

The Notion of Giftedness An Inquiring Essay

I have no patience for the hypothesis occasionally expressed, and often implied, especially in tales written to teach children to be good, that babies are born pretty much alike, and that the sole agencies in creating differences between boy and boy, and man and man, are steady application and moral effort

This is Francis Galton, who in his book on *Hereditary Genius* (1869), proceeds to explain that mental capacity, as well as physical, is hereditary: and although education can help to realise potential, it can never help to transcend it. Francis Galton (1822-1911) was one of those 'Eminent Victorians', who played a major role in introducing statistics in the Social sciences. He is remembered for making explicit the statistical concept of correlation, and responsible for making the normal distribution such a norm. In one of the chapters of this book (reprinted in *The World of Mathematics*, Vol II p.1173-1188) titled *Classification of Men according to their natural Gifts*, from which the quoted passage above, provides the introductory sentences, he makes explicit a statistical hierarchy of man. The argument of Galton is essentially by analogy. He points out that training can improve your physical performance, at first spectacularly (leading many a beginner to dream about glory) then levelling off, to eventually reach a limit, which a more gifted athlete can easily surpass, even without special training. In the same way he argues, your intellectual capacity can be nurtured and improved, but only up to a limit, which can only be transcended by somebody intrinsically more gifted.

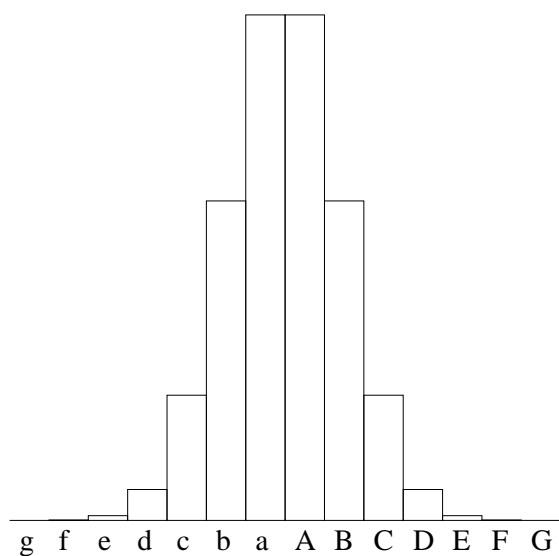
This is both a very attractive idea, as well as a deeply depressing one. As it is our mental capacity that makes us transcend our animal cousins, and which constitute the basis for our civilization, and its concomitant achievements in Arts, Science etc, it provides the ultimate source for our pride, and defines what is the essence of being human.¹ Thus people who possess this quality in higher degree can thus in a sense partake of a larger share of human self-congratulatory pride. It also leads into potential contradiction for two of the major legacies of the Enlightenment, namely the notion of Human Reasoning being the ultimate guide, and the Equality of Man. There are two ways of reconciliation, either that all men are equal, and then by necessity endowed with the same mental powers; or that the intrinsic worth of a human being is measured by his or her intelligence, and not by his or her social class. It is the latter view that has tended to be predominant; but by assuming that mental gifts are transmitted through heredity, there is a danger to once again identify worth by social (or racial) belonging, both being in a sense self-perpetuating.

Now why is it considered nobler to achieve something by being inherently gifted, rather than by perseverance and industry? Is not the temperament of being tenacious and hard-working, also a kind of gift; and if so, if it achieves the same ends, why should it

¹ As possible rivals to intelligence, may be noted a refined Moral sense, and maybe even a Religious sensibility. Those might have been taken seriously in the 19th century, but in the 20th century intelligence seems to go undisputed

not be classified as highly? Clearly there is a Romantic Notion at play here, the notion of a mind with a privileged access to the divine. One speaks of intuition and inspiration, as godgiven, and the one who has those gifts is elevated to a status of a demi-god - a genius. This notion is very deeply ingrained, and to deny its validity, is to cast into doubt the very notion of individual worth. What fascinates people about intellectual achievements, is not so much the work behind, as the possibility of exactly that mysterious quality - intuition, which is supposed to provide a short-cut to the truth.

Galton is very systematic. He proceeds to classify people along a normal distribution, giving very specific figures (see table below). He speaks about the classes A,B and C of mediocrity, being mirrored by a,b, and c, in toto making up at about 95% of the human population. The class C, the most superior of the three, would in Galton view correspond to the ordinary foreman of a jury. Then there is class D consisting of people who win the customary prizes offered in life, and E referring to those a bit sharper. F refers to real eminence, out of which you expect only 250 people out of a million to achieve, while G is a step beyond, supposedly reserved for the 'geniuses'; then there is class X of the exceptional, one in a million, of which he wisely gives no examples. Galton speculates that the class F of dogs, would be superior to the class f of men, and that this certainly would be true for the corresponding classes G and g.



On what basis does Galton provide such a classification? Any such classification presupposes some kind of measurement. In fact it is easy to measure length, and a classification of one million such measurements of the height of men, would indeed provide a normal distribution. How do you measure Giftedness? To Galton the answer is obvious, namely scores achieved at Academic examinations, and what Galton in particular has in mind is the Mathematical Tripos, which were in effect at Cambridge University throughout the better part of the 19th century, and some way into the 20th. The Mathematical Tripos was a very competitive affair, in which hard mathematical problems were given to be solved during a limited interval of time. The papers were graded and marks assigned, and there was a linear ranking of the participating individuals, which then were assigned various distinctions.

Galton noticed that there was a great spread in the points scored between those at the top, and the great majority at the bottom, a spread, which he speculates, was rather narrowed than exaggerated, as the mechanical effort of writing things down, no doubt hampered the very best.

Classics and Mathematics were the main avenues of education and excellence for the bright Cambridge undergraduates, and Galton does not really dwell on the delicate

question on how to compare the relative merits of those two. He is content to observe that excellence in one intellectual subject does not necessarily preclude excellence in another, on the contrary, being good in one makes being good at the other, much more likely, thus giving credence to the idea of a kind of general, unspecified intelligence; a kind of pure substance of intellectual energy, to be articulated in a manifold of different ways.

Classification of Men according to Natural Ability

| below | above | 1 | in | numbers in a million |
|-------|-------|-----------|----|----------------------|
| a | A | 4 | | 256,791 |
| b | B | 6 | | 162,279 |
| c | C | 16 | | 63,536 |
| d | D | 64 | | 15,696 |
| e | E | 413 | | 2,423 |
| f | F | 4,300 | | 233 |
| g | G | 79,000 | | 14 |
| x | X | 1,000,000 | | 1 |

The idea of intelligence took root at the turn of the previous century, and the scales of Binet took on a much wider significance than initially intended. Binet was interested in a diagnostic tool, to help and assess the development of retarded children. To define the scale, a norm had to be established. Binet devised such a normal development of intellectual development set off against age, and then it became a simple matter of comparing the actual development against what would be expected. Thus by dividing the intellectual age with the chronological age one got a percentage, which provided a handy number somewhere below one hundred, referred to the 'Intelligence quotient' (I.Q.). Now inevitably, some normal, i.e. non-retarded, children would actually be ahead of their chronological age, thus providing numbers above one hundred. Those numbers were naturally more intriguing than the lower ones. In many ways of life, people are perfectly satisfied with being normal (sexual orientation, moral sense, social competence), but with some rather sensitive issues, not being sub-normal is not good enough, being super-normal is what counts. When it comes to the qualities of the mind, being average is somewhat of a put-down. It then became the tasks of psychologists to refine the notion of a normal development, as to deserve consensual blessings. This normal development could be set off as a straight line, which would provide no mathematical difficulties, just be a matter of repeated normalizations. However, with this definition there is no reason why the I.Q. should be constant. If you perform like a two year-old at the age of three, why should you perform like a four-year old at the age of six? In fact, from the point of view of Binet, the variation of I.Q. would be rather interesting. But the invariance of the I.Q. was seen as something highly desirable, without its invariance, it would lack its significance. If the tests did not show a constant I.Q. throughout development, there was something intrinsically wrong with the tests, and they had to be revised accordingly. An even more serious objection is that intellectual development does not continue indefinitely². Is a 60-

² As a small child, your drawing skill may be considered a fairly relevant indication of your mental development, but pretty soon it will diverge. Few people would want to be tested on their mental powers

year old more intelligent than he was at forty? It would seem that intellectual development, just as physical development would level off, maybe even decline with ageing³. Thus we got a new definition of intelligence, the limiting I.Q. as it emerged at the zenith of your development, maybe at 18 or some such age. This view of the I.Q. would also solve the problem of invariance. But now we encounter an even more difficult problem, to measure the intelligence of people, more intelligent than yourself. Binet, as an old, experienced man, had a rather easy task to get an overview of the mental capabilities of retarded children. Setting aside certain ironies, one may be fairly confident that Binet would be on top of his material and those subjected to it. Just as we with a certain confidence can devise criteria for the physical development of children, we also can devise similar useful criteria for their mental development, with an emphasis not so much on grading, as passing certain requirements.

The I.Q. controversy shows yet another instance of the trap of scientific emulation into which a social inquiry has fallen. In the Natural Sciences it has been manifested over and over again, the fruitfulness of taking a very specific notion and to generalize it to a much wider context, transcending its initial meaning.⁴ It is easy to point out stupidities in the typical questions asked. To a mathematician the task of extending sequences of numbers, appears particularly irritating. A sequence of numbers can be extended in any number of ways, depending on the particular context; thus the task of the tester is to second-guess the frame of mind of the test-deviser, which could be easy in cases like 1, 4, 7, 10, 13... or 2, 10, 50, 250, 1250, ... but which in other situation may put the imaginative candidate at a disadvantage. One way out of this dilemma is to define intelligence simply as what is measured by an intelligence test. This may seem as a very clever solution, but in fact it is nothing more than a cute cop-out. We may endow the notion of 'intelligence' with an impeccable formal meaning: but this does not address the very fact that we do have a notion of 'intelligence' that we are struggling to define and articulate. One of our problems with so called 'intelligence tests' is simply that they are not 'intelligent' enough. Thus another instance of a concept transcending the discourse in which it is being used.

What about Galton? At his time there were no intelligence tests, what did he use as a measure of mental capacity? We have already mentioned it, namely the demanding Tripos Examinations. Setting aside the fact that those were specified to mathematics, but if we assume the rather attractive idea (at least to mathematicians) that mathematics is indicative of a general intelligence, they seem to serve the task well. The problem of stupid analogies, like extending sequences of numbers, is disposed of; and also the seemingly intractable task of devising questions that go beyond your own mental constraints surely finds here a solution. This is undoubtedly true, and as a relevant testing of mental abilities, giving hard math problems is about as good as we can do. But there are nevertheless certain serious objections.

First, to do well in a mathematical test, you certainly need to learn some mathematics. The idea of an intelligence test is to measure your innate ability, your gift for mathemat-

by submitting their drawings, say of nude models

³ Making a declining I.Q. according to definition, actually indicative of increasing intelligence

⁴ Still one should keep in mind that it is only the succesful examples of this principle which are preserved.

ics. Instruction certainly makes a difference, an untutored Gauß would certainly have no chance against a rather mediocre student, who has at least made the effort to master the terminology. To Galton the distinction must have been fine. To do well academically, would certainly give enough motivation for the majority of candidates to do their best, thus the test would test their ability to have mastered mathematics during a certain period of study, and would no doubt reflect rather faithfully their mathematical potential. And besides what use is potential if it is never articulated?

What would be a typical problem in a Math.Trip. examination. I do not have at my disposal any actual tests, but in the classical book 'Pure Mathematics' by G.H.Hardy, there are a fair amount of quoted problems from previous Examinations. The following from 1886, is the oldest one I have found.

Find the limit as $x \rightarrow \infty$ of

$$\left(\frac{a_0 + a_1x + \dots + a_rx^r}{b_0 + b_1x + \dots + b_rx^r} \right)^{\lambda_0 + \lambda_1x}$$

distinguishing the different cases which may arise.

To the mathematically innocent, this may seem very daunting. The mathematically sophisticated immediately recognises that what is at stake is the quotient a_r/b_r and the sign of λ_1 , everything else is just obfuscation. The hard question would have been to find maximal and minimal values of the expression, something the fortunate candidate is spared. As a purely mathematical problem, it is not particularly interesting, it does not require any particular creativity on the part of the candidate, only a cool and competent look. It certainly would distinguish between the candidate, who has only a shaky command of what the game is all about, and most likely (although it is not clear) had never seen anything similar, and thus has no resource to previous experience: and the candidate, who has a grasp, and whose expertise is not founded on memorization of similar cases. I do not know whether it is a typical problem for the Tripos examinations, as a mathematical problem it is rather easy, serving only as a marker between the incompetent and the competent, and adducing little opportunity for the truly creative to show his or her mettle. I would suspect that many problems would actually be of this kind, and that the harder problems would distinguish themselves rather by being more complicated and involved, and maybe rest on some particular trick. In fact, as is not too uncommon, the Math. Trip. became an end in itself, and to do well, meant not so much studying mathematics, as to studying old problems, as to get a hint of the mindset of those who composed them, i.e. to learn a great repertoire of tricks and strategies of solutions. There developed a niche for special tutors to hone the problem solving skills of candidates, providing them with typical examples and 'tricks of the trade', just as in a different context and a hundred years later, special courses on getting high SAT scores have sprung up in the States⁵. Thus to do well on the Tripos did not necessarily mean that you were a creative mathematician. It certainly showed mathematical competence, and candidates who could work well under time pressure, and unsentimentally disregard the distractions of getting bogged down and side-stepped, were

⁵ SAT being an acronym standing for 'Scholastic Aptitude Test' and has been used extensively in the States for College admissions

at an advantage. During the 19th century, in spite of the prestige we nowadays associate with Cambridge, the mathematical level at the university was rather low, and in a scientific context it definitely constituted a back-water. Bertrand Russell is reported to have been disgusted by it, and did a rather (given his later eminence) mediocre performance, and turned thereafter to Philosophy. The great Cambridge Mathematician G.H.Hardy, referred to as above, fought a long battle to do away with the Tripos, a battle he eventually won, but it lingered on as a tradition well into the 1930's.

Closely connected to mathematical examination tests are competitions in mathematics. The ostensible purpose of an examination is to test, not so much cleverness, as command of material. The point of instruction is after all to impart new skills. That it might require cleverness to achieve a command is another thing. In a test designed for competition, one wants to minimize actual knowledge, and concentrate on creativity and cleverness; just as the ideal intelligence test strives to factor out the cultural bias. However, it is not so easy to do so. Increased knowledge gives a richer web of associations, and the experienced candidate on a competition does have an edge, even if none of the problems, would accidentally fall within his previous experience. Now it is an interesting question to what extent the result on a math competition can predict future success in mathematics. There is a certain amount of correlation. Many distinguished mathematicians have done extremely well on mathematical competitions in their teens, while others have not, maybe even not deigning to participate. On the other hand, there are many instances of youngsters showing great aptitude on such competitions, only to get bogged down in later life. From this one might confidently infer that there is no infallible guide to predict real mathematical worth. However, one should not forget that any kind of such statement presupposes some kind of implicit measurement. How do we gauge mathematical success, it is easy enough in a competition, we only count scores, never mind that the scoring might differ a little from one grader to another; but professional mathematical success depends on judgement to a much higher degree. A test is a kind of a controlled experiment. The task has to be done within a certain specified time period, and no outside interference is possible. The problems are the same, and there is a fairly good consensus of what constitute a correct solution. In life, too many other variables enter, to allow a simple-minded scoring. In a sense time is indefinite, it is up to you how much of it to use. There are distractions, love-affairs, life-crises, and the waxing and waning of motivation. The problems are not given to you, but you choose them yourself. Sometimes you are lucky, striking gold, sometimes even a very gifted mathematician may get lost in a sterile maze. You may get outside help, key-insights may have been provided by mentors, colleagues, or discovered in forgotten work, not always fairly credited. Your achievements, apart from correctness, are judged using criterions of taste. Some areas attract a lot of attention during some period, and if you happen to work within those areas, your importance certainly is correspondingly enhanced; while others are considered obscure, and hence their practitioners are thought of as peripheral. Getting prizes and honors and positions may very much depend of whom you know. And even success in a well-defined sense may depend on other things than pure cleverness. Some individual can persevere for years, working doggedly, whereas another man, with a more volatile temperament, long since would have tired. But this is life, and mathematics is no different from the rest of human occupation, even if the amount of arbi-

trariness may be somewhat less, and the standards of objective criteria more consensually accepted than in other fields of endeavour, academic or not.

The point is that it is difficult to measure, to assign a number; yes even the simpler problem of ranking, to which most professionals are both subjected to and asked to perform, often presents insurmountable problems of comparisons of the incomparable and incommensurate. In fact the more sophisticated and significant the phenomena you are studying, the harder it is to measure it. On one extreme we have athletic performances, where you can determine to the minutes fraction of a second, who was the fastest runner; on the other hand the more elusive intellectual achievements.

Thus the very precise classification of Galton may make us laugh, although some form of it is implicitly assumed by many people, be it privately or as social commentators and analysts. The so called relative grading system, that was introduced in Sweden in the 60's, and held sway I think for twenty years, was based more or less on Galton's point of view. Laugh as we may, there are still some very basic questions he has bequeathed us. First is there such a notion of innate Gift, although it is not easily amendable to quantification. Secondly can it be inherited, which makes the issue very sensitive. The first question can be refined, by considering not just one basic universal gift, but many different, and ask the degree of correlation between them.

The easiest, and least interesting of the questions, is whether giftedness is subject to inheritance, and thus it might be convenient to treat it first, although from a logical point of view, the question becomes moot, as long as there is no consensus on the existence of what is supposed to be transmittable through the generations.

The basic elementary laws of inheritance were established by Greger Mendel⁶, an unknown abbot publishing in an obscure journal, in the middle of the 19th century. His pivotal work remained unknown to science until discovered in the beginning of the 20th century. Galton lived long enough to experience the delayed birth of modern genetics, which provided the mechanism on which Darwin's evolutionary theories could be driven, and confessed to a certain sentimental affinity. Obviously the notion of inheritance predated Mendel, as the title of Galton's work certainly testifies to. In fact the breeding of animals, and the concomitant observation that progeny shows many of the characteristics of its parents, have certainly been with mankind since prehistory. The bond between parent and child is clearly one of the most solid social bonds imaginable. And by extension the mystical importance of ancestry and the affinity with kin (although this is somewhat complicated by the issue of rivalry and the striving for sole possession) belong to the most important sociological factors. In former times the pride of distinguished ancestry played an extremely important role in Western Society. The idea being that the worth of the ancestors was implicitly present in the progeny, even if not particularly articulated. However, in Western Societies old lineages tended to be very few, and seldom of any length. Far more interesting is the Hindu caste system, which I believe 'boasts' a tradition of several thousand years, thereby providing ancestral lineages of an antiquity no Western nobility would ever be able to dream about. The caste system is of course an anachronism, but should provide some basis for studies. Clearly the Brahmins are over-represented in intellectual pursuits, and one may argue whether this is due to the privilege of tradition (bearing

⁶ Incidentally born the same year as Galton, but dying much earlier (1884)

in mind that many Bhramins are financially rather poorly off) or selective breeding. To explicitly pose such questions would be tantamount to academic suicide, but I suspect that the sentimental attachments most Indians may view it with, is based on the ideas of inherited blood, which runs very deep in popular sociology. Nowadays, less emphasis is put on your ancestry in the West, for the simple reason that for most people it is unknown; and more on the quality of your progeny, which is supposed to reflect on you. Still most people have an even cruder conception of inheritance than had Mendel. Typically one thinks in terms of good genes, which like discrete packages can be transmitted to children, and provide some sort of characteristics of family lines. Mendel was interested in simple properties of peas, analogous to the eye-colors and shapes of ears of men; but as in the case of I.Q. the notion of a gene has taken on a much more extensive quality. Vaguely one thinks in terms of genes for all kinds of attributes, like mathematical ability, 'sexiness', business acumen, or what not. This is clearly a very naive and misleading picture, and even if you believe in principle that all your attributes is to be read off your DNA sequence, it does not mean that you can chop off your attributes in discrete chunks and pass them on. Not even Mendel believed that, in fact his basic discovery of dominant and recessive genes, gave a model of how traits could skip generations. In fact it is easy to devise a model in which straightforward inheritance along the ways we find so endearing is shown to be non-existent.⁷

Still, as noted, the idea is very attractive and deeply rooted in the thinking of most people. Also there are many instances of specific talent running in families to provide credence to the notion.⁸ One may disregard those as the simple consequences of environmental imprinting, but so intriguing is the subject, that extensive studies of twins, identical versus fraternal, have been conducted in an effort to separate the insidious influences of

⁷ For the sake of argument say that your intelligence depend on an F-gene and an M-gene, inherited from your mother and father respectively (F for female...). Each gene has a certain quality, which we may call length, and the closer the quotient of the lengths of F and M is to some number say $\sqrt{2}$ the more 'intelligent' you are. In this model intelligence per se is not inherited, it is not linked to a specific gene, rather to a fortuitous combination of two. Thus a very intelligent couple may give birth to a very dumb child indeed, depending on a certain incommensurability, very much like you cannot mate a perfect Lion with a perfect Horse, and expect to get a perfect mixture. In the same way two very dull parents may sire an exceptionally bright off-spring. However, this model is just intended to show one more degree of complexity, if this would be pushed to its limits, it would show that in given populations, providing intelligence would have a breeding advantage, people would eventually tend to become compatible, and this would constitute a world in which the mixing of different populations would have disastrous results, and give a scientific argument for racial purity!

⁸ One should also note that eminent people seldom have eminent progeny, unless of course the essence of the eminence is formally inherited as in the case of royalty. Where are the distinguished children and grandchildren of Gauß, Euler, or any other intellectual giant with a fair brood? In mathematics the noteworthy exception is the family Bernouille, which for many generations produced outstanding scientists. Less spectacular examples are the cases of Birkhoff, father and son; and Bohr with son and grandson. In those cases one is more inclined to attribute success to extension of privileges and contacts, like the case of Bush Sr and Jr. More interesting is the study, how eminence may result from children avenging the frustrations of their parents.

nurture from the natural consequences of nature. Infamous is the study of a distinguished British geneticist - Cyril Burt, who claimed to have proven by such an extensive study that intelligence (at least as measured by standard intelligence tests) showed a high degree of genetic correlation. The exact nature of the results being of little interest, as they later on turned out to have been doctored. Extremely controversial, and generating a high degree of protest and verbal abuse, have been the claims of Herstein and Jensen to point out that Blacks are intellectually inferior to Whites. In one way the bitterness of the opposition is somewhat startling, because not only have the results been questioned, but the very inquiry itself has been seen as greatly offensive. Is not the essence of research to freely inquire, guided by your curiosity? The researches of Herstein and Jensen with cohorts have been viewed as ideologically motivated, with the purpose of giving scientific legality to racial prejudice. Now this may be true, although it is hard to divine the hidden motivations in your own actions, let alone those of others. The strong feelings have been aroused by a basic misconception of the nature of race.

The species is a biologically sound concept, based on the general ability of sexually complementary members to produce fertile progeny. From this point of view Horses and Donkeys constitute different species, as they are unable to produce fertile off-springs, although that does not prevent them from interbreeding successfully, in fact the various hybrids are usually healthier and stronger than their parents, due to the general beneficial aspects of mixing genetically differentiated mates, because of the drastically reduced statistical risks of harmful recessive genes being articulated through duplication. It has also been speculated that Man and Chimpanzee may be similar enough to pass the test of belonging to the same species, but the experiment has never, to my knowledge, been attempted. On the other hand, the criterion is not necessary, people may be naturally infertile. Now the basic insights of the Evolutionists⁹ is that Species are not god-given, but literally evolve through variability within species. The Human species (whether or not including Chimpanzee, or more interestingly extinct cousins like the Neanderthals) shows a great variety, it would be foolish to deny. Man proceeds through categorization, sometimes the categories are of an intrinsic nature, sometimes, like in the naming of stellar constellations they are of a purely conventional kind. The racial divisions are clearly of the latter, as unlike the branching of speciation, races blend into each other, and are in fact eminently blendable. The failure to draw sharp demarcation lines, should not make us blind to the obvious fact that there are objective differences between people, especially between those geographically separated. The attempt to put the racial categorization on a sound scientific basis generated a lot of research up to about sixty years ago. However, the different markers for racial signs were of a rather crude kind, and measurements and indices, which we would now consider with ridicule, were designed. Now much of this research was fully legitimate, motivated by pure curiosity. However, the subject itself was fraught with various ideological issues, as is inevitable in all kind of social research, and the abuses of the findings totally discredited the field as such. Ironically in later years, through the advances of Biochemistry, far more interesting markers have been developed. The study of blood-types is of course an old one, but in recent years direct DNA studies are possible. This is forensic science, and it reveals to us patterns of mixing and migration

⁹ Predating Darwin, although he is credited with drawing the ultimate conclusions

of the past, of great intrinsic interest, and discernable in no other ways. The great statistical genetist Cavalli-Sforza have been very active in this respect, studying the traces of pre-history as they show up in our DNA. However, attempts to establish a racial data base, for the systematic pursuit of such studies, have been foiled by human activist groups, who see in such activities nothing but a continuation of the old discredited science of race, be it through other means.

Race is hence nothing but a rather arbitrary category of people, at best based on some kind of accidental markers, like skin-pigmentation, and curliness of hair (or even in absurd cases ancestral religious practices, having no biological basis whatsoever); thus there is little relation between a particular individual and the accidental category he or she may find themselves in. The division between Black and White is particularly pointless. The racial diversity, as measured by a great variety of markers, like blood-groups, is largest in Africa. In fact only a small section of the original Homo Sapiens populations, currently believed to have originated in Africa, left Africa colonizing the rest of the world. Thus there are many African tribes, the whites being just one of them¹⁰. Now the frequency of different blood-groups differ markedly from population to population, or from race to race, something that engenders very little controversy. The reason is obvious, blood groups are very neutral markers, most of us do not even know our own blood-groups, and we certainly do not know it of others, thus we tend not to associate it with various traits. Had we done so, I am not sure such studies would have been funded. Now if Herstein and his colleagues decide to test 'intelligence' on different populations, why should this be so bad? You can argue that if 'intelligence' is simply what is measured by intelligence tests, then the authors may be faulted for measuring such an irrelevant attribute, or for simply drawing too far-ranging conclusions of the significance. What they cannot be faulted for is to establish a difference, because as long as we have measurable attributes, which vary from man to man, there is no reason we should not find similar differences from population to population, or if you prefer, from race to race. It is only if an attribute is an absolute invariant, we may expect it to be a racial invariant. If intelligence, whatever definition and measurement is used, turns out to vary from individual to individual; you will also expect it to vary from 'race' to 'race'; although statistically you would in general expect that individual variation would be far more marked than racial.

The true essence of 'racism' is not, as is commonly believed, to claim the inferiority of certain races (as that would presuppose that racial groups are intrinsically defined); but to infer attributes of individuals from the racial categories they happen to belong to. Thus racism is the inability to separate the individual from the mass.

Now, admittedly, it is not so easy to always do so. People only become individuals when we learn to know them personally. People whom we only meet fleetingly, tend to be identified with larger groups to which they happen to belong. Like fellow passengers

¹⁰ In the States, in spite of the great social divide, there has been a fair amount of mixing, which is natural among geographically overlapping populations. Also the majority of the African slaves sold to the West came from Western Africa, thus giving a certain coherence to the American notion to Black, but of course having very little racial relevance to most other African tribes. That Slavery was an indigenous African phenomenon, just as it was among classical Greeks and Romans, with the majority of black slaves being mastered by blacks, is of course irrelevant to the present discussion, but may be worth pointing out.

on the plane, or shrieking protesters in the street on one hand; or skinheads, pedagogues, feminists or fat people on the other. This failure of individuation is very natural, without it we would be overwhelmed, and in most circumstances this is fully adequate. This is, I believe, the reason for the vulgarization of the notion of racism, which however regrettable from a logical point of view, must be considered expedient in practice.

After this lengthy digression on the inheritability of characteristics, we are ready to confront the main issue of this essay; namely the notion of intrinsic giftedness.

We have already discussed the inherent difficulties of measurement, and without measurement, any classification along a normal distribution according to Galton is pure nonsense. Now the very difficulty, nay say impossibility to measure giftedness, may lead us to discount it altogether in a scientific approach. In fact any serious scientific limits its discourse, relying on a language, with which some things can be expressed with precision, while being content of not talking about other things at all. The language of partial differential equations, which so dominated physics in the 19th century, had very little significance on say 'emotions'. As far as the physical world exists, as explained by partial differential equations, there is no room for human emotions. This does not necessarily mean that the existence of emotions were denied by the physicists, far from it. The notion might be even sentimentally more endowed, than it would have been otherwise. In the same way a pedagogical theory may deny the notion of inherent giftedness altogether, and work within a self-contained universe of rigorous terminology. The important question is whether such a restraint is fruitful or not, would the denial of giftedness make the study too restricted, and hence the results too trivial? We are after all curious, and thus we are led to study subjects that concern us, even if there is no rigorous method available.

A more encompassing metaphysical view would claim that giftedness is just a kind of superstition, a dwindling residual mystery, shrinking before the onslaught of systematic scientific inquiry, which enables more and more of the mysteries of learning to be unearthed and rationally explained. A little bit like the view of philosophy, as a shrinking discipline, as more and more of it moves away from the realm of pure speculation as it becomes amendable to scientific study. One may have the philosophically unassailable opinion that there is no such thing as giftedness, that in principle all children can learn everything, provided they are instructed properly. This is a philosophy of pedagogical optimism, claiming that in principle we can teach everybody everything. This is a little bit like claiming that in principle everything can be predicted by knowing at a given moment all the positions and velocities of all the particles in the universe. The key-word is 'in principle' in practice the situation is very different. Clearly we are here talking about paradigms that concern itself more with attitudes than facts.

Now it is easy to speculate and to be seduced by your own rhetorics and harder to appeal to empirical facts. However a brief survey of the situation may give a pointer as where to look.

First we have discussed the difficulty of measuring performances, pointing out that the more interesting and complex the performance is the harder it is to put a number to it. To measure pupils mathematical performance in school is rather easy, there is a common consensus as to what the syllabus should be, and what constitute correct and commendable performance. But the subject is not particularly interesting, at least not

compared to what real mathematicians do. But now, when we consider deeper issues, the consensus starts to get frayed at its edges. For one thing it is not clear what constitute deep and central mathematics as opposed to shallow and peripheral, although compared to most human disciplines, the consensus is still rather striking. Too much depends on taste, and received opinion, and as the subject has expanded and ramified, there is too little overlap which allows direct comparisons. The closest we can come to a general consensus of who are truly great mathematicians is to refer to having solved commonly acknowledged problems of undisputed importance. This is the view that was put forth by David Hilbert. And in fact Hilbert himself tried to set the standards of 20th mathematics, by posing the problems at an International Meeting of Mathematicians in Paris 1900. Hilbert also tried to, somewhat unwisely in retrospect, gauge the difficulties (and hence significance) of the problems, by predicting which would take the longest to solve. The Riemann Hypothesis, nowadays considered the most prestigious open conjecture in mathematics (far more so than the Fermat problem ever was), he predicted to be solved rather quickly, but the problems concerning the transcendency of certain real numbers he doubted would ever be settled in the coming century. History proved him wrong, and Carl-Ludwig Siegel remarked acidly, that there is no point trying to gauge the difficulty of a problem until it has been solved.

Whether we want or not, life is filled with judgements to be made. Most of those judgements cannot be objectively justified, in fact the very notion of what constitute an objectively justified judgement cannot itself be objectively justified, but we need to make them anyway, thus taking a pragmatic and less fundamental view of the process¹¹. And it is this very judgement on performance that makes the question of inherent giftedness relevant and interesting.

Now Galton in his argument takes physical performance as a starting point and then continues by analogy, the only resource possible, when you do not resort to empirical testing. But let us return to his point of his departure. We have a fairly good notion of what it means to be physically strong, but when we inspect it more closely we see that it disintegrates in a variety of mutually almost contradictory subspects. The most prominent long-distance runner is not necessarily the strongest boxer, in fact the two ambitions seem more or less mutually exclusive¹² Furthermore longevity, maybe the most exalted aspect of physical strength is far more subtle and complex and does not meet the

¹¹ It can be argued that awareness of the ultimate fallibility of judgement may be an insurance against relying too dogmatically on the process of making them, thus preventing us from imposing and perpetrating fundamental and evil political views. The root of evil, lies not so much in thinking evil thoughts, but believing that there is but one truth.

¹² It is an interesting question, as to the compatibility of different sports. Although most trainers have a good feeling for it, systematic studies have never to my knowledge been undertaken. What are the fundamental parameters for physical performance? Cardiovascular capacity, which is often measured, seems to play a fundamental role in long-distance running, cross-country skiing and bicycling, leading one to suspect that, except for technique, those activities may be fairly interchangeable. On the other hand most short-distance runners seem to have little stamina (or temperament) for long distance running, while there seems to be a very high documented correlation between the short dash and the broad jump. High-jumpers on the other hand seem far more specialised, and would probably do very badly in all other

eye, at least not in the same startling way as more direct manifestations. Clearly we should speak of different physical endowments, and the most elusive of them all, being very hard to predict and pin down (although in retrospect trivial to measure).

What are the most fundamental mental capacities, and to what extent does eminence result from a fortuitous combination of such along with fortunate external circumstances (like simple luck?)? The question can obviously not be solved by thinking alone, only posed. Like in sports, experience from school shows that pupils being on top of one subject, usually is on top of others, that although there may be a great diversity of challenges, the mind which is up to par in one, usually finds itself more than capable in another. One speaks about special talents, or gifts, in mathematics, chess, music, language, occasionally as mutually exclusive, at other times connected in mysterious ways like mathematics and music. On the other hand one seldom hears, if ever, about special talents in history, geography, divinity¹³ or physics, chemistry and biology for that matter. The first disciplines produce the spectacle of prodigies, while one never hears about a prodigy in history or sociology or pedagogics¹⁴, not even in the natural sciences. The conclusion one naturally draws is that fields like mathematics draw on pure mental capacities, while scholarship in history is a more complex thing, involving the combination of many mental capacities, matured and shaped by prolonged experience. Certain mental capacities may be necessary, but far from sufficient. To achieve eminence being gifted is not enough, dedication, hard work, vision, maybe even luck are needed as well. Thus if we want to look for the sources for and the nature of mental gifts, it is there we should look, the other subjects being too complex¹⁵.

The simplest of those subjects mentioned is of course Chess. It also stands out as being an isolated, specialised and rather accidental activity with no social redeeming features. To many it might seem to be 'pure thinking', while to most of us it seems too restricted, if intriguing, and with no possibility of transcending itself, like all worthwhile human pre-occupations. Those very facts may also make it ideal for a study as a toy-subject.

Chess can be measured, in fact the very measurement of chess, is in the very essence of its activity. Two players are mutually compared during a game of chess. One wins, or the other, or both give up in disgust. Naturally one could think of other activities not involving playing chess, like writing commentaries on chess, devising chess-problems, tutoring students, advising other players, all of which could be conceived as worthwhile

meets. The scoring system in the Declathon, seems to me to be arbitrary and based solely on tradition, and a more thoughtful inquiry into it may yield clues for the comparisons between different activities. The extreme view of the mosaically inspired view of the world of sports, would teach that everyone could be a champion, provided the rules were changed appropriately, and thus that the galaxy of sport stars would look entirely different, would the accidental rules be changed. If the net in tennis would be lowered by two inches, would that mean that an entirely different set of plays would net outrageous sums of money? The truth is usually said to fall between extremes, but in this case I personally believe in a fairly high level of stability as to athletic performances, dividing the field into a fairly small set of basic skills.

¹³ Let us leave aside the question as to whether Jesus ever was of the flesh

¹⁴ This does not prevent some people to rise to early eminence in those fields

¹⁵ One may argue that being a professional mathematician is a complex matter, and that talent is not enough in the long run, putting the activity on par with more scholarly academic pursuits like history

activities. But when it comes to chess, it is playing that matters, everything else is peripheral. Now every game produces a winner (or two disgusted fellows) and one naturally wonders whether there is any degree of consistency. There is no absolute consistency, a worldchampionship is not decided on a single game, as it would be otherwise, one can only speak of consistency in some probabilistic terms. From this a fairly accurate and sophisticated system of ranking has been devised, and it seems that one can statistically predict the result of a game between two players, knowing their rankings (which by its structure is allowed to vary with time). In the extreme a beginner is sure to lose against a champion, although one might imagine that the innocence of a beginner could result in so utterly strange kind of moves that they would completely throw off the experienced player¹⁶. No such ranking exists among mathematicians (to say nothing about historians and sociologists) although many may believe that it does exist, but we may be unable to construct it. Thus you cannot pit two mathematicians against each other and in each encounter proclaim a winner. If you could, assigning prizes and academic positions would be a straightforward business.

Now the education of chess-players is a rather extensive and systematic activity, especially in Russia. There are literally millions of serious chess-players in the world, and tournaments and tutorings are going on all the time. Clearly there should be a lot of experience and data, some of which published. I know nothing about the didactics of chess, but as a toy-subject (as mentioned above) it would be ideal as a test. As most people are not emotionally attached to chess in anyway, there is nothing offensive about the notion of a special gift for chess; also as chess is practised through games, who are fair by definition, you quickly learn to adjust to your limits, and there is little latitude to question them. Chess is simply the game of chess. Related to this is the stability of a putative chess talent. If the rules are changed ever so little, like changing the format of the chess-board or the movements and characters of the pieces, would there emerge a totally different set of champions? And how does it compare to games like 'Go' which in their conception seem even 'purer', and which in the Orient may attract far more attention than Chess does in the West? Also what is the correlation between Go and Chess? Is it possible to isolate some more primitive mental capacities, which underlie (to different degrees, depending on the game) the executable skill of playing?

Most children seem to need instruction to learn to read and write. Some seem to pick it up by themselves already by the time they are expected to start school, while others seem to have a hard time ever learning it, in extreme cases they appear incapable of learning at all, which puts them at an extreme social handicap in a contemporary society which relies so heavily on literacy. Thus reading and writing is a skill, be it a late cultural one in the history of mankind, which no one doubts is of outmost importance. (The skill of arithmetic being seen more and more by most people to be obsolete and easily compensated for). In former times the inability to learn to write and read with fluency automatically not only hampered your academic progress, but was thought to exclude it. There was a word for it, but one that has been replaced by a fancier one, as

¹⁶ This could conceivably happen, just as the proverbial monkey sits down at the keyboard and types out 'Hamlet' with a few accidental typos here and there. But do not bet on it! The untutored imagination is feeble.

if to both emphasize and hide our ignorance. Nowadays dyslexia is considered to be a neurological dysfunction, thus beyond the control of the individual, and also, it is stressed, dyslectics are not intellectually inferior to their less unfortunate school-mates. In fact being dyslectic is challenging in the literal sense of the now common euphemism of 'challenged' for handicapped. Transcending your mental handicap, may even sharpen your intellect. Now we are discussing mental capacities on the neurological level, and this seems to be politically fully acceptable. In this sense a dyslectic is less gifted than a normal mind, be it in a very specific aspect (like a human pianist lacking one hand, and hence being forced to limit his repertoire). I am not sure whether there is a direct neurological explanation of the syndrome, I would doubt it. Neurology is above all a medical science of diagnosis, not of explanation and treatment. One of the main defining symptoms, as I understand it, is an inability to visually imprint words, and thus a more or less pronounced tendency to switch letters of words, even characters themselves, which are experienced to be invariant under reflection¹⁷. To make sense of the visual data we are bombarded with every moment, is a highly sophisticated process, involving more informational data, than any other sense data¹⁸. Structuring this torrent of information, requires a lot of skills, the extent of which is not fully known. The skill that dyslectics lack, is probably just one of many, and in a sense it might be an accident that culture has evolved in such ways that this skill has become so indispensable. Another pathway of cultural evolution, and a completely different set of people would find themselves at a disadvantage. So far I have been talking about dyslexia as a defect, but this only makes sense in a specific context, the condition as such may be advantageous in other visual challenges¹⁹. On the other hand we have only spoken of dyslexia as a defect, are their visual skills that not only make reading and writing easy, but even enhances it? Would so called photographic memory be related to this?

Related to dyslexia are certain skills or defects of music, like tone-deafness, the inability to sing (let alone having perfect pitch) and an insensitivity to rhythm. Being musically impaired is something that hampers few people, at the most it does curtail your potential field of interest and activity, but what you do not know, you do not miss. Thus there has been little research on such matters, but it stands to reason that it should be a fruitful area of study, and that perhaps basic musical competence can be reduced to a certain number of neurological skills. Does something like this also hold for mathematics? If so one could argue that on the neurological level of explanation, there is such a thing as mathematical talent; and if one would be challenged to teach everybody everything, brainsurgery would

¹⁷ One consequence of dyslexia is the inability to spell. This spelling deficiency could range from being spotty to downright bizarre and embarrassing. Reading and recognising words, seems to be another aspect, maybe not at all related to spelling deficiency, at least when the latter is fairly mild. I myself have noticed a slowly diminishing ability of proper spelling with age, but this may only be an illusion brought about by actual improvement

¹⁸ Studies have been made, indicating a process of about 40 kB a second, a mere fraction of which, being part of a conscious process

¹⁹ One thinks of the ability to make out meaningful pictures out of random patches. Some people have this ability to an uncanny degree, while others are very bad at it. I do not suggest that there is any direct connection, just that there are many visual skills, most of which are useless, and hence never brought to our attention

be an inevitable aspect of instruction. Few pedagogues tend to think in those terms, and even fewer would be allowed to try their hands at it. This also opens up the possibility of shared characteristics between such seemingly disparate fields like mathematics, music and say languages (some people are excelling in all). One basic neurological ability may find different articulation in different contexts. It is often speculated that the ability to write good prose is connected with musical ability, although the latter maybe totally hidden due to other defects like tone-deafness.

In conclusion we may state that the notion of giftedness is indeed a very seductive and attractive idea, especially to those who believe they possess it, and that to deny its objective existence would rob them of precious self-esteem. But also that in practice, considering the limited capacity of the science of education and instruction, there is such a thing as differentiated intrinsic ability, which has inescapable consequences as to education. Some people pick up things automatically and instinctively, others do not pick at all. To deny this, would be to deny the world as it is, in favour of an idealistic conception of it. But to assume the existence of special talents, is not the same as endowing them with a divinity, which may be just a projection of vanity and a manifestation of narcissism. Finally from a purely scientific standpoint, we do not expect dogs and crows (although we may credit them with some not inconsiderable intelligence and capacity for emotions²⁰) to learn to read and write and hold forth on philosophical issues. We simply assume that their brains are not developed for the tasks. Similarly, but of course on a much smaller scale, we should not shy away from the possibility that brains are differently constituted from individual to individual; and as far as we adhere to the modern paradigm that the brain is the basis for all mental phenomena, and that there is no such ethereal things as the soul, this conclusion has inescapable ramifications. The subject is of course controversial, and as a tool and pretext of establishing a hierarchy of man, it presents a constant danger. The only anti-dote to such potential abuses, is to take an ironic view, and constantly remind ourselves of the multifariousness of mental ability, of how flimsy are the methods of gauging it, and how complex are the interactions to make them articulate. With such an humble attitude we may just be about able to handle the dangers.

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²⁰ Although one should beware of the phenomenon of anthropological illusion, which incidentally probably works both ways