The Hidden Algebra of Mind:

Reflections on the Indivisibility of Human Nature and the Responsibility of those who Carve it up

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Almost all people puzzle about themselves. Behind that puzzlement seems to be a grab-bag of flimsy, sometimes frightening, but usually unsettling views of "human nature". It is hard to say what the mix is between personal experience and what comes from "recent discoveries" about human nature that are thrust upon us by popular culture and number-rich psychological studies. We hear about "Real boys", " nature or nurture" , "the selfishness gene" or "why shouldn't we make better people with genetic engineering" and those ideas seem to sneak into us, like it or not. Altogether, it seems that our image of human nature gets bounced around quite a bit.

Professionally as well as personally, I puzzle over these things too. It is my business as a linguist and cognitive scientist to represent one corner of human nature. (I seek to refine certain partly mathematical claims about innate structure of language.) Like many of us, I am led into computational imagery, and like others, I am troubled by the reductionist and simplistic imagery that often dominates our sense of ourselves. It is obvious that all theories of human nature are fundamentally imperfect, and yet these offbase theories invade our emotional lives, throttle our

perceptions and pitch us back and forth as we, teachers and parents and lovers, decide what to do everyday.

No one, to my knowledge, asks this simple question squarely: what is the human impact of ideas about human nature? What happens to us when we are bombarded by potent judgements about ourselves? No person is unaffected. What consequence does the hubbub of boy/girl contrasts have for boys and young men? Boys get branded as inevitably bad, barred from gentle feelings, innately disposed to "act out" or dominate girls. What do little black children do, faced with the jokes and cartoons from the anti- "ebonics" polemicists who galloped through the media last year ? Evidence suggests that by fourth grade, as Harry Seymour in Communication Disorders says, "black children fall silent with a dull look in their eyes" if they feel that their dialect makes their voice and opinions unworthy. How many times last year in the heat of the anti- ebonics rhetoric---a million perhaps?—did a black child who knew the answer, not raise his hand in class because he had recently learned to be ashamed of his speech?

Sometimes there is grassroots opposition to the mental stereotyping that the test industry (with solemn intellectual support) advocates. A group of Massachusetts high school children refused to take the statewide mandated Massachusetts Comprehensive Assessment System (MCAS) tests (just like those of other states), with a visceral sense that it is "unfair" to their mental abilities and potential. Could it be that these tests are not only biased and partial, but that they miss the very essence of human ability? To be extreme, might they be almost as irrelevant to the mind as the skull measurements favored in the Third Reich? The high school revolt indicates that we feel easily bullied by ideas about human nature that we cannot gain perspective on?

While some think that ideas are just ideas until they are "implemented", a better assumption might be: all ideas have an instant impact on our lives, though often unconscious. Ideas therefore

confer a special (though hardly exclusive) responsibility on all those who either invent or promote them. Where can we see the impact? I think that the parent who slaps a child while muttering, "you little monkey", has been influenced by Darwinist theory. The impulsive criminal who says " I just don't know what made me rob the store" has experienced a trickle-down version of the idea that free will is an illusion. The child who defends his unpopular views by saying "it all depends on how you look at it" is the beneficiary of relativistic popular culture which itself is, unconsciously, boosted by relativistic physics.

A Darwinist may object to my forging a link between evolutionary ideas and parenting style. Some protest (though not the sociobiologists) that they are only talking about insects and mice and no extrapolation to people is intended. Darwinism need not lead to neglect of poor people . Such disclaimers are really inadequate moral evasions: the emergence of Social Darwinism is an inevitable and logical extension of the fitness concept and, therefore its inhuman consequences are partly the responsibility of intellectuals who invite, deliberately or not, extrapolations from animal behavior to human behavior (including the Third Reich or ethnic cleansing in Kosovo). We have no way to fully fathom how ideas affect us. And yet, somehow, the impact of ideas should be a part of the moral calculus of those who promote them, particularly when it is obvious that only “partial truths” are available.

It is important to realize that most sciences of the human being, including much of medicine, remain in a "pre-theoretical" state. The term "pre-theoretical" is used for those early stage sciences based on models where central terms have no rigorous definition and where ordinary intuition is ahead of science in its subtlety of insight. In what follows we will develop intuitive examples, avoiding reference to any form of mass measurement. I argue that no approach to the human mind can extract a subpart of human ability without distorting the overarching "self" which

organizes our actions. For scientists to exhibit humility before the complexity of human nature is a virtue and not a failure. It means simply that we should prevent any crude science from displacing sophisticated kinds of human intuition when real human beings are involved. "Scientific" wisdom is nowhere near human wisdom.

How, then, should we proceed? I think it is fair to say that our deepest intuition about human nature is that all people should respect each other's dignity. If so, the goal of humanitarian science should be to honor that notion in a scientifically respectable way. Dignity is the core of our sense of self, but it is easily undermined. I think efforts to subdivide human abilities lead to primitive definitions of human nature which are, inevitably, destructive of our sense of human dignity.

How can we recapture and preserve human dignity in science? It is a very difficult task because science must begin with simple models when it is precisely the inherent oversimplification of our models which endanger our respect for one another. The problem arises not only in psychology, but in physics and biology, which also have implications for our vision of human nature. The way to minimize the problem is to articulate the goal of psychological research in a way that does not avoid mysteries, but highlights them as the domain in which to seek the deepest principles of human nature. So we will try to project what a fully articulated theory of self and intelligence must entail by looking closely at a few examples. That means we must re-imagine the mystical entity that we refer to as The Self or even The Soul.

First let's look at the term "intelligence". The term "intelligent life form" is used in the biological sciences to identify when humanlike behavior is evident in archeological studies. In psychology however the term "intelligence" has been given a much narrower definition: it is a value term which includes some kinds of human behavior and excludes others. It is interesting, and

sad, to see how the term "intelligence" has been narrowed by those who seek to explore "intelligence" in a "scientific" way. From the perspective of modern cognitive science, this effort is not only unscientific, but more importantly, profoundly demeaning to all human beings. As we show below, even a cursory look at the mind, since a truly rigorous approach is not within our grasp, reveals that the whole "self" is inextricably connected to any legitimate concept of intelligence. One consequence of this view is that the evaluative term "intelligence" should remain an intuitive word which cannot be defensibly associated with any form of mass measurement.

Before we look at examples, here's the overall logic:

1) . Every human thought and action--especially those carried out in a few milliseconds--involves a capacity to combine inherently incommensurate factors: visual perception, touch, values, personality, aesthetic factors, estimates of other minds. How do we do it?

2) Instantaneous mental activity must connect diverse mental abilities in a common but unknown "algebraic notation",

3) Each person's formulae are unique; each of us commands the hidden mental algebra in a different fashion,

4) We cannot really fathom the formulae of someone else.

5) Since we cannot really judge the mysterious core of others, we should have both a sense of individual dignity and respect for each other.

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Micro-analysis has been a major source of progress in every scientific field. It is therefore a good vehicle for the examination of human nature. Every human action is composed of diverse ingredients. The act of composition is, often, so rapid that we have no insightful method of introspection. Language is a domain where instant integration is evident. If I utter the sentence:

“Our dear President Clinton should be MUCH more careful in his manipulation of the poor" more than a standard liberal point of view is expressed. The word "dear" is at once ironic and friendly. The choice of honorific (not saying "Bill") reflects the social distance between people without personal acquaintance. The intonation on MUCH, like the loudness of "ow" in measuring pain, is finely calibrated to an abstract notion of "degree of care". The word "manipulation" reflects the education of the speaker. The term the "poor" reflects a personal assessment of sophisticated mathematical representations of well-being within an obscure notion of general affluence (TV for everyone, fancy subways). And if you come from a nearby culture, like Britain, you may be offended, startled, or baffled by the need to accurately assess the thrust of an emphatic stress on a single word MUCH, because the British intonational system conveys emphasis in a slightly different style, and an "understated" use of emphasis.

One could in fact fill pages with further analysis of the micro-structure of a single sentence. For our purposes, the important question is, how, actually, does the mind integrate these influences in a fraction of a second to both produce and understand such a sentence? Each sentence is a unique object, so the factors are not pre-packaged, but delivered into each word in a coordinated fashion, like knowledge of a tune is delivered to the fingers of a piano player. The pianist takes information from a page, translates it into phrasing in the mind, and translates this information into very precise instructions to the very tips of her fingers. This is what must be explained--not simple mechanics of how joints work, but how incommensurate information--from paper to touch to sound-- is translated into instructions for the tips of our fingers. And ears check the outcome in a feedback loop to our fingers again. And, like the piano player who pours her own personality into a rendition of Mozart, we can sprinkle our pronunciation with subtle reflections of our attitudes.

Nothing less than the connection between fingertips, music, and ears is needed in order to define what a finger is (and what an ear is).

Any choice of human scientific goals that does not state the hardest problem, leads to an understatement of biological organization, and ultimately of human nature. The integration of inherently incommensurate information is present every moment of every day.

Our language for the mind is woefully vague compared to the microscopic reality. We employ terms like "eloquence" to refer to our capacity to capture a strange fit between an odd medium, language, and the world we act in. But if asked to explain how one achieves eloquence, we must struggle, like hapless literary critics, to consciously and inadequately unravel in detail what any human can unconsciously compose in a few milliseconds. Words like "eloquence" or "beautiful" allude to but fail to capture what they describe. Likewise, our "academic" or "psychological" representations of the human mind are mere caricatures of the actual complexity of mental life.

It is as if we described the human body as composed of flesh and bones when we really know that one needs a 1000 time magnification to see a micro-biological structure that genuinely represents physiology. We will have no genuine grasp of the mind until we can invent a microscope for mental structure that is comparable to the subtlety of the biological structure we already know to be present.

How do we explore this process, which distinguishes the human mind from any machine (such as any current computer): the human ability to undertake computations across incommensurate domains.? Such computations exist both in the fraction of a second that a parent puts out an arm to protect a child from an oncoming car or in the slow monthlong fashion in which we choose between a vacation, a new car, or more life insurance. These are real mental

computations which encode facts, values, and diverse phenomena into a mental algebra that we do not understand. It is the ability that lies behind our capacity to answer almost instantly the question "how are you today?" in a broad fashion. If one answers, "ok, I did well on an exam but my back hurts", instead of "good, I did well on my exam, though my back hurts", two different, instant results of information integration about ourselves have occurred. Each will reflect, in part, our personalities, social attitudes, and sense of who we are talking to. Perhaps 95% of all intellectual computations involve incommensurate information. They are the stuff of life. They define who we are and who we think we are, ultimately our sense of self. Even the most arcane, single-domain subjects, like chess, involve diverse information: a move is made with information about the opponent, the clock, and a judgment about whether strategic or computational decisions are called for.

Scientific advances come from creating formulas across incommensurate domains. Thus the equation: force = Mass times Acceleration recognizes a real concept, Force, which is not reducible to a single kind of ingredient, but rather is a hybrid. It is never the ingredients that are crucial, but a formula for combination: like a cake crucially results from the chemistry of cooking, not just the ingredients. Let us consider another analogy. Take a person who can juggle nine balls at once. The ingredients are self-evident: precise tossing (and catching) and timing. But these are abilities which all of us have: we can each throw a ball into the air to a fairly precise height. And we can each keep time, like a metronome. Why does this not suffice to make us all jugglers? The answer is that there exists a third ability, which we cannot define, labeled roughly "coordination" which allows joint monitoring of two inherently different abilities.

In fact one might argue that in terms of real information processing, athletic intelligence is the most sophisticated form of intelligence available. That is, one integrates strategy, physical awareness, awareness of the score, the personality of the opponent,one's energy level, and then does the equivalent of a calculus problem to do a jump shot in basketball. The last part is familiar math tagged onto a formula we have not yet begun to understand.

How do we express the fact that we can have a heavily automatic process---a tennis stroke--which makes minute adjustments for light, an instant assessment of muscle strength, the opponent's style, and one's own personality.? How and why does one's personality affect a forehand stroke more than a serve?

The answer must lie in a sophisticated version of what Jerry Fodor has called information encapsulation. He pointed out that certain reflexes cannot incorporate relevant information. For instance, if I can prove to you that something passing before your eyes will not hit your eyes, your eyes may still blink. If I point a gun at you, you might instinctively duck, but if I persuade you that the gun is not loaded, then you can prevent ducking. Blinking involves an encapsulated module--affected only by certain information--while ducking can take everything we know about into account.

This proves that the hidden algebra is not totally unconstrained. Our biology lets certain kinds of information into certain decisions, but not all. This is a natural starting point from a scientific point of view. Just as we ask: what is an impossible grammar (much is impossible), we should ask: what is an impossible mental computation, especially what is an impossible instant computation? Blinking provides a nice example: our eyes cannot incorporate a personality assessment in the decision to blink. We should expect that the algebra of the mind will be far more challenging than any physical or biological model developed heretofore.

Here is where individual differences must be acknowledged, again just where incommensurate information is involved.. The politician who can gauge an audience, bring just enough economic facts to bear, do a risk-calculation for saying unpopular views, and sense the news soundbite that will result, exhibits a capacity for split-second information management that we may not all share.

Particularly in the moral domain, some forms of information integration may be impossible or a huge stretch. Can we reasonably determine the value of carrying a group of laughing children in a van for a birthday party against the unneeded, but still miniscule, pollution when the van is driven around empty? (As a van-owner, I have come up with no good personal answer.)

And where do our usual explicit diagnostics of intelligence fit into this vast arena? The mathematics we do on the most sophisticated mental test is elementary compared to the mathematics our minds can do unconsciously with no instruction. Consider now an analogy to the concept of test. Suppose one wanted to test athletic ability. One might see how fast people can run. The results are very clear and measurable. In fact, in many sports running speed is a vital ingredient, but we all know that a whole host of other abilities are involved. Many swift runners are lousy baseball players. But, statistically, one might be able to have a better than chance prediction rate if one assumes that running ability is the same as athletic ability. It would be like assuming that age and height are correlated. Over large numbers, the correlation will work. But do we really want to judge individuals in such a one-dimensional manner? No coach would substitute any such test for their own composite ability to judge athletes. Mental computation is even more difficult to see. Why should one subordinate our sophisticated abilities to the judgments of a single dimension test?

Linguistics has been the premiere domain in which mentalism can be seen to take priority over the neurological representations which it will eventually serve to define. The intricate geometry of linguistic phenomena, like the visual geometry implied by stereoscopy, is not easy to illustrate. Two properties which serve creativity lend themselves to brief discussion:

1) Freedom of fixed reference: humans can refer to unique new objects, like cellular phone, while bees have a fixed reference to the angle of the sun (and other directional features)

2) We can repeat operations inside of operations (recursion). Thus we can endlessly continue with prepositional phrases (the man on the corner in the city with highways....). Or we can create endless genitives:

my mother's friend's dog's disease..

These two properties create the potential for infinite variety in expression, but the mathematics is different from that required for 3-D visual images. A third way that infinite structures exist in language can be seen in questions

who bought what

This has a potentially infinite answer: there is no limit to the number of who's or what's. But it also requires systematic pairing: x bought y, z bought w, etc. I have recently examined (together with Jill deVilliers) how children learn sentences

that involve such a variable and a pairing algorithm. We were

amazed to discover that 3yr old children understand these implications perfectly.

These important mental properties may occur elsewhere. Perhaps the ability to embed an operation inside of itself, for instance, is the origin of the capacity for self-consciousness. No one know what principles are needed for emotional constructs.

What is the language of the mind? The kinds of unconscious mental computations we are discussing occur too fast to be represented in words. Therefore the old notion that we "think in words" must be fundamentally in error. Nonetheless, all mental computation that occurs quickly must exist in a mental language that deserves a precise mathematical description which can explain how the computation happens in just milliseconds. It is here that the computer metaphor seems to be a useful first step. The binary code operations in computers might help us imagine how the brain works. But we must still solve the original problem: how do we algebraically represent diverse information? The fact that we can compute rapidly means that an algebraic language must exist in order to allow that computation to occur.

Let us consider another analogy. If you drive a car, you must integrate weather conditions, your knowledge of the capacity of your car, a reading of the intentions of an oncoming car, a sense of your own health and personality into decisions that direct tiny muscles in your fingers in milliseconds. A computer is built upon known mathematical principles and it cannot integrate inherently different kinds of information unless such information is translated, by a program, into a single kind of mathematical notation. The translation scheme, in order to mimic human life, must be as sensitive as we are. No program has even begun to mimic our information organizing procedures. No theory available today can explain something as simple as what determines how we glance around a room.

One might say that how the mind achieves this integration of information is the great question of the age. In fact, it may be that new mathematics will have to be invented just to account for the mental acts we carry out on a daily basis. Roger Penrose, an eminent physicist, has suggested that quantum mechanics will be involved, allowing invisible connections between different parts of the brain so that processing is both parallel and integrative across different parts of

the brain. It should be no surprise that only another mind, in unconscious ways, can appreciate these mental accomplishments. It should be no surprise that art whose origins are admittedly unconscious elicits great admiration. How does a writer capture the look on a person's face with a new metaphor?

In contrast, any effort to look at "basic" or "fundamental" aspects of behavior by simplification to known psychological concepts, inevitably chooses some animalistic notions like “egocentrism” or "self-interest" to describe emotions, or a purely mechanical version muscle ability. If one wants to understand how fingers work, one cannot simply ask about the mechanics of making a joint pivot. One must immediately ask how one plays a tune on the piano with fingers which involves, again, the integration of huge amounts of diverse information in micro-seconds. At no time should we lose sight of what we intuitively know to be the genuine intricacy of human ability.

The field of economics recognizes the fact that "choice" ranges over incommensurate domains. Their approach reveals precisely how one should not conceive of the problem. They simply develop a brute force utilitarian metric. Assign a value to each desire and then compare them: I want ice cream [+5], I want to stay thin [-4], I want to save money [-1], and I want to have fun with friends [+1]. Now you add them up and decide to eat ice cream. However, we can be sure that however we make such decisions, it not in this manner. We consult basic values, and current needs with a formula that involves our personalities in much more complex ways. Any simplification of it, as we find in economics, is really a denigration of all human beings.

Suppose, for instance, that two of the factors mentioned above, "staying thin" and "saving money" have a geometric relation to each other. Whenever they occur together,

they explode, like in a chemical interaction. Then we would have to multiply□not add each of their numbers. The model just mentioned, though, allows only addition. Addition is obviously inadequate as a means to describe how we actually make decisions. In reality, multiplication is insufficient as well and a real "calculus" exists whose properties would be interesting to articulate. (And Sam Bowles assures me that economists are busy building such models.) If one follows the model of linguistics, one would ask what is mentally impossible: are there any pieces of information so unlike that the mind is incapable of co-evaluation?

Social scientists argue that simple models allow mathematical correlations over large numbers of people which are compatible with the addition metric. Such correlation's simply worsen the deception and continue to promote an oversimplified view of human beings. It is ironic that economists put more mathematical complexity into the statistical analysis of economic hypotheses rather than into the representation of the minds being described. It is not clear that there is such a thing as “economic man” (self-interested) as distinct from “human man” (with intricate human relations). Can we really slice out “self interest” as a separate computation as economists would have it?

Let us consider another analogy. Take a person who can juggle nine balls at once. The ingredients are self-evident: precise tossing (and catching) and timing. But these are abilities which all of us have: we can each throw a ball into the air to a fairly precise height. And we can each keep time, like a metronome. Why does this not suffice to make us all jugglers? The answer is that there exists a third ability, which we cannot define, labeled roughly "coordination" which allows joint monitoring of two inherently different abilities. There is a more abstract principle involved. This is true of our

decision-making as well. There are more abstract principles involved which lead us to recognize a certain "style" and to come to respect those who have "good judgment".

There are real principles behind such uses of the mind. They remain mysterious, but they are not mystical entities, nor are they simply a reflection of emotional tuning. Some people seek "being centered" as a solution to problems, but again we do not know what "emotional balance" means, .although the term is an interesting metaphor. It is more subtle and probably involves principles of mental "coordination" which we have not yet imagined.

Now suppose there are ten (or a hundred) kinds of intelligence bundles that we have not recognized yet, at least not labeled in some conscious fashion. In fact, Howard Gardner has made a similar claim in a general and intuitively natural way: musical ability, social ability, and athletic ability are all distinct kinds of intelligence. But we should not shut our eyes to the possibility that there are more interesting kinds of intelligence lurking within us that we have not discovered yet, which move across these domains. And they will be far subtler than a list of commonly known talents.

Nevertheless they will doubtless all have a certain characteristic: they involve the coordination of inherently different kinds of information. A successful dance teacher might have a unique ability to combine dance knowledge with a sense of the personal style of an untrained ballerina. A politician may be able to combine legal reasoning, a sense of publicity, and ethnic interests in a unique way. Each combination of inherently diverse domains could reflect a special biological disposition that we do not really grasp. Gardner's view is that intelligence is modular, following some familiar routes of human talent. I would argue that there are probably an infinite set of unique combinations of ability, just like there are an infinite number of distinct human faces.

The common sense modules (traditional talents) are highly misleading in this respect. While the face is just a set of surface combinations, the set of combinations of mental ability must be orders of magnitude greater.

Those talent-combinations that move to the forefront of society are partly a matter of cultural luck. The ability to create computer programs is not purely mathematical, but rather involves “user-interfaces” etc. The current crop of wealthy computer czars have such abilities, but those abilities were probably unrecognizable three generations ago. Likewise in ancient societies, lacking mathematics, those who were mathematically gifted but verbally inept were probably seen as "less intelligent" because verbal ability was the only kind of intelligence.

There is another important ingredient in human nature that defies easy scientific representation: free will. There is no total free will. For instance, most of us by an act of will cannot decide to believe that two and two are five. But infinite computational variety coupled with higher order forms of regulation give us a sense that we make decisions for ourselves. Our sense of free will is a central ingredient in our sense of human dignity. The machine within us does not run us. We run the machine. How do we represent such a view? It cannot be represented easily with a computer metaphor. Nevertheless the exercise of free will is an ingredient in the application of intelligence. How do we carry it out.?

There is no clear answer to this question that I can see. But perhaps one can visualize how to approach it. Once again, the mind is infinite in a number of directions. For instance, the principle of addition is infinite. When a child says "never" he invokes infinity. When we utter any sentence we have created a novel object from a set of infinite possibilities. Not only is our sentence unique, but what it means is unique. We have the ability to create unique meanings and unique emotions to match those meanings instantaneously. We have not only an infinite sentence-builder,

but an infinite emotion-builder. That mechanism responds to influences from outside ourselves. But, in some way, we also determine which external influences we will register and how we interpret them. Thus, in a way we do not fully grasp, we are not totally at the mercy of our circumstances. Some "Inner self" (that old ghost in the machine) must fashion action which alters our environment, rather than environment altering us.

Emotions have a second-class status within the concept of intelligence. But emotions are just another form of mental computation, though obviously, we experience them differently. Every moment generates a unique emotion. Perhaps we have each had 200,000 quite different emotions. My emotion in writing this on a computer is different from the emotion that someone would have scrawling the same sentence in the 19th century. To experience having an exam, losing your shoes, and being in love on the same day, creates a unique emotion, a unique feeling when asked "how are you" which involves the same capacity to combine different kinds of information that we discussed with reference to intelligence. Idyllic moments are inherently diverse: sipping lemonade on a sunny day with a good book and a friend. There is, then, from an information point of view, very little difference between "reason" and "emotion". The real question is how we capture our ability to create unique combinations of reason, emotion, and perceived reality.

If we knew how to add free will to this image, then we would see ourselves as not only having choices in life, but having the capacity to create the infinite set of choices from which we choose. The fact that this formulation may feel as if it contains paradoxes makes it like other classical scientific paradoxes which have been the starting point for new insights.

Now we have come full circle. We asked at the outset how come modern society has allowed itself to defile the original notion of intelligence by substituting a debased notion of computational ability. We have discovered that everything in ourselves participates in our thoughts

and engages our mental computations, that everything we are is a part of our intelligence, although the hidden algebra that brings the self together remains a mystery.

What terms do we apply to the self? One term, of great interest, is the notion of "integrity". What does it mean? It seems to have exactly the property we seek: it refers to logical consistency in action and thought. A person has integrity if all his actions follow from the same principles. The very notion that integrity is a human value supports the view that logical consistency across obscure, interior values can be unconsciously appraised. Where does our intuition of a person's integrity come from? Do we unconsciously associate a set of actions with a person, generate an unconscious principle that defines them, and then determine unconsciously that a person honors them? It seems that somehow we do.

Our intellectual journey in this essay may seem amusing to some, but without consequence. However there are substantial consequences How do we protect ourselves from the cacophony of illegitimate statistics and one-sided views of human nature which our culture employs? The answer to this question is far from clear, but a few things are evident.

First, we should never allow ourselves to subordinate our personal judgments to the results of tests. Tests are, at best, a form of mass evaluation, not individual evaluation, though it is not clear what they evaluate in any case. Second, we must prevent ourselves from developing personality cults, and via them, a class system for the mind. We have to make the effort to see that someone with a strong Southern accent, who often says "yawl", really is excellent in mathematics. The best protection against a personality cult is seeking diversity in every social realm. Intuitively, our society has come to see diversity as important. Unconsciously, then, we are recognizing that guaranteeing diversity in our social organizations, promotes the goal of having diverse kinds of human intelligence recognized.

Needless to say, this perspective supports democratic values, the idea that we can intuitively judge political policies with tremendous sophistication, as we intuitively judge people. Thus political decisions should be made by the population and the role of experts should be to provide us with information and not to supplant our ability or power to make human judgments.

All scientists, but especially psychologists, should ask themselves about the impact of imperfect ideas. Every single person is hurt by the modern concept of "intelligence". We cannot see each other clearly as long as our capacity to associate strange statistics with individual human beings distorts our sense of humanity. Every parent who sees a wild child, even momentarily, as a kind of animal, has been damaged by Darwinist doctrines. Every teacher who believes the numbers that tests provide are the "truth" is like a person who believes that only classical art is real and all modern art is sloppy. The consequences are not far away. They are present in the glances we give one another, the tones of voice we choose, the advice a teacher gives to a child who tests poorly but has ambitious projects. Moreover, because the impact is largely unconscious, we are collective victims, unable to see through the fog we have created. For instance, if I say that a person is a B student, and you say that you do not believe in grades, nonetheless my comment will contribute to your image of that person, even against your will.

Aside from our personal reflections, we might ask: is this a good moment in history to contemplate human nature scientifically? I am not so sure. If we had a medieval perspective perhaps we think it is obvious that one should contemplate human nature in terms only of Good and Evil or Duty and Dereliction. Instead a shadow is cast over our thinking by the dominance of self-interest doctrines, with its links to Darwinism and economics. The act of conversation--language--entails taking other people's Point of View. The smallest infant--contrary to widespread assumptions--could not reach out or make a demand if they did not think there were other minds

different from themselves. Jerry Bruner has remarked with some astonishment (NYReview of Books) that he and we could have ever have believed that children were egocentric. Just witness, he says, the complex, social interaction between mother and infant involved in mutual gazing, where the infant responds, anticipates, and elicits glances that entail a calculation of what feelings the parents face projects. Perhaps we should be wary of our confidence that social science methods, endless number-crunching, international panels, and the success of other sciences' confers upon us some culture-free and superior methods to contemplate what a human being is.

The philosophically astute reader will realize that we have turned the usual perspective on the mind/body problem on its head. As Chomsky has pointed out:
the body may be an incoherent object that we will never understand. We inevitably turn to a mathematical representation of biology, in his words, "once the concept of body/matter is abandoned as it must be, when the force of Newton's conclusions is finally recognized. " In the past it turns out consistently "that the assumptions made about the 'material base' were wrong." Thus staring through a microscope enriching our knowledge of neurology cannot unlock the secrets of mind. Abstract biological principles—akin to gravity---must still be uncovered, which make mind a principled biological outcome.

In sum, a hidden algebra—and its formal principles --must be at the root of a description of how the body is designed to serve the mind and carry out its instructions. We cannot understand our fingertips unless we see them as instruments of mental intentions. And, once again, each mind generates slightly different modes of analysis. Modern culture magnifies the differences. Who knows what sorts of unimagined talents the Internet will elicit? While this essay focusses on what human beings in daily life should be aware of, one can also ask what the task of cognitive science should be. It should be to build interfaces and make claims about what kinds of information can be

put into a single formula and what not, and whether there are universal limits on human nature that determine how fine-grained that integration can be.

One point remains: if we accept the fundamental indivisibility of human nature, cognitive science can progress while as individuals we sustain a rock-solid sense of self-respect and regard for the dignity of others.

[Bibliography can be supplied]