQs are good at working within the bounds of more or less complex constraints. Yet some problems, especially those involving "lateral thinking", require creativity...the ability to break free of apparent constraints. So to some extent, attributes like creativity, novelty and originality seem paradoxically related to intelligence. Have we had any success in relating creativity to IQ, and specifically to g?

Arthur Jensen: About all I can say on this is that the level of g acts as threshold for the possibility of creativity and that this threshold differs somewhat for different fields of creativity, particularly to the extent that the field calls for a special talent that somewhat outweighs the relative importance of g. The

main reason that a fairly high level of g acts as a threshold is that to be creative in most fields, one has to master the basic knowledge, techniques, and skills needed just to be able to work in the field, to say nothing of being creative in it. The cognitive demands on achieving the essential level of mastery of the working tools are typically considerable and are often highly g-loaded. Hence you don't find truly creative scientists, writers, musicians, etc., with low or even average IQs. A music composer, for example, must master such abstract and complex subjects as harmony, counterpoint, orchestrations, and so on -- all g-loaded subjects. Plus an incredible amount of assiduous practice, so that much of this knowledge and skill repertoire becomes automatized, thereby freeing the individual for creative expression. Read the biographies of any of the importantly creative people in history and you'll find that the prerequisites and necessary personal conditions for creativity are above-average g plus an unusual capacity for work and persistence in the face of difficulty or adversity.

Question #11

Chris Langan: Many people believe that genius and insanity are closely related. Indeed, history provides numerous examples of creativity and insanity or (near-insanity) in close conjunction. Statistically, does intelligence correlate either positively or negatively with any kind of insanity or mental instability?

Arthur Jensen: The supposed relationship between creativity and mental disorder has been well researched and is proven to be a fact. Depression and bipolar disorder have a higher incidence among creative writers and artists than in the general population; schizothymic characteristics are somewhat more frequent among philosophers, mathematicians, and scientists. The late Professor Hans J. Eysenck hypothesized a trait he called "psychoticism" which he thought was an essential ingredient in major-league

creativity. Psychoticism is not itself a psychiatric disorder or disabling condition (although it is associated with a proneness for such), but a constellation of intercorrelated personality traits, most of which I have found in virtually every famous creative genius I've read about. Eysenck's theory and the evidence for it is the most interesting I have come across in this field. This is a complex subject and I couldn't possibly do it justice by trying to explain it all here, but I will recommend the following two books, which are the best I've come across on this topic:

H. J. Eysenck, Genius: The Natural History of Creativity. 1995, Cambridge University Press.

M.A. Runco & R. Richards (Eds.), Eminent Creativity, Everyday Creativity, and Health. 1998, Ablex.

Question #12

Chris Langan: Even IQ tests with moderate ceilings can be upwardly extrapolated, and there exist experimental high-ceiling tests that appear to have much higher ranges than standard IQ tests when anchor-normed on those same standard tests. Indeed, whatever the limitations on its measurement, there would seem to be no *a priori* ceiling on intelligence itself. Yet, some claim that the very idea of an IQ in excess of +4σ is "meaningless". In your opinion, can it be fruitful to consider IQs in excess of +4σ? What, if any, is the absolute upper limit on the measurement of IQ?

Arthur Jensen: I believe we have no means at present of determining a ceiling for intelligence or for extrapolating existing scales to a theoretically derived ceiling. I'm not even sure if the idea of a ceiling for intelligence is a meaningful concept. An upper limit for the measurement of g may be

more meaningful and +4σ (IQ of 160) may well be the highest level in which we can have much confidence that it is g that is being measured. It has long been known that various tests become less g loaded the higher one goes in the IQ distribution. That is, if we gave a large battery of diverse tests to people with IQs above, say, 120 (i.e., the top 10% of the population) and to people with IQs below IQ 80 (the bottom 10%), we will find that the correlations among the tests are considerably smaller in the high IQ group than in the low IQ groups, and consequently the tests have less in common (i.e., their general factor g) and hence lower g loadings in the high than in the low group. This appears to be quite a linear effect as we move up the IQ scale. If the IQ scale were a true interval scale (we only assume it to be such), we could extrapolate the linear trend to the point at which g loadings = 0. That, then, would be the ceiling of the g factor. High IQ persons' abilities become more highly differentiated and specialized, hence are less correlated with one another and afford a weaker basis of prediction of any particular ability from a knowledge of the individual's standing on some other ability. Yet this diverse or differential development of mental abilities itself seems

dependent on the possession of a fairly high level of g, in the sense of superior performance on the kinds of tests that are the most g loaded.

The problem in researching the uppermost region of human abilities is that the further we go above the mean IQ, the smaller is the proportion of the population that we can obtain as research subjects, and, since research in this field depends a lot on statistical inference, we would find it exceedingly difficult, or even impossible, to obtain large enough subject samples to permit statistically significant conclusions. The more highly selected the subject sample, the smaller is the variance of the test scores and their reliability. There are more tractable and scientifically more important things to be researched at present. Because there is little if any practical value in measuring ability levels above the 99th percentile in the general population, hardly anyone, least of all the producers of mental tests, is interested in doing so. The only interest I have ever seen has been among some members of the high IQ clubs that are offshoots of Mensa. I once tested a group of some 20 to 30 volunteers from Mensa. On a standard psychometric test they averaged about 20 IQ points

or so above the average of U. C., Berkeley, undergraduates. I was interested in whether the Mensa subjects would also show faster reaction time (RT) than Berkeley undergrads, who on our RT averaged about +1 s above the general population mean on such tests. The Mensa subjects averaged considerably faster RT than the Berkeley students. The fact that RT is monotonically related to IQ throughout an 80-points IQ range, from about IQ 60 to at least IQ 140, suggests that it might be a useful tool in studying the upper reaches of ability, strange as that may seem. But of course there is a physiological limit to RT, determined in part by the limits on time for sensory transduction of the stimulus and afferent and efferent nerve conductive velocity. But RT has the advantages of measurement on a ratio scale and also of being based on the very same test at all levels of IQ (beginning at a mental age of about 3 years, below which subjects typically have difficulty in performing the RT tasks without training).

Question #13

Chris Langan: Intelligence is the ability to reason, i.e. to solve problems. Problems are solved according to procedural schemata called algorithms. Algorithms can be learned. Ergo, intelligence can to some extent be learned. Equivalently, a mathematician specializing in neural networks might say that since the intelligence which becomes "crystallized" in synaptic weighting patterns is algorithmic in both form and content, neural nets can be trained for "intelligence". The brains of children undergo structural development, and even adult brains retain a certain amount of neural plasticity. So even though statistics indicate that IQ tends to be stable throughout the human lifespan, does it remain possible that under the proper conditions, IQ can to some extent be learned…that a general set of high-level algorithms can be burned into cerebral synapses? Would such an IQ boost necessarily be "hollow" with respect to g?

Arthur Jensen: Yes, certainly. Various thinking or problem-solving algorithms can be trained and even automatized through extensive practice. These phenomena are associated with neural plasticity and the innate capacity for learning. It is individual differences in these brain attributes, rather than the acquisition of specific algorithms for thinking and problem-solving per se, that are the basis of the g factor. Algorithmic training is remarkably specific to a particular subject-matter and has surprisingly little transfer beyond the material on which it has been trained. This is one of the problems with most conventional IQ tests, verbal and nonverbal tests alike: two things are being measured: g + learned algorithmic thinking and problem-solving skills, and these are completely confounded in the total score on the test. Chapter 10 in **The g Factor** deals with just this problem, which is described as the confounding of the vehicle (e.g., the knowledge and skill demands of a particular test) for measuring a given construct and the construct itself (e.g., the g factor). This is a big problem, often insufficiently recognized by the users mental ability tests. It is much less a problem in explicit achievement

tests. A test in algebra, for example, may be a poor way of assessing g, but a good way to find out where a person stands in knowledge and use of algebra. If everyone tested had taken equivalent courses in algebra, the scores on the algebra test would also be quite highly g-loaded (i.e., correlated with g). For persons who have completed high school, tests of reading comprehension measure g about as well as most IQ tests, except for true dyslexics. One of the potential advantages of chronometric tests (e.g., reaction time and inspection time) is that they have some g loading yet have virtually no intellectual or algorithmic content. Their disadvantage is that they also measure, besides g, a large component of purely sensory-motor abilities that fall entirely outside the domain of mental abilities (as shown by their lack of correlation with any other kinds of cognitive tests).

The learning of problem-solving and other algorithms is crucial in most realms of intellectual work and it can be inculcated to a considerable degree through training. It may even improve certain test scores to some extent. But this is not the same as improving whatever it is that makes for g. In fact, the level of algorithmic complexity that can be acquired is

limited by an individual's level of g. Before children are exposed to any kind of maths, for example, one can make fairly good predictions on the basis if IQ of which ones will or will not top out in various levels of higher abstract mathematics, regardless of educational opportunity, effort, and the like. Only persons in the top 15% of the IQ distribution are employed as mathematicians; that seem to be the absolute minimum threshold for this occupation. Many students entering college whose ambitions are to be rocket scientists or engineers soon discover they can't make the math requirements despite their most earnest efforts to do so.

Question #14

Chris Langan: In **The g Factor**, you state (regarding the Flynn Effect) that "Whatever causes the rise in IQ, it has its greatest effect on those at the lower end of the scale, with a corresponding shrinkage of the standard deviation." However, since it is unclear how adult IQ scores above 100 were normed on older IQ tests that relied on mental age, it is unclear whether the distribution to which you refer is that characterizing ratio IQ or deviation IQ, where ratio IQ is thought by some theorists to be lognormally rather than normally distributed (e.g. Vernon Sare, University of London, 1951). Can you clarify this point?

Arthur Jensen: The Mental Age/Chronological Age, or 100(MA/CA) = IQ, has been virtually defunct since the 1940's. All professionally constructed and published IQ tests today are based on deviation IQ [i.e., z = (Raw Score - Mean)/SD,

and IQ = 15z + 100]. The ratio IQ becomes increasingly suspect as children get older. It is based on the presumed (or demonstrated) linear relationship of the test's raw scores to CA. But this relationship begins to depart from linear at around 12 to 13 years of age, and after age 15 (it used to be 16) it is so nonlinear that the MA/CA ratio becomes increasingly meaningless with increasing age. Often the raw scores on a test are converted to normalized z scores and then converted to IQs, ensuring that the IQs are normally distributed; at least in the standardization sample. If we assume that intelligence should be normally distributed, and if the IQ distribution is made perfectly normal (i.e., Gaussian), then we can claim that IQ is an interval scale. But the assumptions are the critical joker in this line of reasoning. There is nothing that actually compels these assumptions; they are merely plausible and statistically convenient.

The best single study of the Flynn Effect (i.e., the secular rise in IQ over the past several decades) was done in Denmark with military conscripts. The lower portion of the IQ distribution showed larger gains than the higher end, probably because in the more recent decades more of the

lower portion under the bell curve received more educational attention and better education, and also probably better pre- and post-natal health care and nutrition.

As raw scores on mental tests are based simply on number of correct answers (a function of item difficulty, i.e., percent of population passing an item), which constitutes only an ordinal (rank-order) scale of ability on the given test, any transformation of the scale -- normal, lognormal, hypergeometric, or whatever -- really has the same status as an ordinal scale, i.e., the raw scores or any transformation of them could just as well be treated as ranks. These can be converted to percentile ranks, a given percentile simply indicating the percent of persons in the standardization group that fall below a given raw score (number right). These percentiles can also be transformed to normalized or lognormalized scores (or any other transformation) if one wants to make assumptions about the form of the distribution of the latent trait (e.g. intelligence) in the population; but not an iota more of real information in conveyed by these transformed scores than is present in the ranked scores. Now if our measure were true physical measures (i.e., a ratio scale)

but were expressed as ranks, their rank order would covey less information than the raw scores themselves. A true ratio scale (e.g., height, weight, reaction time) is a necessary and sufficient condition for describing the form of their distribution in a given population or random sample of some specified population. That's why the "Flynn Effect" for the increase in the average height in the population has not created any controversy as it has in the case of IQ. By having a ratio scale, the phenomenon and its magnitude are clearly established by the raw measurements, whatever may be their cause. But no one argues, "Is it really height that has increased?" That is the whole argument about the Flynn Effect and IQ -- is it really intelligence that has increased, or only test scores? When we get true ratio scales of mental abilities, we will be able to answer the kind of question you are asking. The scientific study of developmental trends in mental growth is greatly handicapped by our lack of true ratio scales, without which the shape of the growth curve of mental test scores is almost meaningless beyond saying it is positively monotonic between any two points on the scale of chronological ages, up to about age 20.

Question #15

Chris Langan: Why are IQ's measured on relative scales rather than in absolute terms? Saying that someone is brighter than than 99% of the population is no more meaningful than saying that someone is taller than 99% of the population. While raw scores on tests containing items of low to moderate complexity provide an "absolute measure" of sorts, they seem only indirectly related to intellectual speed and power. The solution times of various problems, or the most complex problems solvable without time constraints, would be more direct measures of speed and power and thus more acceptable as absolute metrics. Are there other absolute measures of intelligence, and if so, how do they relate to IQ?

Arthur Jensen: This is a continuation of the previous question. I think it quite informative to know a person's percentile score (assuming it as accurate), as it tells you where

that person stands with reference to some "normative" group on the trait in question. A pediatrician can rather precisely measure an infant's head circumference with a tape measure (a ratio scale), but to interpret this measurement he needs to look it up in a table of norms giving the percentile equivalent of that measurement (and its standard deviation) for the average infant of the same age. The only absolute measures of intelligence I know of that are behavioral are various forms of reaction time (RT) and inspection time (IT) measures, which we know, are related to IQ because of their significant correlations with IQ. Interestingly, the longer the average RT for a task beyond about 1 second (for young adults), the less it correlates with IQ. In more complex tasks that take much more than 1 second to perform, other, noncognitive factors enter in and "dilute" the RT measure with sources of variance that do not represent whatever we mean by general intelligence. Physiological measurements, which are a true scale, such as latency and amplitude of the evoked brain potentials and rate of glucose uptake by the brain while solving a problem (measure by PET scan), and (in one study) the brain's pH level, are all correlated not just with IQ, but

with the g factor per se. A combination of such chronometric and physical variables will one day yield ratio-scale measures of mental ability that are scientifically more meaningful than those obtained from conventional IQ tests. The details of this topic form, in part, my answer to **Question #31**.

Question #16

Chris Langan: On most IQ tests, ceiling effects begin to occur above the two-sigma level. Thus, ceiling effects can occur before deviations from a Gaussian distribution become significant, effectively obscuring the deviations. But for (e.g.) blacks, the ceilings are high enough (in standard deviations) that significant differences ought to be apparent and measurable. E.g., if the SD for blacks were 12.75 (85/100 X 15), the 5 SD level would come at IQ 149 and the 4.75 SD level (one in a million) would be IQ 145.56. So blacks should be ideal for studying the differences between ratio IQs and adult deviation IQs, which seem to approximate lognormal and normal distributions respectively. However, this raises some questions: is the black IQ distribution normal, lognormal or Pearson Type IV, i.e. "abnormal"? How has the Flynn Effect acted upon the black IQ distribution (where insulated from the heterotic effects of miscegenation)?

Arthur Jensen: This is a clever thought, although it has become increasingly difficult to get IQ data on blacks, at least in sufficient numbers to study the top-level percentile in the black population. In light of what I said in my answers regarding scales and distributions, I don't think it would be fruitful to pursue this issue with conventional tests. I have looked at a great many distributions of both white and black IQs in whole school populations. The black distributions generally resemble the Pearson Type IV Distribution; it is considerably skewed to the right. Not as much, if any, theoretical significance can be attached to this observation as would be possible if the mental measurements were a ratio scale.

Question #17

Chris Langan: It has been argued that the deviations from a normal curve that occur among child IQs are simply a function of varying rates of mental maturation. Thus, while the distribution of childhood ratio IQs looks closer to lognormal than normal, and while the distribution of some adult indices like AGCT-derived IQ scores shows a frequency pattern agreeing closely with childhood ratio-IQ distributions, the distribution of adult IQs is Gaussian. Now, if specific individuals tend to regress toward the mean as they mature but the overall distribution remains the same as it is for children, then there must be "late bloomers" who rise to take their places in order to keep the upper ranges of the distribution populated. Has this phenomenon been studied? Do very high adult ratio IQ's appear with greater-than-Gaussian frequency as they do with children, or are the distributions different?

Arthur Jensen: Yes, the variation in IQ (or relative standing in some normative group) as individuals grow up from about age 2 (when IQs are first reliably measured) to maturity has been studied quite thoroughly. (The subject is treated at length in my book **Bias in Mental Testing**, Chapter 7, 1980 Free Press). (Also see **The g Factor**, pp. 316-318.) Individuals' IQs fluctuate rather randomly up and down throughout their development, but become increasingly stable with each successive year. This has been studied by looking at the matrix of correlations betweeen IQs measured every year from age 2 to age 18 or so. The correlations are increasingly higher as a function of age. Many early bloomers and late bloomers exchange their positions in the IQ distribution, and in about equal numbers. Hence the overall distribution of IQs remains fairly constant throughout the entire developmental period.

Question #18

Chris Langan: It seems that research on the profoundly gifted has not only been very limited, but that virtually none of it addresses the question of how society can bring out the best in its brightest members. One of our members, Bob Seitz, asks: "During my years with NASA and Georgia Tech, I casually wondered why there didn't seem to be a national registry of the very brightest, with attention to their needs and their encouragement. But when, two years ago, I finally discovered the ragged state of affairs vis-a-vis our brightest, I was shocked.

It seems that as IQ's rise from 75 to 125, dramatic changes occur in life outcomes and socioeconomic statuses. But once intelligence exceeds the upper part of that range, there seems to be little correlation between IQ and success in even the most demanding intellectual pursuits. This raises the possibility that high-IQ types are being neither allowed to

fully utilize their potential nor rewarded in proportion to their abilities. One might expect this to detract from their enthusiasm and level of performance. But even though the costs to society may be immeasurable, no one seems to be addressing or investigating the situation. Do you have any opinions on this matter?"

Arthur Jensen: This all goes back again to the fact that achievement in a multiplicative (not additive) function of a number of critical traits, of which g is only one, though a very important one. Given a range of IQs sufficient for everyone within that range to be able to learn the "tools of the trade", then other personal factors become more critical determinants of achievement. The more unusual the achievement, the greater the number of different factors that have acted multiplicatively to produce it. People do not tend to undervalue intelligence so much as they undervalue the other multiplicative traits that enter into achievement. Our expectations for achievement are weighted too much for then effect of IQ and not enough for other valuable traits. Because of its threshold nature, however, a low IQ is a handicap, and

even more so in our modern technological society than in the more agrarian past. Higher IQ is always an advantage in the multiplicative combination of factors required for outstanding achievement. One of the things most lacking in education, and often also in parental upbringing today, is inculcation of the kind of values, including self-discipline, that are among of the essential ingredients in the multiplicative formula involved in outstanding achievement.

Question #19

Chris Langan: Aside from social ineptitude, perhaps the trait most often associated with IQ > +4σ is being a multimillionaire (Bill Gates is a frequently-cited example). It seems that when the hyper-gifted turn their hands to making money, they succeed in spades. But with respect to social utility, this is often a waste. We need cures for cancer…better ways to relate to each other…cures for Alzheimer's and Parkinson's Diseases…a marriage between general relativity and quantum mechanics. In short, we need real works of genius. But even though society has a vested interest in fully utilizing the talents of its geniuses, it continues to let itself be vastly outbid for their services. We encourage "real geniuses" to squander their potential on what often turns out to be pointless, inflationary acceleration of the financial treadmill while discouraging those without academic credentials from participating in the social and intellectual mainstream, relying

on the survivors of academic bureaucracy to solve our most urgent problems. Unfortunately, academic politics is not a valid test of intelligence. Is there any effort to understand what's going wrong in this area?

Arthur Jensen: I believe that, generally, multi-billionaires do have plenty of "social utility" --the Rockefeller, Ford, Carnegie, Sloane-Kettering, and Mellon foundations, for example, not to mention the industries, jobs, and their products that have benefited the whole society are indeed a boon to the whole society. These foundations built on the fortunes of these billionaires are responsible for many of the grants made to researchers working on Alzheimer's, Parkinson's, caners, AIDS, and a great many other medical and humanitarian enterprises. The industrial and financial achievements on the scale of Gates, Rockefeller, Ford, Etc., it seems to me, are highly worthy of our admiration.

I do agree that in today's world, especially in the United States, the job market places too much emphasis on academic credentials, and not enough on the assessment of actual abilities. If I had to choose between knowing a job applicant's

IQ or level of education, I'd pick the IQ, assuming the job doesn't require some specialized skills that can only be acquired in college or graduate school. In today's world, however, one has to wonder about a high IQ individual who has not finished high school or gone to college; one would want to know about other achievements as well as their personality traits. In personnel selection it is most valuable to have objective test scores both on g and on subjects most relevant to the job as well as formal educational credentials. They are usually in fair agreement, but when not, they bear further looking into.

Question #20

Chris Langan: In working with some of the profoundly gifted, I've encountered a few hints about how their extraordinary potentialities become derailed. There seem to be major problems with the extremely gifted in a society that isn't geared to them, like the plight of an eight-footer in a house with six-foot ceilings. How much attention has been given to the social and emotional problems of the highly gifted population?

Arthur Jensen: I know other psychologists who are better able to answer this than I can, for example Professors Julian Stanley (John Hopkins), David Lubinski, and Camilla Benbow (Vanderbilt). It is true that most super-gifted children, especially as they approach adolescence, are not as challenged or as happy about going to school with their age-mates as they would be if they were entered into a regular 4-year

college with classmates who are six or seven years older. The channeling that takes place in college and thereafter in the world of work is such that people generally find themselves in the company of others who are not all that different from themselves in abilities, interests, and the like. The super-ability types usually come to realize that people differ greatly in abilities, and that they have to learn to live with this fact gracefully. Those who don't learn this lesson pay a price. I haven't yet seen a good case made for the idea that people become maladjusted simply because of their having a very high IQ. Although IQ and mental health have only a slight positive correlation with each other, it's not in the least surprising to come across high IQ persons with emotional and inter-personal problems. But I doubt that any disability can be blamed on a person's having a high IQ per se.

I do feel sorry for those children whose parents have been told that their child is gifted and never let their child forget it for one minute. (The singled-out child's siblings suffer as well in this case.) It's interesting to read the later volumes of Terman's Genetic Studies of Genius (based on subjects selected as school-age children with Stanford-Binet IQ>139). A

large majority of these "Termanites" became fairly ordinary adults and some were less successful in life than are many persons of average IQ. I have heard some educators express concern that something must have gone terribly wrong in the upbringing or education of many of the Terman group to cause the average level of their apparent achievements as adults to be so considerably less impressive than their IQ. But this IQ-achievement discrepancy is exactly what one should expect in terms of the multiplicative theory of achievement I have described in my answers to some of the previous questions.

Question #21

Chris Langan: As students, doctors and lawyers take tests like the LSAT, their average IQs are found to be around 127, while in contrast, mathematicians average around 140. Has any research been done relating test scores to minimally acceptable professional performance in (e.g.) medicine and law, as gauged by (e.g.) deaths attributable to diagnostic error, cases lost, or judgments overturned? Since certain studies have found that IQ is a better predictor of job performance than educational credentials, shouldn't we (and our licensing bureaus) be paying more attention to it? Is our failure to do so attributable to affirmative action or other minority preference programs?

Arthur Jensen: Excellent question. Probably the answer to it might be too politically incorrect for anyone to be able to risk the research that could answer it, or to even obtain a grant to

do such research. There are plenty of anecdotes that one hears of, but I haven't come across any bona fide research studies that investigated the relationship between test scores and performance catastrophes at a professional level such as you mention. But it is hard to imagine that such a relationship does not exist, since such a relationship has been amply demonstrated by research on personnel selection in hundreds of jobs in which test validity has been determined in terms of actual job performance. The U.S. Employment Service, using the General Aptitude Test Battery (GATB), has published the results of literally hundreds of such test validation studies for predicting success or failure in various job categories, not including doctors or lawyers or other high-level professionals. And it is the g factor of the GATB that carries most of the predictive power of this battery composed of eleven diverse tests. It would be a safe bet that doctors (or other professionals) who are fired because their performance is at a sub threshold level of competence have a lower average IQ than the competent majority of their profession. I intend to circulate this question among some colleagues who are more expert on this topic than I and will let you know if there are

any studies that can provide a more definite answer to your question. But the issue is so contaminated by the need for political correctness that it may be virtually impossible to obtain a valid answer in the present climate.

Question #22

Chris Langan: The "generality" of g reflects the fact that g is found in conjunction with every other intelligence factor...that, as you posit in **The g Factor**, it represents a combination of all of the distributive criteria that contribute to intellectual processing everywhere in the brain. Some of these criteria clearly have a genetic basis, e.g. neural and synaptic density, neural conduction velocity, neurotransmitter abundances and control mechanisms, glial density, degree of axon myelinization and so on. Just as genetics dictates that a rat is more intelligent than an insect and a man is more intelligent than a rat, human beings differ in genetic constitution and may therefore differ in these criteria. So g is biologically plausible as well as empirically confirmed. But with the advent of the politically correct Multiple Intelligences theory, it has fallen into disrepute among educators and been rendered prematurely obsolescent. What is your opinion of

those who, being more enamored of political correctness than common sense, deny the existence of g despite its scientific basis? Do you see a light at the end of the tunnel?

Arthur Jensen: My answer to this question must already be obvious. The "light at the end of the tunnel" is simply objective empirical science. Those who would belittle the role of g in human cognition could prove their case simply by showing that their tests, or measures, or assessments of "multiple intelligences" are more highly correlated with any important "real-life" criteria independently of g than those criteria are correlated with g alone. But most researchers of "multiple intelligences" don't actually measure anything at all. Their claims are based on purely literary, armchair psychology. So there is no means of putting their theories to an empirical test. It is simply non-science and just a part of the passing parade of untested notions that so frequently attract educators and dilettantes. That some of these fads are also perceived as PC, of course, adds to their popular attraction.

Question #23

Chris Langan: With each passing year, it seems that popular culture places a lower value on high intelligence. Intelligent or studious children are called "geeks", while intellectual mediocrity is regarded as "cool". So shamelessly do the popular media encourage this perception that it sometimes seems as though the human race is being systematically lulled into a state of intellectual degeneracy. In your opinion, will this trend ever be successfully counteracted? If not, what do you foresee as the long-term effect on the distribution of intelligence in the general population?

Arthur Jensen: The trend you describe will be (or is already being) successfully counteracted in some other countries, and as a result, unless we soon get our own house in order, we'll be the losers--scientifically, culturally, and economically. There is nothing in the Book of Nature that says the USA is automatically immune to the possibility of devolving towards

the conditions of Third World countries. The advancing front of future civilization may well gravitate eastwardly. I can't say I ever really understood Oswald Spengler, but the title of his famous book *(Decline of the West, Ed.)* seems prophetic. But I don't worry about it as long as civilization will be preserved and developed somewhere on earth.

Question #24

Chris Langan: There is a certain amount of evidence supporting the hypothesis that intelligent people, being better able to fill their lives without raising families, are having fewer children. Unfortunately, for every socially responsible, intelligent person who decides to postpone or forego childbearing, ten others, many with lesser genetic endowments, stand ready to fill his or her place in the gene pool with their own progeny. Insofar as the net result would appear to be dysgenic, is it ethical to continue to let this happen?

Arthur Jensen: Yes, it is likely that there is a dysgenic trend in g level, at least in the USA. A plausible case can be garnered from U.S. Census data over the last 3 decades. I don't know whether it is or isn't ethical to neglect seriously investigating the possibility of a dysgenic trend or, if it indeed exists, to do

nothing about it. But a dysgenic trend that affects the overall level of g in the society would have ill-fated consequences for this country's future welfare, to say the least. Three facts have to be much more generally understood: (1) There is a g factor, (2) the distribution and overall level of g in the population is causally related to the level of civilization and the quality of life in a modern society, and (3) g is highly heritable (i.e., influenced by genetic factors). Given these facts, a conclusion regarding dysgenics would depend on examining birth rates in different segments of the distribution of the g factor in the nation's population. Depending on the conclusions from this examination, it will be up to informed public opinion and the public will need to decide what, if anything, should be done, or could be done, about it in our free society.

Question #25

Chris Langan: Modern civilization grows increasingly dependent on complex technology, and thus on people with the intelligence to design, implement and maintain it. This places a higher level of social utility on high intelligence, and thus on highly intelligent people. This brings to mind a rather depressing joke: “The problem with the gene pool is that there is no lifeguard!” Would intellectual eugenics necessarily be a bad thing for humanity? Is there a danger that this would lead to a *Brave New World* scenario?

Arthur Jensen: Right on target! "Brave New World" is of course pure science fiction, which is invariably based on the science of the past and rarely imagines anything like the actual scientific and technological developments of the future. But there are even worse scenarios - dysgenic ones - than are portrayed in Huxley's novel. The lower one-fourth (perhaps

even the lower one-third) of the IQ distribution, as we know its mental capabilities today, will have a hard time finding gainful employment of the kinds that are needed in a largely technological, information-intensive society. The USA is already having to import workers, mostly from Asia, to fill these kinds of positions, which would otherwise have to go begging for applicants.

A serious question that is hardly ever put up for discussion is whether a society should design itself in terms of the level of ability (largely g) and work demands that could accommodate the vast majority of its existing population or work toward raising the overall level of ability to accommodate the increasing ability demands of our trend toward a more technological and information-intensive society. A number of symposia could be organized about this theme.

Question #26

Chris Langan: For some time now, Robert Plomin has been locating genes associated with high IQ. The evolution of the human genome project raises the possibility that even more of these genes will soon be located. Meanwhile, genetic testing and engineering technology promises to let people select their mates for complementary genetic characteristics, and even to "upgrade" the DNA of their offspring *in vitro*. Do you see this as harmful or beneficial to society?

Arthur Jensen: American behavioral geneticist Robert Plomin (now a professor in the Behavioral Genetics Research Unit at the Institute of Psychiatry in London, England), working with a large team of colleagues specializing in genetic research, has already identified several different sections of DNA (on chromosome #6) which reliably differ between large groups of people of <u>average</u> IQ and of very <u>high</u> IQ. This research is

progressing at an accelerating rate as the technology for identifying differences in specific sections of DNA (not necessarily genes per se) is advancing rapidly. Inevitably many more "IQ genes" will be identified within the very near future. No one in the field is really surprised by Plomin's findings, because the heritability of IQ and of psychometric g (which is the main basis of IQ heritability) has long been well established by the methods of quantitative genetics based on the correlations of various kinships reared together and reared apart. The importance of Plomin's research is that it yields specific information that will be used to trace the pathways of genetic expression, i.e., discovering just how the identified genes chemically affect the development of the brain variables that cause individual differences in g. It is a necessary complement to the approaches based on direct studies of brain physiology, affording clues that narrow the search for the key causal variables. Knowing precisely what a gene does and how it does it is a major step toward understanding the workings of brain-behavior phenomena. The history of such advances in scientific knowledge strongly indicates that they most usually prove beneficial to humanity.

Plomin's effort, I believe, is one of the most worthwhile pursuits in present-day behavioral science.

Question #27

Chris Langan: It was suggested some time ago that pharmacological methods, e.g. neurotransmitter loading, could boost mental performance. More recently, the initial phase of the Human Genome Project has begun to give way to the secondary "proteomic" phase, i.e. tracing the biochemical pathways of genetic expression. As some of the involved proteins are implicated in mental performance, new IQ-boosting drug therapies may be discovered. Is there any reason to be interested in genetic intellectual endowment when it may soon be possible for the under-endowed to swallow higher intelligence in the form of a pill?

Arthur Jensen: One important advantage of the purely genetic effects on the development of intellectual functions, in contrast to chemically induced effects in individuals, is obviously that the genetic effects can be transmitted naturally

from generation to generation, whereas the chemical effects must be continually reinstated anew in every generation. In a period of large-scale catastrophe many of those who were dependent on the chemical treatment would be deprived. I think it essential that the genetic mechanisms involved in mental abilities to be further researched, because even the discovery of effective chemical interventions for improving a person's level of g will depend in large part on an understanding of the chemical pathways through which the genes affect individual differences in g or other ability factors that may also be under genetic influence.

Question #28

Chris Langan: Because genetic testing and engineering costs money, only the wealthy can easily afford it. This raises the possibility that intelligence will become increasingly correlated with socioeconomic status…that the central thesis of the controversial bestseller *The Bell Curve* will be artificially amplified by genetic tampering. Do you see this as a potential threat to social stability?

Arthur Jensen: This question raises serious concerns about the extent to which, in a democratic society, the government should be involved in control over science, its applications, and the lives of its citizens in general. The thesis of The Bell Curve was met with paroxysms of denial and it is doubtful whether the problem posed in this question will, in the present political atmosphere, receive the kind of serious discussion it deserves. The gap between the "haves" and "have

nots" in this country, to say nothing of the world at large, is, I fear, already great enough to be "a potential threat to social stability."

Question #29

Chris Langan: Just as the human brain excels at certain intellectual tasks, computers excel at solving other kinds of problem. Hence, the idea of creating a superior intelligence by wiring together brain and machine. Do you regard as ethical this potentially dehumanizing “cyborg” approach to intellectual augmentation, which some regard as inevitable?

Arthur Jensen: This still looks to me like science fiction. Many of us are already quite tied to computers (I am in that condition at this very moment!), although not through any direct line into the brain's circuitry. That possibility sounds a bit awful to me, but as a matter of principle I won't stop it if it became a reality. In my personal philosophy I tend to be "pro-choice" all the way, and I only hope we can preserve and promote that freedom!

Question #30

Chris Langan: As far as the evidence is concerned, the existence of g is scientifically indisputable. But let's face it: this poses a problem for minorities possessing statistically less of it per capita. After all, if it is simply accepted that the mean IQs for "colored" people and pure blacks are respectively one and two standard deviations below the mean white IQ, employers and educators may be tempted to apply these statistics in vocational and academic contexts, effectively leading to "discriminatory" outcomes in which the minorities in question are "underrepresented". Accordingly, certain remedial principles of social engineering are assigned a higher priority than the psychometric findings themselves, resulting in reverse discrimination against qualified people of European and Asian ancestry. Given that this country is run by those with backgrounds in the social sciences rather than in psychometrics, do you foresee any changes?

Arthur Jensen: I sense a growing tendency in our society in favor of treating all persons as individuals, and I believe that increasingly individual rights will trump group rights. The government itself should not discriminate on the basis of face, ethnicity, national origin, religion, sex, or sexual orientation. I believe the same policy should be inculcated in the personal belief system of all citizens. But of course this is one person's ethical philosophy (and I hope also that of a vast majority of Americans), although it has nothing to do with scientific evidence. I believe that any kind of quotas or discrimination in education or employment opportunities based on an individual's group membership rather than on that individual's own characteristics only promote social conflict and instability. A just society can help people in need without resorting to discrimination on the basis of irrelevant criteria involving group-membership. It also promotes ill will and social unrest if members of minority groups have the perceptions that the majority is not making a very real effort to shun group discrimination and to treat people strictly as so-called "America's race problem."

Question #31

Chris Langan: You're working on a new book. Can you please tell us briefly what the working title is and what it will cover?

Arthur Jensen: The working title of the book I am presently writing is "Mental Chronometry and Individual Differences." It is not conceived as a "trade book" in the least, but will be a highly specialized and technical treatise for advanced students and professional doing research in this field, or wanting to learn more about it. Mental chronometry bridges the interface of brain and behavior and can benefit both of these subjects of inquiry. To get a better hold on brain-behavior connections, we need better behavioral measures of individual differences than are provided by our present psychometric tests that have no true scale and can only rank-order individuals. As mentioned several times in response to

previous question regarding measurement problems, I believe we must measure individual differences in mental abilities by means of true ratio scales, and these can be made possible with mental chronometry. Models of brain activity built on the time taken by various mental functions are already a venerable area of research in experimental psychology and can provide a basis for exploring the nature and dimensions of individual differences. The burgeoning research literature on this is already surprisingly vast, and it is a big job just getting it under control, even though I have been working in this area for some 20 years. This research requires very special instrumentation (now greatly aided by computers), and individual testing of subjects under highly controlled laboratory conditions. The time measurements obtained make much more sense in relation to physiological and electro-physiological brain measurements than do the ordinal-scale scores on psychometric tests. We are dealing here with measurements in milliseconds, mostly in the range below one or two seconds. These chronometric methods are of interest not only in experimental and differential psychology, but are being increasingly used in medical diagnosis and treatment.

Chronometric variables are fare more sensitive to subtle drug effects than are any psychometric tests. Chronometric methods also can detect insidious brain conditions long before they can be recognized through subjective self-awareness, gross behavioral observations, or conventional psychological testing. However, as a useful tool for studying individual differences in both their normal and abnormal aspects, mental chronometry is still in its bare infancy. I believe it should become a major branch of behavioral science, and I hope my projected book will help it along this path.

Christopher Langan and Gina LoSasso

About the Mega Foundation

Christopher Michael Langan was identified as "severely gifted" while still a young child. As he grew up, he was nevertheless challenged with inadequate schooling, extreme poverty, bouts of severe abuse, and the responsibility of helping care for his younger siblings. Raised to value brawn as highly as brains, Christopher worked at various times as a cowboy, firefighter and construction worker, and for the past 20+ years, as a bar bouncer in assorted nightclubs across the

East End of Long Island. Without benefit of formal higher education, he has engaged for over two decades in research on mathematics, physics, cosmology and the cognitive sciences.

Gina Lynne LoSasso was born and raised in Brooklyn, NY. Although tested and identified as "severely gifted" at a young age, she "fell through the cracks", and like far too many other exceptionally gifted individuals, became a high school dropout at age 16. She finally returned to school full-time in her late thirties and earned a doctoral degree in Clinical Psychology, after which she completed a post-doctoral residency in Neuropsychology.

In 1999, Gina and Chris created the Mega Foundation, a charitable nonprofit foundation established to provide aid, support and camaraderie to the severely gifted in order to help these creative individuals reach their goals and realize their potential. Hundreds of exceptional people have already come together under the Mega Foundation aegis to find friendship, share ideas, and become involved in Foundation programs and projects.

About Mega Press

Mega Press is a small alternative press operating under the auspices of the **Mega Foundation**. The mission of Mega Press is to provide an alternative publishing venue for extremely gifted individuals who are unable or unwilling to publish their work through larger, more traditional publishing houses. Mega Press authors retain all rights to the distribution and presentation of their intellectual property.

In addition to publishing print and electronic editions of selected writing, research and artwork from members of the gifted community, Mega Press is preparing a series of free or low-cost high-quality electronic books based on public domain art, science, mathematics, literature and philosophy.

For more information about Mega Press, contact the Mega Foundation at **info@megafoundation.org** or visit the **Mega Press website** to join our mailing list for updates.