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YES, GIFTEDNESS (AKA "INNATE" TALENT) DOES EXIST![1]

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Abstract

This chapter pursues two main goals: (a) demonstrate that natural abilities—and their outstanding expression as gifts—really exist (the mainstream Pronat position), and that recent attacks by a few researchers who deny their existence (the Antinat position) can be easily parried empirically; (b) expose improper scholarly behavior by some Antinat researchers. Part I surveys the author's Differentiated Model of Giftedness and Talent (DMGT) and analyzes the concept of natural ability, pointing out its main defining characteristics. Then, it demonstrates with extensive empirical evidence that general intelligence meets all defining criteria of a natural ability. Part II illustrates how some influent Antinat researchers systematically exclude relevant evidence, accumulate irrelevant information, ignore crucial objections, and select from published studies only the results that support their position. These repeated instances of ethically improper scientific behavior show their lack of openness to an objective examination of all the available evidence and reassessment of their entrenched beliefs.

Keywords: *Deliberate practice, expert, expertise, prodigy, common sense, exceptional ability, skill acquisition, anecdotes, music, innate talent, giftedness, representative tasks, superior power, superior control, superior speed, developmental windows, rates of learning, individual differences*

Most educators and researchers in psychology and education acknowledge without hesitation the existence of *natural abilities*. By natural, I mean mental or physical abilities (a) whose development is significantly influenced by our genetic endowment, and (b) that act as causal agents in the growth of competencies (knowledge and skills) characteristic of a particular field of human activity. As described below in more detail, my talent development theory, called the *Differentiated Model of Giftedness and Talent* (*DMGT*) associates giftedness with outstanding (top 10%) natural abilities, and talent with outstanding (top 10%) systematically developed competencies. In the analysis of competency development, natural abilities—and by extension giftedness—represent the "potential" pole on a potential-to-performance continuum. The developmental process draws on these potentialities to systematically build competencies in a specific occupational field (e.g., professions, trades, technology, arts, sports). Consequently, natural abilities contribute significantly to predict, along with other important causal variables, the level of these occupational achievements. If we put aside the specific use of the terms giftedness and talent in the above description of competency development, it summarizes a view that would rally a majority of scholars interested in the talent development process.

This mainstream position, which I will label *Pronat*, leaves room for a small minority of researchers—whom I will call *Antinats*—who are not just skeptical about the "naturalness" of some abilities, but who manifest a strong opposition to naturalness itself. Two groups of scholars, one in Britain (Howe, Davidson, & Sloboda, 1998) and the other in the United States (Ericsson, Roring, & Nandagopal, 2007) expressed most strongly their opposition to the concept of natural abilities (whose giftedness level they usually call *innate talent*). In the first of these two articles, Howe et al. (1998) concluded their review as follows: "The evidence we have surveyed in this target article does not support the talent account, according to which excelling is a consequence of possessing innate gifts" (p. 407). In the more recent attempt, using a different sample of alleged counterevidence, Ericsson et al. (2007) came to an equally strong conclusion: "With the exception of fixed genetic factors determining body size and height, we were unable to find evidence for innate constraints to the attainment of elite achievement for healthy individuals" (p. 3). If we put aside the invited comments to each of these two texts, most of them clearly opposed to the authors' conclusions, I have not found any comprehensive response to these two attacks on the associated concepts of natural ability and giftedness. The more recent of the two texts became my last straw, convincing me of the necessity to write (Gagné, 2009b) a systematic and detailed counterpoint to these two Antinat statements. The present chapter draws significantly from that in-depth response.

In the first part, "The Case for Giftedness," I will define the concept of natural ability as it appears within the framework of the DMGT. I will include all levels of natural ability since Antinat researchers have questioned the existence of the whole concept, not just its giftedness part. I will then introduce evidence for its existence in the most broadly researched ability domain: the intellectual domain. I will also briefly mention similar empirical evidence with regard to physical abilities. In the second part, "The Case for Antinats' Systematic Factual Misrepresentations," I will discuss the much more delicate subject of recurring scholarly misconduct on the part of Antinat researchers, sampling examples from the two target articles mentioned above. I will conclude that their repetitive biasing of scientific data in order to maintain their ideological positions leaves little hope for an eventual meeting of minds between the two opposing camps.

PART I: THE CASE FOR GIFTEDNESS

Part I is subdivided into three main sections. Firstly, I briefly present my Differentiated Model of Giftedness and Talent, a talent development theory that defines the terms *gifts* and *talents* in very distinct ways. The DMGT offers a general framework to analyze the dynamics of talent development over the life span; it also introduces a clearly defined set of terms to describe unambiguously all major components of the talent development process, as well as the prevalence of various levels of giftedness and talent. Secondly, I define the concept of natural ability, also called *aptitude* or *potential*; I show how aptitude measures can be distinguished from achievement measures through a series of criteria inspired by Angoff's (1988) work. In the third section, I demonstrate with appropriate scientific literature how the construct of general intelligence meets all the defining criteria for natural abilities. A very short addendum at the end briefly argues that physical abilities also represent clear examples of natural abilities.

The Differentiated Model of Giftedness and Talent (DMGT)

Among current conceptions of giftedness (Sternberg & Davidson, 2005), the DMGT stands alone in its clear, distinct, and well-operationalized definitions of two key concepts in the field of gifted education: giftedness and talent. It is a well-known observation that most educators commonly use these two terms as synonyms, just like in the recurring expression: "the gifted and talented are…" Occasional distinctions between the two terms will take many forms and give rise to a diversity of views and theories. Yet, an in-depth look at these divergent views reveals an underlying general belief in two distinct forms of exceptional abilities, namely early emerging forms of "giftedness" with strong biological roots, as well as fully developed adult forms of "giftedness." Scholars will express that distinction through pairs of terms like potential/realization, aptitude/achievement, and promise/fulfillment. The DMGT was created to take advantage of that distinction. I will not describe it in detail, but rather survey its components and structure just enough to enlighten readers who have never encountered this theory (see Gagné, 2009a, for a more detailed presentation of the updated DMGT 2.0). As shown in Figure 10.1, the DMGT brings together five components: gifts (*G*), talents (*T*), the talent development process (*D*), intrapersonal catalysts (*I*), and environmental catalysts (*E*).

The Talent Development Trio

The first trio includes the three components whose interaction summarizes the essence of the DMGT's conception of talent development: the progressive transformation of gifts into talents. Below are formal definitions for the two target concepts.

Giftedness designates the possession and use of untrained and spontaneously expressed outstanding natural abilities or aptitudes (called gifts) in at least one ability domain, to a degree that places an individual at least among the top 10% of age peers.

Talent designates the outstanding mastery of systematically developed competencies (knowledge and skills) in at least one field of human activity to a degree that places an individual at least among the top 10% of "learning peers" (those who have accumulated a similar amount of learning time from either current or past training).

The terminology used in the above definitions reveals the breadth of the theory. Although it was created to explain the transformation of gifts into talents, the DMGT

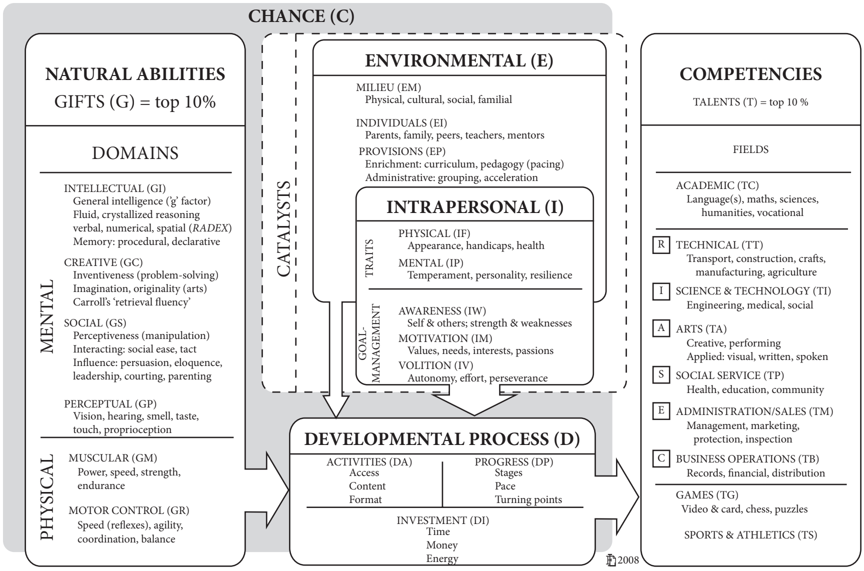

FIG 10.1 DMGT Components

also applies more generally to the transformation of average (or low) natural abilities into average (or low) competencies (knowledge and skills).

Gifts (G). The DMGT proposes six natural ability domains, four of them belonging to the mental realm (intellectual—*GI*, creative—*GC*, social—*GS*, perceptual—*GP*) and the other two to the physical realm (muscular—*GM,* motor control—*GR*). Natural abilities are not innate; they do develop, especially during childhood, through maturational processes and informal exercise. Yet that development and level of expression are partially controlled by the individual's genetic endowment. We observe major individual differences in natural abilities in the daily lives of all children, both at home and at school. For instance, think of the intellectual abilities needed to learn to read, speak a foreign language, or understand new mathematical concepts; the creative abilities needed to solve different kinds of problems and produce original work in science, literature, and art; the physical abilities involved in sports, music, and sculpture; and the social abilities essential in interactions with classmates, teachers, and parents. Gifts can be observed more easily and directly in young children because environmental influences and systematic learning have exerted their moderating influence in a limited way. However, they still show themselves in older children and even in adults through the facility and speed with which individuals acquire new competencies (knowledge and skills) in any given field of human activity. Said differently, ease and speed in learning are the trademarks of giftedness.

Talents (T). As argued within the DMGT framework, talents progressively emerge from the transformation of these outstanding natural abilities or gifts into the well-trained and systematically developed competencies characteristic of a particular field of human activity. On the potential–performance continuum, talents represent the performance pole, thus the outcome of the talent development process. Talent fields can be extremely diverse. Figure 10.1 shows nine talent subcomponents. Six of them correspond to the American College Testing's World-of-Work classification of occupations. It has its source in John Holland's (see Anastasi & Urbina, 1997, Chapter 14) classification of work-related personality types: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC). Three additional subcomponents complement the RIASEC taxonomy: pre-occupational academic (K–12) subjects, games, and sports. A given natural ability can express itself in many different ways, depending on the field(s) of activity adopted by an individual. For example, motor control (GR) can be modeled into the particular skills of a pianist, a painter, or a video game player. Similarly, cognitive processes can be modeled into the scientific reasoning of a chemist, the game analysis of a chess player, or the strategic planning of an athlete.

Developmental process (D). In this theory, natural abilities or aptitudes serve as the "raw materials" or constituent elements of talents; they act through the talent development process. Talent development is formally defined as the systematic pursuit by *talentees*, over a significant period of time, of a structured program of activities leading to a specific excellence goal. The neologism *talentee* describes anyone actively involved in a systematic talent development program, whatever the field. The D component has three subcomponents: activities (DA), investment (DI), and progress (DP), each of them subdivided again into multiple *facets*. Talent development begins when a child or adult gains access (DAA), through identification or selection, to a systematic program of activities. These activities include a specific content (DAC), the curriculum, offered within a specific learning environment (DAF or format). That learning environment may be either unstructured (autodidactic learning) or structured (e.g., school, conservatory, sport organization). The investment (DI) subcomponent quantifies the intensity of the talent development process in terms of time (DIT), money (DIM), or psychological energy (DIE). Ericsson's concept of deliberate practice (Ericsson, Krampe, & Tesch-Römer, 1993) fits perfectly well within the DIT and DIE facets. Finally, the progress (DP) of talentees from initial access to peak performance can be broken down into a series of stages (DPS; e.g., novice, advanced, proficient, expert). Its main quantitative representation is pace (DPP), or how fast—compared to learning peers—talentees are progressing toward their predefined excellence goal. The long-term developmental course of a talentee will be marked by a series of more or less crucial turning points (DPT) (e.g., being spotted by a teacher or coach, receiving an important scholarship, accidents, death of a family member or close friend).

The Prevalence Question

Any definition of normative concepts must specify how subjects differ from the norm and what it means in terms of the prevalence of the population subsumed by the label. In the DMGT, I have placed the initial threshold for both giftedness and talent at the 90th percentile. In other words, those who belong to the top 10% of the appropriate reference group in terms of natural ability (for giftedness) or achievement (for talent) deserve the relevant label. To counterbalance this generous choice for the minimum threshold, the DMGT proposes an MB (metric based) system of five successive levels of giftedness or talent (Gagné, 1998b). Thus, within the top 10% of *mildly* gifted or talented persons, the DMGT identifies the following four progressively more selective subgroups, respectively labeled *moderately* (top 1%), *highly* (top 1:1,000), *exceptionally* (top 1:10,000), and *extremely* (top 1:100,000).

The "Supporting Cast"

Two large sets of catalysts, respectively labeled *intrapersonal* and *environmental* (see Figure 10.1) affect the talent development process, either positively or negatively.

Intrapersonal catalysts (I). The I component has five subcomponents grouped into two main dimensions, namely stable traits (physical—IF, mental—IP) and goal management processes (self-awareness—IW, motivation—IM, and volition—IV). Within the mental or personality (IP) category, we find an almost infinite list of descriptive qualities. The concept of temperament refers to behavioral predispositions with a strong hereditary component, whereas the term *personality* encompasses a large diversity of positive or negative acquired styles of behavior. The most widely accepted structure for personality attributes is called the Five-Factor Model (FFM), or more commonly the "Big Five." They are respectively labeled Extraversion (E), Neuroticism versus emotional stability (N), Agreeableness versus antagonism (A), Conscientiousness (C), and Openness to experience (O). Research has shown that each factor is strongly rooted in biology (McCrea, 2009).

The term "motivation" usually brings to mind both the idea of what motivates us (IM) and how motivated (IV) we are, that is, how much effort we are ready to invest in order to reach a particular goal. Within the framework of their *Action Control Theory*, two German scholars (Corno, 1993; Kuhl & Beckman, 1985) proposed to differentiate the goal-seeking process into distinct goal-setting activities, which would receive the motivation label (IM), and goal-attainment activities, which they labeled "volition" or willpower (IV). Talentees will first examine their values and their needs as well as determine their interests, or be swept by a sudden passion; these will serve to identify (IM) the specific talent goal they will be aiming for. The loftier that goal, the more effort talentees will need to reach it (IV). Long-term goals placed at a very high level require intense dedication, as well as daily acts of willpower to maintain practice through obstacles, boredom, and occasional failure.

Environmental catalysts (E). The E component used to be placed below a central arrow representing the developmental process. As part of the recent update, they have been moved up and behind the I component. This partial overlap signals the crucial filtering role played by the I component with regard to environmental influences. The narrow downward arrow at left indicates some limited direct E influences on the developmental process (e.g., social pressures, rules, or laws). But the bulk of environmental stimuli have to pass through the sieve of an individual's needs, interests, or personality traits. Talentees continually pick and choose which stimuli will receive their attention. The E component comprises three distinct subcomponents. The first one (EM) includes a diversity of environmental influences, from physical ones (e.g., climate, rural vs. urban living) to social or cultural ones. The second subcomponent

(EI) focuses on the psychological influence of significant persons in the talentees' immediate environment. It includes of course parents and siblings, but also the larger family, teachers and trainers, peers, mentors, and even public figures adopted as role models by talentees. The third subcomponent (EP) covers all forms of talent development services and programs. The two traditional facets of enrichment and administrative provisions directly parallel the "content" and "format" facets of the DA subcomponent earlier described. Here we adopt a broader outlook rather than examine provisions from the strict perspective of a given talentee's talent development course. Enrichment refers to specific talent development curricula or pedagogical strategies; its best-known example is called enrichment in density or curriculum compacting. Administrative provisions are traditionally subdivided into two main practices: (a) ability grouping (part-time or full-time) and (b) accelerative enrichment (e.g., early entrance to school, grade skipping).

The Chance (C) Factor

Chance used to play the role of a fifth causal factor associated with the environment (e.g., the chance of being born in a particular family; the chance of the school in which the child is enrolled developing a program for talented students). I came to realize that, strictly speaking, it is *not* a causal factor. Just like the type of influence (positive vs. negative), chance characterizes the *predictability* (controllable vs. uncontrollable) of elements belonging to three other components (G, I, or E). Chance's crucial involvement is well summarized by Atkinson's (1978) belief that all human accomplishments can be ascribed to "two crucial rolls of the dice over which no individual exerts any personal control. These are the accidents of birth and background. One roll of the dice determines an individual's heredity; the other, his formative environment" (p. 221). These two impacts alone give a powerful role to chance in sowing the bases of a person's talent development possibilities. Because of its redefined role, the "chance" factor should no longer appear in a visual representation of the DMGT. Yet its popularity among DMGT "fans"—as well as my personal attachment to it—brought me to create some room for it in the background of the components it influences.

Underneath the DMGT

As mentioned earlier, natural abilities are not innate; they do possess undeniable biological underpinnings. The DMGT represents a theory of talent development limited to the "ground level" of directly observable behavior. The supporting biological structures are situated underneath. Although they contribute to create the large individual differences observed at ground level, they are not constituent elements of the DMGT itself; each level has its own degree of autonomy. The DMGT's basement can be metaphorically subdivided into three levels (see Figure 10.2). At the bottom, we find genotypic structures and processes (e.g., DNA, RNA, protein production). The second level contains a large diversity of physiological and neurological processes (called endophenotypes) that ensure the proper functioning of body and brain. Many of them are

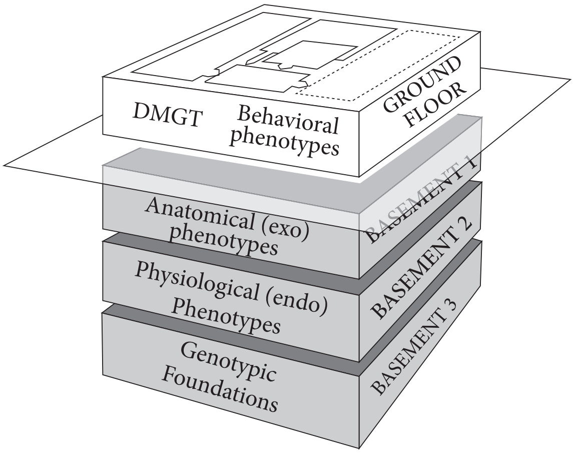

FIG 10.2 DMGT's Basement Shown in Three Levels

known sources of individual differences in the G and I components. The highest level includes anatomical structures, called exophenotypes (e.g., brain size, height, joint flexibility), which have been associated with abilities and other personal characteristics. These three underground structures interact dynamically to ensure the proper development of natural abilities and many intrapersonal catalysts (Gagné, submitted).

The Dynamics of Talent Development

For the model to become a theory, the five components need to be dynamically associated, a process still in progress. Here are a few highlights of the theory part of the DMGT. The relationships among the five components express themselves through a complex pattern of interactions. The most fundamental is the causal relationship between outstanding natural abilities (gifts) and outstanding competencies (talents), illustrated by the large central arrow in Figure 10.1. Because gifts are the constituent elements (or raw materials) of talents, it follows that the presence of talents implies underlying gifts. But that statement needs to be qualified. Of course, I and E catalysts, as well as the D component, play a significant facilitating (or hindering) role in the developmental process. Because of that role, they reduce to a moderate level the predictive power of gifts as contributors to talent emergence. Consequently, individuals with natural abilities below the gifted level could still reach talent-level attainments through strong inputs from intrapersonal and/or environmental catalysts, as well as from the developmental process itself (amount and intensity of learning and practice). This moderate relationship between gifts and talents also means that gifts can remain undeveloped, as witnessed by the well-known phenomenon of academic underachievement among intellectually gifted children. The causal components usually act through the developmental process, facilitating or hindering the learning activities and thus the performance. But any pair of components can interact, and in both directions (e.g., G influencing I, and vice versa); achievements (T) or their absence can even have a feedback loop effect on the other components.

Are some components generally recognized as exercising more powerful influences on talent emergence? It is possible to find in the scientific literature strong defenders for each of the DMGT's components. It is clear, for instance, that strong environmentalists (e.g., Bloom, 1985) will choose the E catalysts; for his part, Ericsson (Ericsson et al., 1993) has been insisting for almost two decades that his "deliberate practice" construct (a part of D) is the crucial element in talent development. My own review of the existing literature has brought me to propose the following hierarchy among the four components: G, I, D, E (see Gagné, 2004, for a detailed discussion). Yet, creating a hierarchy should not make us forget that (a) *all* components play a crucial role in the talent development process, and (b) each individual story of talent emergence reveals a unique interaction pattern between the four causal components (see Gagné, 2000, for a detailed illustration).

About Natural Abilities and Giftedness

The preceding section shows that the concept of natural ability anchors the DMGT's distinction between gifts and talents. Without that distinction, the whole DMGT structure literally crumbles. It thus becomes imperative to offer clear empirical support for natural abilities, especially in view of the strong opposition mentioned at the beginning of this chapter. To avoid any conceptual ambiguities, I must first define and describe the concept of natural ability, better known through its synonym of aptitude.

Recognition in Daily Language

The concept of aptitude or potential has been part of lay psychology almost forever, appearing in dozens of expressions like the very common "realizing one's potential." There is no lack of sayings to translate the idea that some individuals possess in one or more domains higher aptitudes than their peers, sometimes much higher ones. When we say of a young person that she is a "born" musician (or "born" athlete, or "born" leader), we are implicitly alluding to the non-learned, biological, or genetic foundations of human abilities. Many more common expressions convey a similar meaning, for instance, "you either have it or you don't," "he's a natural," or "it's a gift from God." Here is an interesting anecdote about that common-sense conviction. The mother of Quebecer Mario Lemieux, one of hockey's greatest idols, described as follows the first time her son stepped onto the ice:

> When he disappeared into the crowd of boys with his stick and his puck, he took all eyes with him. They all said, "Look at this little guy, look at him go, look at him skate!" Pierrette says. If the Lemieuxs didn't know it already, they found out then that the youngest of their three sons had been uniquely blessed with a natural grace and fluidity whose origins were far, far removed from anything to do with his parents' decidedly unathletic genes. "That," Pierrette insists emphatically, "came from the sky. It's a natural gift. No one in the family gave it to him." (Brender, 1997, p. 14)

Scientific Controversy

That unanimous recognition in lay psychology and works of fiction did not prevent the aptitude concept from becoming the target of much controversy in scientific circles. The controversy crystallized around two major themes: (a) the denial of any "naturalness" in human abilities and (b) the denial of any appropriate way to operationalize or measure a person's potentialities. As described in the introduction to this chapter, the first of these two themes will be this chapter's core issue, confronting Pronat and Antinat scholars over the defensibility of strictly environmental interpretations of talent development, as opposed to a recognition that biologically grounded outstanding natural abilities contribute significantly to the emergence of talents. So, let's leave it aside for the time being and focus on the second theme. Over the past few decades, strong discussions, sometimes quite heated, have gone back and forth over the measurement of aptitudes (e.g., Anastasi, 1980; Lubinski & Dawis, 1992; Snow, 1992; Snow & Lohman, 1984). For instance, Anne Anastasi, one of the past century's most prominent experts in psychometrics, once said that she would, if she could, excise the word *aptitude* from psychology's vocabulary (see Angoff, 1988). It is hard to imagine a stronger statement. Thankfully, most scholars do not endorse such an extreme position. Defenders of that construct bring forth two main arguments. First, they point out the large individual differences in ease and speed in learning—the DMGT's trademarks for natural abilities—at any level of the school system. As Angoff (1988) comments, "given the same amount of exposure to education…some individuals seem to be able to solve problems; understand the significance of events, facts, and connections; and draw inferences, generalizations, and deductions that others seem unable to do at all, or at least not as readily" (p. 716). Second, they argue that educators easily accept other types of aptitudes, like musical aptitudes, athletic aptitudes, or leadership aptitudes. Why reject that concept when applied to academic learning?

A crucial difficulty lies in a common interpretative error, namely a tendency to consider aptitude/potential and achievement as two *qualitatively* distinct entities. If they really differed in kind, it should be easy to properly label any behavioral measure as either a measure of potential or a measure of achievement. Unfortunately, no simple solution exists. Here is a typical example. Most scholars acknowledge that IQ tests are proper measures of intellectual aptitudes; some academics even call them "cognitive ability" tests, whereby the term *ability* implicitly means "natural ability." Most of these IQ tests include items that assess both vocabulary and arithmetic knowledge. At the same time, every standardized achievement test used in school districts includes these two subject matters, all the way from kindergarten to the end of high school. So, how can vocabulary or arithmetic questions serve simultaneously to assess potential and achievement? One thing is clear: Although we find it easy to distinguish potential and achievement conceptually, that distinction becomes much more imprecise at the level of concrete measurements. Lubinski and Dawis (1992) proposed the following illustration: "It may be appropriate, for example, to characterize a gifted athlete from a distant country who has phenomenal quickness, running speed, and strength, but is ignorant of the game of football, as having latent talent for football. But this characterization is based on a lot of behavior, a lot of *manifest* behavior" (p. 4). So, how can we hope to distinguish aptitude measures from achievement measures if both rely on some form of performance?

Angoff's Differentiating Criteria

Thankfully, the late William Angoff (1988) proposed an elegant solution to this conundrum. He identified a series of 10 criteria that differentiated aptitude measures from achievement ones. They appear in Table 10.1 in a three-domain structure I created from Angoff's simple enumeration. Note that Angoff worded all the descriptions as *quantitative* differences between the two types of instruments; they simply *lean in opposite directions* with regard to each criterion. These "leanings" announce occasional difficulties in determining whether a particular measure belongs to the aptitude or the achievement category. Hopefully, we will encounter a minority of such cases. If you need to keep in mind concrete examples as you compare the two columns in Table 10.1, just think of an IQ test as a well-recognized measure of aptitude, and of teachers' exams or standard achievement tests as excellent examples of achievement measures; the relevance of these criteria should be evident. Notice that items A to C in Table 10.1 clarify the conundrum mentioned in the preceding paragraph, namely the use of vocabulary or arithmetic questions to assess simultaneously potentialities and achievements. Other examples might help better understand Angoff's differentiation.

Table 10.1 Angoff's Differentiating Characteristics for Aptitudes and Competencies

	Aptitudes (natural abilities)	*Competencies (systematically developed abilities)*
	Content	
A	More *general* content	More *specific* content
B	"*Old formal*" learning	*Recent* acquisitions
C	More widely *generalizable*	*Narrower* transfer to other situations
	Processes	
D	Major *genetic* substratum	Major *practice* component
E	*Slow* growth	*Rapid* growth
F	*Resistance* to stimulation	*Susceptibility* to it
G	*Informal* learning	More *formal* learning
	Purpose	
H	*Prospective* use (predicting future learning)	*Retrospective* use (assessing amount learned)
I	Usable for *general population* evaluation	Limited to *systematically exposed individuals*
J	Usable before any formal learning	Requires formal learning to assess

Examples. Achievement measures by far outnumber aptitude measures. We have already mentioned their ubiquity in all subject matters and all levels of the educational system, from kindergarten to postgraduate education. Athletics and sports also give prominence to achievement assessments, not only at professional levels—as shown in the sports section of any daily newspaper—but also at all levels of the talent development process in every sport. Indeed, coaches rarely assess aptitudes directly; they rely totally on achievements to determine talentees' progress, and their access to more advanced training. In the macro-field of arts, music teachers rely as much on achievement measures as sports coaches. Of course, these measures do not have the objectivity of sports statistics; they require expert judgment for both technical and expressive aspects of the talentees' performances. All these judgments will be normative, allowing formal rankings of students on a competence continuum, with an easy identification of talent, whatever the cutoff percentage chosen.

With regard to aptitude assessment, we have to satisfy ourselves with a much more limited toolbox. Two domains, the intellectual and the psychomotor, have developed psychometrically valid measures of natural abilities. IQ tests, group or individually administered, are generally recognized as the most reliable and valid assessments of general cognitive functioning, often referred to as the *g* factor (Jensen, 1998). More specific tests cover special cognitive abilities, like fluid reasoning, spatial reasoning, memorizing, and so forth. In the psychomotor domain, one finds complex batteries of tests to assess the physical fitness of children in elementary or junior high schools (President's Council on Physical Fitness and Sports, 2001; Australian Sports Commission, 1994). The creative domain also has tests, but their psychometric qualities remain well below those of IQ tests, especially in terms of convergent validity (Plucker & Renzulli, 1999). Because of its more recent exploration, the social domain lags behind in terms of psychometrically sound measures (Matthews, Zeidner, & Roberts, 2002); available instruments predominantly revolve around self-assessments or peer judgments.

The limited availability of well-honed psychometric instruments devoted to the assessment of aptitudes leaves open indirect approaches to estimate potentiality levels. The most common approach targets achievement measures themselves. Recall that I have identified ease and speed in learning as the trademarks of giftedness. How does learning pace manifest itself? Through normatively better achievements within a shorter span of time. Of course, such normative comparisons would be made among "learning peers," that is, learners who have made approximately equal investments (DI) in a particular learning program. For instance, teachers in a given grade level have little doubt that their academically talented students—their top 10%—enjoy a clear advantage in terms of learning potentialities. Of course, as shown in the complex DMGT structure, many more "ingredients" than just intellectual giftedness contribute to ensure outstanding achievements. But Pronat scholars defend the significant contribution of outstanding natural abilities in the present case cognitive abilities.

Ordering the criteria. Except for one item, Angoff did not propose any hierarchy among his differentiating criteria. That exception was the stronger genetic underpinnings of aptitudes (item D), which played a central role in that article. I did propose some form of partial hierarchy (Gagné, 2009b), identifying two characteristics as fundamental aspects of aptitudes and then describing four corollaries that logically ensued from either one of the two central characteristics. Just like Angoff, I chose genetics as the primary defining characteristic of natural abilities. Indeed, the adjective "natural" directly refers to the underlying genetic substrate of these abilities. Many researchers in the field of behavioral genetics have assessed the heritability of natural abilities, especially those in the intellectual and physical domains (Bouchard, Malina, & Pérusse, 1997; Plomin, DeFries, McClearn, & McGuffin, 2001; Simonton, this volume). As we will see in the next two sections, the evidence in favor of significant genetic underpinnings is beyond any reasonable doubt. By contrast, practice plays the key role in bringing about outstanding achievements. In fact, the differentiation might go even further; some research has shown that academic achievement measures have genetic roots (Plomin et al., 2001), but the genetic component in academic achievement almost completely overlaps the hereditary component of IQ scores (Plomin & Price, 2003).

As a second crucial characteristic, I proposed aptitudes' role as a constituent element of competencies. Angoff does not mention that crucial relationship, probably because it cannot be considered a "differentiating" characteristic; more properly, it represents a linking element between aptitudes and achievements. The analysis of any learning situation will bring forth that crucial role of aptitudes as raw materials of competencies. The competencies—and talents—that progressively develop are not appearing out of thin air; sometimes they barely differ from their natural antecedents. Think of sprinting or weightlifting, for example. Yet even these athletic skills require years of practice to be honed to Olympic standards. The same parallelism applies to the close relationship between natural cognitive abilities and the learning of academic subjects. Finally, structural analyses of occupations reveal that a particular natural ability can serve as a building block for many of them. For instance, speed is important not only in running but also in long jump and pole vaulting, in some positions in football, in bobsled (especially the last "pushing" member on teams of two or four), and so forth. Similarly, cognitive abilities contribute to the growth of professional skills (e.g., lawyer, doctor, chemist), technical skills (e.g., computer analyst, supervisor in manufacturing, electrician), or expertise in arts (music, drama, visual arts). Creative abilities play a significant role in scientific research, fiction writing, TV or film scenarios, choreography (dance, skating, gymnastics), and many more similar "creative" professional occupations (e.g., architecture, civil engineering, academic handbooks). These two crucial characteristics have direct links with many items in Angoff's list (see Table 10.1). For instance, strong biological underpinnings explain aptitudes' slow growth (item E), as well as their resistance to direct stimulation (item F). As for the second characteristic, it has direct links with aptitudes' more general content (item A), their wider generalizability (item C), and their perfect prospective usefulness (item H).

The four corollaries discussed in the source chapter (Gagné, 2009b) concern the informal development of aptitudes (item G), their independence from any specific occupational field (items A, C, I, and J), their predictive power (item H), and their constraining impact on attainable competency levels. That last corollary, not mentioned by Angoff, follows from the predictive power of natural abilities. It stands to reason that a causal relationship between two variables means that higher—or lower—levels in one are associated with higher—or lower—levels in the other. Consequently, with at least a moderate correlation between a given natural ability and a competency, we should expect high natural abilities (gifts) to increase the probability of high competencies (talents), and vice versa. The quantitative nature of any correlation demands an equally *quantitative* definition of constraints; they are not an either/or condition, but a subject of varying probability. That quantitative perspective means that lower natural abilities will put more weight on the learning process, a weight that reduces the chances of high achievements, thus creating a *practical ceiling* to attainable performances, even in the presence of intensive practice. No doubt that high motivation and strong willpower can allow some individuals with non-gifted abilities to reach talent-level performances (top 10% in the DMGT). But *average* natural abilities will probably prevent most learners from reaching talent-level performances, however large the input from the other components (I, D, or E).

This corollary is particularly important in view of Ericsson et al.'s (2007) main conclusion: "With the exception of fixed genetic factors determining body size and height, we were unable to find evidence for innate constraints to the attainment of elite achievement for healthy individuals" (p. 3). In other words, they judge that individual differences in cognitive, creative, or physical aptitudes have strictly nothing to do with elite achievements. Any "healthy individual" would need to invest little more than a sufficient amount of time and deliberate practice, and the motivation to sustain that practice; observed differences in achievement would depend essentially on amount of deliberate practice and motivation level. As Ericsson (1998) states: "The real key to understanding expert and exceptional performance is in the motivational factors that lead a small number of individuals to maintain the effortful pursuit of their best performance during their productive career—when most other individuals have already settled for a merely acceptable level" (p. 414). I intend to show that this allegedly more parsimonious view of expertise emergence misses many significant variables, and that the DMGT offers a much more complete framework to analyze talent development.

Aptitude Development[2]

The significant heritability of natural abilities does not make them innate. The term "innate" "implies hard-wired, fixed action patterns of a species that are impervious to experience. Genetic influence on abilities and other complex traits does not denote the hard-wired deterministic effect of a single gene but rather probabilistic propensities of many genes in multiple-gene systems" (Plomin, 1998, p. 421). Consequently, the label "innate" conveys two false images about natural abilities: (a) that the observed individual differences are immutable and (b) that they appear suddenly. Few scientists use the term "innate" to describe any type of natural ability or temperamental predisposition. Lack of space prevents a detailed discussion of the complex processes through which natural abilities appear and then progressively develop throughout life, yet in a large part before puberty. The three biological basements mentioned in the DMGT's description do play a significant role, but intrapersonal (I) and environmental (E) catalytic influences similar to those involved in the talent development process also contribute significantly to that developmental process (see Gagné, in press). A large body of scientific literature (e.g., see Sternberg & Grigorenko, 1997) suggests that the quality of the social and family environment, especially in situations where it is seriously lacking, impacts the growth of cognitive abilities.

Two main developmental processes are involved in the development of natural abilities: (a) maturation and (b) informal learning and practice. The primary role of maturation, a process with strong genetic roots, plus daily life learning explain both the partly uncontrollable and spontaneous development of natural abilities. Piaget's developmental theory constitutes an excellent example of this type of development with regard to cognitive abilities. Natural abilities tend to develop more slowly on average (item E in Table 10.1) than systematically developed competencies; maturational processes progress at their slow internal pace, but with large individual differences, and attempts to accelerate informal learning activities are not common (Angoff, 1988). Moreover, the hereditary component makes them much more resistant to change (item F), one way or the other, than systematically developed competencies.

Now that I have set the scene by defining the key construct, what empirical evidence exists to support the Pronat theoretical position that some abilities possess all the necessary characteristics to be labeled "natural"? I will limit that demonstration to two domains, the intellectual and the physical, simply because there is in both a large and diversified amount of relevant scientific literature. If my demonstration succeeds, there will be no reason to doubt that similar empirical data will eventually become available to confirm the "naturalness" of creative, social, and perceptual abilities.

Evidence from the Intellectual Domain

Among the six natural ability domains identified in the DMGT, the intellectual domain exceeds all others in terms of amount and quality of research, not only on the nature of intelligence but also on its genetic origins and its predictive power for a large variety of significant personal and social outcomes (Gottfredson, 1997b; Lynn & Vanhanen, 2012).

Defining General Intelligence

For most people, intellectual giftedness represents *the* prototypical expression of a natural ability; it brings to mind spontaneously the image of bright kids. And the strong demonstrated relationship between intelligence measures and academic achievements reinforces that relationship. This prototypical role of intellectual giftedness gives special importance to the demonstration made in the present section. But what is intelligence? Does that term refer to a clear scientific construct, shared by a large proportion of specialists in that field? Answering that question is important in view of the positions maintained by Antinats on that subject; they either consider general intelligence irrelevant in the discussion of "innate talents" (Howe et al., 1998) or question its very existence (Ericsson et al., 2007). For instance, Ericsson et al. (2007) affirm: "It is possible that a general [cognitive] ability could represent some form of genetic talent. Notably, whether such a general ability exists is still disputed" (p. 37).

Is it really a disputed concept, as the above quote argues? Not at all; in fact, most specialists in the broad field of cognitive studies generally agree on its basic nature. A large group of them decided to publicly disseminate that consensus less than two decades ago, soon after the publication of Herrnstein & Murray's (1994) highly controversial book *The Bell Curve*. Reacting to a diversity of criticisms generated by that book, a group of 52 eminent scholars in the field of intelligence and cognition published in the *Wall Street Journal* a full-page statement summarizing the most solid empirical knowledge accumulated about intelligence and IQ tests (see Gottfredson, 1997a, for a narrative description of that initiative). Their position paper, called *Mainstream Science on Intelligence* (*MSOI*), took the form of a series of 25 short statements on the nature and measurement of intelligence, on the validity of IQ scores, and on the origin and stability of individual and group differences. The first statement precisely circumscribes the concept of general intelligence:

> Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—"catching on," "making sense" of things, or "figuring out" what to do. (Gottfredson, 1997a, p. 13)

That definition coincides with many others. For instance, Carroll (1997) states: "IQ represents the degree to which, and the rate at which, people are able to learn, and retain in long-term memory, the knowledge and skills that can be learned from the environment (that is, what is taught in the home and in school, as well as things learned from everyday experience)" (p. 44). In brief, contrary to Ericsson et al.'s (2007) statement quoted above, most specialists in the field fully agree on the core nature of general intelligence.

General Intelligence as a Natural Ability

For general intelligence to be recognized as a natural ability, it must first, according to the characteristics identified above, have direct genetic roots. If there is a subject that leaves no room for doubt, this is one. And there is no point in detailing here what a large number of literature reviews have already said on the genetic origins of individual differences in intelligence (e.g., Plomin et al., 2001; Plomin & Price, 2003; Simonton, this handbook). The MSOI handles the nature–nurture question with five statements (14 to 18). They can be summarized as follows.

> St. 14: Individuals differ in intelligence due to differences in both their environments and genetic heritage; heritability estimates range from .4 to .8 (on a scale

from 0 to 1), thereby indicating that genetics plays a stronger role than does environment in creating IQ differences among individuals. St. 15: Members of the same family also tend to differ substantially in intelligence (by an average of about 12 IQ points) for both genetic and environmental reasons. St. 16: That IQ may be heritable does not mean that the environment does not affect it; individuals are not born with fixed, unchangeable levels of intelligence (no one claims they are). St. 17: Although the environment is important in creating IQ differences, we do not know yet how to manipulate it to raise low IQs permanently. St. 18: Genetically caused differences are not necessarily irremediable, nor are environmentally caused ones necessarily remediable. Both may be preventable to some extent. (Adapted from Gottfredson, 1997a, pp. 14–15)

Recall that I chose as a second crucial characteristic of natural abilities their role as raw materials or building blocks of the competencies that define any specific occupational field. That close relationship in terms of contents and processes anchors the predictive role and power of natural abilities that Angoff stressed. There is overwhelming empirical support for the strong predictive power of IQ measures with regard to a broad spectrum of human achievements. Let's focus first on academic achievement. Numerous literature reviews (e.g., Hernstein & Murray, 1994; Jensen, 1998; Sattler, 1988), as well as one major meta-analysis (Walberg, 1984), have confirmed uncorrected correlations of around .60 and .50 at the elementary and high school levels, respectively. These high correlations speak for themselves: They reveal that brighter students achieve much better, thus have better chances to complete a high school diploma and access undergraduate and graduate programs. For example, according to Herrnstein & Murray's (1994) analysis of the National Longitudinal Survey of Youth database, 55% of students with the lowest IQs (bottom 5%) never completed a high school diploma, 35% of those in the next 20% of IQ scores (between 76 and 90) did the same, but fewer than 1% did not complete a high school degree among the top 25% in general intelligence (IQs of 110 and up).

Second, beyond general education and vocational training, literature reviews abound on the predictive validity of IQ scores with regard to job performance (e.g., Hunter & Hunter, 1984; Gottfredson, 1997b; Schmidt & Hunter, 1998). Ericsson et al. (2007) briefly cite the Hunter and Hunter (1984) review as follows: "The observed correlations between particular tests and the criterion performance is often relatively low and in the 0.1 to 0.3 range" (p. 13). Strangely, citing the same source, Gottfredson (1997b) summarizes their results as follows: "The validity of cognitive ability (corrected for unreliability and restriction in range) for predicting job performance rose…from .40, to .51, and .58, respectively, for the low, medium, and high 'data' complexity job families" (p. 82). She concludes: "*g* can be said to be the most powerful single predictor of overall job performance.…No other single predictor measured to date (specific aptitude, personality, education, experience) seems to have such consistently high predictive validities for job performance" (p. 83). We will see in the second part of this chapter that Antinat "scholars" excel in misquoting research that contradicts their ideology.

Finally, the predictive power of IQ tests extends well beyond academic achievement and job performance. Herrnstein & Murray (1994) used a five-category breakdown of IQ scores (bottom 5%, next 20%, middle 50%, next 20%, top 5%) to examine the impact of individual differences in intelligence on various life outcomes. Their observations, which focus on white American adults, are disseminated through Chapters 5 to 11 in *The Bell Curve*. Gottfredson (1997b) summarized them in one table (Table 10, p. 118). To highlight a few results from that table, I will use two comparison groups: the below average 20% (IQs between 76 and 90) and above average 20% (IQs between 111 and 125). Among other things, these two groups reveal the following disparities: (a) *Twice* as many (17% vs. 7%) of the lower-IQ mothers had children with IQs below 75; (b) *four times* as many (17% vs. 4%) lower-IQ mothers had illegitimate children; (c) *five times* as many lower-IQ mothers lived in poverty (16% vs. 3%) or went on welfare after their first child was born (21% vs. 4%); (d) *seven times* as many (7% vs. 1%) lower-IQ men had been incarcerated; (e) *eight times* as many (17% vs. 2%) lower-IQ mothers were chronic welfare recipients; and, finally, (f) the ratio of high school dropouts between the two groups was *no less than 85:1* (35% vs. 0.4). Of course, the disparities increase dramatically when we compare the two extreme groups, namely the top and bottom 5%. Again, we can see how IQ scores produce significant quantitative constraints to the quality of life among Caucasian adults, so much so that Gottfredson concludes: "There are many other valued human traits besides *g*… but none seems to affect individuals' life chances so systematically and so powerfully in modern life as does *g*. To the extent that one is concerned about inequality in life chances, one must be concerned about differences in *g*" (pp. 120–121).

In summary, the above evidence makes it clear that general intelligence meets the main defining criteria of a natural ability or potentiality. Not only does it have strong and undisputed genetic roots, but its significant—and often preeminent—predictive power for a diversity of life outcomes (educational, occupational, societal) confirms that its reasoning and problem-solving processes serve as building blocks for a wide variety of competencies; this fundamental role makes general intelligence totally field-*in*dependent. Finally, because of the significant causal influence of these cognitive building blocks on most competencies, general intelligence creates major *quantitative*, thus practical, constraints on achievements. Said differently, as the level of intelligence decreases, the probability of attaining the upper limit for achievements in many fields also decreases.

Addendum: Evidence from the Physical Domain

In the extensive document (Gagné, 2009b) that inspired this chapter, I presented a detailed analysis of the empirical literature on the genetics of physical abilities, on their constituent role in building talents in a variety of sports, and on the strong predictive power of individual differences in physical abilities for achievement in sports. Space limitations forced me to choose which of the two domains would be discussed here. As a compromise, here is the brief summary that ended that survey (pp. 181–182):

> As in the preceding section [intellectual aptitudes], I first circumscribed the target concept of (natural) physical ability, with its outstanding manifestation in physical giftedness. The morphological, physiological, and metabolic characteristics defined by Bouchard & Shepard (1994) were qualitatively distinguished from abilities. But, since these endophenotypes directly impact individual differences in measured abilities and are commonly assessed along with abilities, I judged appropriate to include them as relevant predictors of talent in sports. Two different sources of evidence (Entine, 2000; MacArthur & North, 2005) were tapped to cover research on the genetic roots of physical abilities. In each case, there was more than enough conclusive evidence that individual differences in physical abilities (and their morphological and physiological understructures) have genetic roots. That significant genetic endowment creates major constraints in reaching high performance levels. The theme of constraints appeared again and again in the quoted sources. As a response to Ericsson et al.'s (2007) conclusion that except for "fixed genetic factors determining body size and height, we were unable to find evidence for innate constraints to the attainment of elite achievement for healthy individuals" (p. 3), I will end this summary with a recall of some contrary statements: "Most of us could never achieve elite athlete status, however hard we trained" (MacArthur & North, 2005, p. 331). "Don't expect to see a white man set a world record in a road race—any race, at any distance from 100-meters to the marathon" (Entine, 2000, p. 19). "It's genetically improbable to expect to find any elite marathoners coming out of Cameroon, Nigeria, or Senegal" (Entine, 2000, p. 249). "The discovery could explain why 'some people train for ages but remain eighty-pound weaklings, while others develop muscles very quickly,' said the team leader, Dr. Kathryn North [the same North as in MacArthur & North, 2005]" (Entine, 2000, pp. 254–255).

PART II: THE CASE FOR ANTINATS' SYSTEMATIC FACTUAL MISREPRESENTATIONS

Scientific knowledge grows from the accumulation of new information as well as the confrontation of divergent theories. In the course of debates that can last for many years, both sides present large quantities of facts as evidence or counterevidence. Ideally, members of both camps should read all the research cited by their adversaries; in practice that is rarely feasible. Moreover, no one expects non-specialist readers to have easy access to the cited sources; consequently, they are the ones most at risk from any scholarly misconduct. Protagonists and lay readers usually accept "as is" the citations and quotes presented by either side, confident that proper scholarship will ensure the objectivity of that information. Of course, everyone knows that divergent positions will make for divergent interpretations, but they expect that the facts themselves will be reliably reported, and that researchers will not misrepresent authors' positions. Without such attention to faithful reporting, the confidence between scientific peers, as well as between authors and readers, would rapidly dissolve.

Where does this introduction lead me? It directly targets the reasons behind the large gap—the chasm—between the two positions discussed in the first part of this chapter. We did not see arguments over shades of gray, but diametrically opposed views. Why has there been no progression over the past two decades toward at least some partial agreement? I will argue that this lack of progress ensues in large part from repetitive Antinat behavior that does not respect the basic scholarly rules described above. This is a very strong judgment about the professional behavior of peers, and it demands adequate supportive evidence. This is why I reserved the second part of this chapter for that demonstration. I will analyze a variety of statements from the two target articles (Ericsson et al., 2007; Howe et al., 1998) mentioned in the introduction to Part I. I am well aware that the title adopted for Part II uses a strong expression, but it conveys precisely my conclusion, namely that both groups of Antinat spokespersons cited above repeatedly resorted to a variety of factual misrepresentations in their analysis of the research literature. I will argue that their misbehavior was in no way impulsive, thoughtless, or unreflecting; it originated in purposeful decisions by their authors. My accusations *directly* target the researchers who have signed the two Antinat articles mentioned. But they do *indirectly* include all other Antinat researchers who explicitly endorsed the views of these frontline spokespersons.

I have subdivided this "dissection" of Antinats' questionable scholarship into two main sections: (a) their selective choice of "acceptable" debating arenas and rejection of "unacceptable" ones and (b) their biased selection of the scientific literature, and corresponding biased analysis and reporting of factual data that contradict their position. Keep in mind that the following discussion summarizes the much more detailed analysis presented in Gagné (2009b).

Selective Choice of Debating Arenas

The selective process adopted by Antinat spokespersons works in two distinct ways: either they exclude phenomena judged relevant by defenders of the mainstream Pronat position, or they give priority status to themes that Pronats have shown to be either noncontroversial or irrelevant.

Omitting Annoying Research Areas

I am not targeting here the omission of small facts or minor interpretations, but of whole research areas. Various commentators of the Howe et al. (1998) target article, including myself, pointed out a variety of major omissions by the authors, among them their lack of—or very partial—coverage of the literature on (a) the genetics of intelligence, (b) early precocity, (c) the genetics of learning pace, and (d) the limited and transitory impact of early cognitive stimulation with at-risk populations. My preferred example remains their refusal to discuss the troubling phenomenon of prodigies, especially the case of extremely precocious violin or piano soloists. Howe et al. (1998) brushed aside that information by saying: "The accuracy of such autobiographical reports is questionable considering that childhood memories of the first three years are not at all reliable" (p. 401). I countered by bringing up the extraordinary case of Sarah Chang, one among dozens if not hundreds of very precocious musicians (Kenneson, 1998).

> Dorothy DeLay, a renowned professor at New York's Juilliard School of Music, recalled as follows her first encounter with the young prodigy Sarah Chang, who subsequently became her pupil. "I think she was six, or perhaps five, and she played the Mendelssohn concerto with real emotional involvement, and I said to myself, 'I have never seen or heard anything quite like it in my entire life"' (Lang 1994, p. 123). Is professor DeLay an unreliable witness? How can one explain such extreme precocity without invoking some form of natural talent? Examples like these abound; they show ease of learning at its most extreme. (Gagné, 1998a, p. 416)

In their rejoinder, Howe et al. (1998) completely ignored that critique. But Ericsson et al. (2007) picked up that example in the second target article; they argued that "such evidence is not based on reproducible observable performance but on anecdotes that typically cannot be verified and in particular replicated under controlled test conditions. Such evidence is of little value to scientists and will not contribute to sound empirical foundations" (p. 30). Again, I reacted to this renewed refusal to acknowledge testimonial information.

> What a strange requirement to ask for controlled replication of publicly known achievements! Here is a short excerpt from Ms. Chang's official biography (http://pso.culturaldistrict.org/pso_home/biographies/guest-artists/chang-sarah, 2007). "Born in Philadelphia to Korean parents, Sarah Chang began her violin studies at age 4 and promptly enrolled in the Juilliard School of Music, where she studied with the late Dorothy DeLay. Within a year she had already performed with several orchestras in the Philadelphia area. Her early auditions, at age 8, for Zubin Mehta and Riccardo Muti led to immediate engagements with the New York Philharmonic and the Philadelphia Orchestra." Here are my questions to Ericsson. 1. Are these accomplishments "verifiable" facts about her extremely rapid progress? 2. Do her performances at age 8 qualify as "expert" performance? 3. Do her 8-year-old achievements compare favorably with those of most "expert" *adult* violinists studied by Ericsson? 4. Is this a clear exception to the 10-year rule? 5. And, especially, does Ms. Chang's early progress exceed by "galactic" units the learning pace of those thousands of young violin learners who "screech" their way through years of Suzuki classes? My own answer is predictably "Yes" to all these questions. (Gagné, 2007, p. 68)

Concerning their argument that such testimonies are "not based on reproducible observable evidence," how can they be? The proof of precocious behavior requires no replication at all, only reliable information, which is the case most of the time. The fact remains that such testimonies are undeniable proof of exceptional precocity (Feldman, 1986; Kenneson, 1998; Morelock, this volume; Radford, 1990), and that precocity must be explained. Is it just deliberate practice, as Antinats will argue, or are natural abilities at work, as Pronats will maintain? Together with the Pronat majority, I believe that children who show precocious mental or physical development are perfect examples of giftedness' trademark: ease and speed in learning. The arguments invoked by Antinat spokespersons in order to reject testimonial case studies of prodigies or other less extreme cases of exceptionally rapid progress are not defensible. Their allegedly "parsimonious" theory based on deliberate practice cannot adequately account for that powerful collection of counterevidence.[3]

Misdirecting Inclusions

Antinat researchers also evade contrary evidence by reorienting the debate toward preferred areas, without regard for their relevance, or lack of. One technique, which I have labeled "cluttering," consists of accumulating short descriptions of studies presented as evidence for their position. Few details are given save a statement that tries to link the stated "fact" to that paragraph's line of argumentation. In a proper scientific context, each mention would require a careful description of the study's relevance, of all appropriate data, of methodological and interpretative limits, and so forth. They include none of that. Pronat scholars know that each statement tells just a small part of the "whole" truth, often not the most representative part, and that it needs to be qualified, nuanced, and replaced in its proper context. That kind of explanation would require at least one long paragraph, an overwhelming challenge within the limited space allocated to journal authors (see example in Gagné, 2009b, pp. 186–187). As a second technique, they introduce "straw men," namely untenable beliefs or positions that they falsely attribute to Pronat defenders and then easily demolish. For example, their use of "innate talent" as their preferred label for natural abilities allows them to accuse Pronat scholars of defending abilities that appear suddenly, without prior training, and that cannot be improved. A third technique consists of bringing up totally irrelevant empirical data as "proof" of their position. For instance, Howe et al. (1998) made much use of mean comparisons between novice and expert musicians, instead of showing much more relevant effect sizes to assess the impact of individual differences in amount of deliberate practice. Sternberg (1998) focused his critique on that particular type of irrelevant evidence:

> Howe et al. make two main points. The first is uncontroversial, the second, unsupported by their evidence or arguments. The first point is that deliberate practice is necessary, or at least extremely desirable, for the development of expertise. Although Howe et al. spend a great deal of space making this point, no one I know would deny it, so there is not much point to discussing it.…The second point is that there is little or no documented evidence in favor of innate talents. Virtually all the evidence they review is irrelevant to their point, adding bulk but no substance to their article. The problem is their misunderstanding of what would constitute evidence in favor of a genetic basis for talents. The only available evidence relevant

> to claims about genetic bases of talent are documented heritability statistics. (pp. 425–426)

In their response to the commentators, Howe et al. (1998) completely ignored Sternberg's (1998) central critique. They summarized his comment as follows: "Sternberg goes further, suggesting that much of the evidence for and against talents is merely suggestive. He disputes neither our conclusion that there is little evidence for the talent account nor our view that no one source of evidence would be definitive" (p. 434). That summary of Sternberg's comment completely misrepresents his strong message concerning the irrelevance of their "proofs."

Misrepresenting Other Researchers' Work

Let's look now at systematic biases in Antinat analysis and interpretation of the scientific literature. Because of space limitations, I will omit "minor" lapses. In the first of the two examples that follow—two among many—Antinat spokespersons very briefly cite—not even quote—an article, extracting from it, totally out of context, marginal comments that they falsely present as a core statement from the author(s), whereas the core message says the *opposite*. The second example, which I find even more serious, involves the selective presentation of favorable results from a study, with the deliberate omission of other results that contradict their Antinat thesis. The *Publication Manual of the American Psychological Association* contains in its section on the ethics of scientific research a very clear admonition: "Errors of omission also are prohibited. Psychologists do not omit troublesome observations from their reports so as to present a more convincing story" (American Psychological Association, 2001, p. 348). That admonition concerns not only the authors' personal studies but also their reporting of other researchers' work.

The MacArthur & North Literature Review

When I analyzed Ericsson et al.'s (2007) manuscript, I noticed the following statement: "A recent review (MacArthur & North, 2005) found that individual differences in attained elite performance in sports *cannot*, at least currently, be explained by differential genetic endowment" (p. 37). The cited article came from the journal *Human Genetics*. I was surprised that this type of journal would publish an article directly contradicting a large body of evidence supporting the heritability of physical abilities. When I read the original article, I discovered that its content totally contradicted Ericsson et al.'s citation. Here are a few statements from MacArthur & North (2005) in the very first page of their review.

> Physical fitness is a complex phenotype influenced by a myriad of environmental and genetic factors, and variation in human physical performance and athletic ability has long been recognized as having a strong heritable component.... Recently, the development of technology for rapid DNA sequencing and genotyping has allowed the identification of some of the individual genetic variations that contribute to

> athletic performance.... Elite athletes, viz. athletes who have competed at a national or international level in their chosen sport, represent a rare convergence of genetic potential and environmental factors.... Most of us could never achieve elite athlete status, however hard we trained.... Elite athletic performance is a complex fitness phenotype substantially determined by genetic potential." (p. 331)

These quotes clearly express the strong hereditary beliefs of MacArthur & North (2005). Moreover, the abstract clearly states their goal of reviewing three decades of accumulated *positive* evidence on the genetic roots of physical abilities. How can professional researchers turn upside down the essence of the message in their summary of an article's content? It cannot be an oversight; only careful reading could pinpoint toward the end of that article the little cautionary sentence on which they based their citation. Here is that note: "There is still no evidence that any of these variants have any substantial predictive value for prospectively identifying potential elite athletes" (p. 336). Properly understood, that short sentence meant that no researcher had yet published a prospective longitudinal study on the predictive power of identified gene variants for elite athletic performance. Yet Ericsson et al. totally misrepresented that article. Not only did they wrongly offer that cautionary note as a main message in MacArthur & North's (2005) article, but, much more seriously, they totally ignored that review's incontrovertible evidence on the hereditary bases of natural physical abilities.

The Kliegl & Baltes Studies

In his critique of the Howe et al. (1998) target article, Baltes (1998) called attention—very gentlemanly—to the fact that the authors had completely ignored a major result from one of his studies (Kliegl et al., 1990) designed to test the limits of systematic learning. The following quote briefly describes the study and then identifies Howe et al.'s major omission:

> Our focus was on exceptional memory performance, a domain that is often used as a candidate for exceptional talent (Baltes & Kliegl, 1992; Kliegl et al., 1990). When people participated in 36 sessions of intensive and organized training in a memory technique (the method of loci) that can be used to reach exceptionally high levels of memory performance, all of them benefitted from this intervention. If continued beyond 36 sessions (Kliegl et al., 1987) people reached levels approaching those of memory experts. This finding is consistent with those reported in Howe et al.
>
> This testing-the-limits work, however, produced an equally convincing second finding that highlighted the fundamental significance of individual differences. As subjects were pushed toward the limits (asymptotes) of their maximum performance potential, individual differences were magnified (Baltes & Kliegl, 1992). The conclusion is clear: the talent for being a memory expert reflects both experiential and individual-differences factors. In this case, because of the age association

and extreme robustness of the individual difference finding, the likelihood is high that biology based factors are involved (see Lindenberger & Baltes, 1995, for further expositions).

Howe et al. make some use of our work, but their interpretation is one sided (sect. 4.1). They select only one of the two main findings, that is, the finding of major training gains for all. The equally compelling evidence of sizeable individual differences in acquisition curves and maximum performance potential is ignored. Moreover, they ignore that, contrary to their view (sect. 2.3), the correlation between the skill trained in this testing-the-limits experiment and a multivariate measure of intelligence was larger at the end of training. (Baltes, 1998, p. 408)

Rowe (1998) also mentioned a study similar to that of Baltes & Kliegl (1992) done with twins on the training of motor skills (Fox et al., 1996). Here is his brief summary of that study's main results:

Before training, twins varied widely in their performance on the "pursuit rotor" task (i.e., following a target on a rotating disk with a pen). The heritability of motor accuracy was about 55%…After practice, the worst scoring person scored higher than the best scoring person had before practice. As individuals differed in their level of improvement, variability of the accuracy scores also increased with training. Before practice, variance (s^2) equaled about 100; after practice, it equaled about 400. The fourfold increase in variance with practice means that practice actually increased the range of individual differences. Heritability also *increased* after practice (from h^2 = .55 to .65). Nonetheless, championship rotor pursuit performance was not very well predicted from initial performance (Bouchard, personal communication, 1997). One explanation is that speed is particularly important among highly skilled individuals, and the demand for speed was not apparent before training. (p. 422)

The two studies mentioned by Baltes (1998) and Rowe (1998), respectively, constitute powerful contradictory evidence to Antinat positions. Both of them clearly show that intensive skills training—of the testing-the-limits type—does not bring the participants to an identical "expert" level. The large individual differences observed at the outset of both studies not only reappear at the end of the training, when subjects approach their maximum reachable performance, but also show a significant *increase*. In the case of the Fox et al. (1996) study, the range approximately doubles (considering that the variance has quadrupled). Neither Howe et al. (1998) nor Ericsson et al. (2007) discussed these two crucial sets of results that strongly favored the Pronat perspective. How did they react?

Let's look first at Howe et al.'s reaction to Baltes' comment. Since they had quoted from Baltes and Klieg's work the main result that supported their position, they had seen of course the other significant results contradicting their Antinat thesis. Yet they ignored them. Even worse, the three authors also ignored in their rejoinder Baltes' criticism, as well as the contradictory data. Concerning Rowe's (1998) mention of the

Fox et al. study, they reacted even more strangely. Completely ignoring the contradictory results presented, they focused on the last two sentences of the Rowe quote above, saying: "as Rowe acknowledges, in some instances performance levels after practice bear little relation to performance prior to practice. This is further evidence against the importance of innate differences" (p. 435). Not only did they, again, ignore totally the core of the critique, but, by also ignoring Rowe's sensible interpretation of the lack of correlation between pre- and post-measures (from T. J. Bouchard's personal communication), they blindly interpreted that phenomenon as Antinat evidence. Their behavior confirms the depth of their ideological entrenchment.

Now, what about Ericsson et al.'s (2007) reaction? It is a well-known fact that Anders Ericsson introduces in most of his publications his early work on memory training (Ericsson, Chase, & Faloon, 1980). He did so again in the Ericsson et al. target article, totally ignoring both studies with a similar testing-the-limit methodology. Even more seriously, he (and his co-authors) completely ignored the Baltes (1998) and Rowe (1998) comments that clearly mentioned these studies.

Summary

I hope that the above examples have shown clearly that these Antinat researchers have repeatedly misrepresented scientific data and authors' statements, and that their repetitive disregard of major criticisms could not be anything but deliberate. Keep in mind that I am confronting here not inexperienced researchers, but internationally renowned researchers with decades of scientific publications in major journals. They must know the basic rules of their profession. Yet they decided to ignore specific criticism of their work, especially comments like those of Baltes and Rowe that described inappropriate research behavior. The above arguments apply even more strongly to Ericsson et al. (2007). First, they made their own scholarly misrepresentations. Second, they were well aware of all the critical comments addressed at Howe at al. (1998); they had even announced at the beginning of their target article that they would answer these critiques. They did not.

CONCLUSION

I did not write Part I to convert any Antinat believers: I believe it is a hopeless task. On the other hand, there is no lack of professionals and educated laypersons interested by the question "How does talent emerge?" Unfortunately, they are the ones most likely to be impressed by the Antinat rhetoric, especially if there is no clear alternative. I had them in mind throughout the writing of Part I. I tried as best I could to debunk the most common Antinat objections, offering precise quotes occasionally to better associate the point and the counterpoint. Concerning Part II, two observations influenced my decision to expose publicly the scholarly misconduct of Antinat spokespersons. First, I observed that Pronat scholars tended to remain indifferent to Antinat scientific misconduct; no one seemed motivated to address their research ethics beyond an occasional polite mention of their questionable behavior. That is clearly evident in some of the comments I quoted (e.g., Bates, Rowe, Sternberg). Second, I had been aware for some time that the Antinat message was rapidly spreading internationally through keynotes and high-exposure publications. Colleagues and friends, many of them outside the talent development community, were saying how impressed they were with the general message of strict environmentalism espoused by Antinat scholars, especially by their most famous representative. Many science writers even based parts of their bestselling books on that questionable ideology (e.g., Colvin, 2008; Coyle, 2009; Gladwell, 2008).

Some will say that my switch of focus from strict evidence confrontation to the more personal domain of scholarly behavior killed any remaining hope for an eventual meeting of minds between the two camps. Let's be realistic: The fact that they have to resort to such questionable scholarship to justify their Antinat thesis proves their lack of openness to an objective examination of scientific evidence. That attitude emerges quite clearly in Ericsson et al.'s (2007) concluding remarks.

> The progress of science is closely linked to the accumulation of base of reproducible evidence. We hope that the proponents of innate talent are challenged to identify any existing evidence on suddenly appearing reproducible abilities and other abilities that are necessary for attaining expert and elite levels of performance, particularly those that cannot be improved and acquired through training.... The sooner that we can share a common body of valid reproducible evidence the faster our theorizing will develop to provide a comprehensive account of the fascinating domain of exceptional performance. (p. 45)

These three short sentences enshrine the irreducible gap between the two opposing camps. First, they keep using the expression "innate talent," although they were told repeatedly (e.g., Gagné, 1998; Plomin, 1998) that this label misrepresents genetically anchored but constantly developing natural abilities. Then, their second sentence brings back two of their imaginary Pronat straw men: *sudden appearance* and *immutability*. They keep bringing them up even though they have been told repeatedly that Pronat scholars have *never* maintained that natural abilities, even with their significant genetic roots, appear suddenly or that they are immutable. And to cap it all they even challenge Pronat defenders to identify "any existing evidence" of these imaginary straw men! Finally, concerning the third sentence, how can we ever "share a common body of valid reproducible evidence" when Antinat defenders keep rejecting or ignoring whatever evidence Pronat defenders bring forth?

REFERENCE NOTE

1. The present chapter is a shortened, updated adaptation of Chapter 7 ("Debating Giftedness: Pronat vs. Antinat") in Shavinina's (2009) *International Handbook on Giftedness* (see Gagné, 2009b). The editor of that handbook made possible a response by the main researcher targeted in my chapter (see "Postscript" in Ericsson, Nandagopal, & Roring, 2009), as well as my rejoinder to that response (Gagné, 2009c).

2. As I was completing this text, the editor called my attention to another chapter (Treffert, this volume) whose interpretation of savants' exceptional "talents" could challenge my view on the non-innate, developmental nature of aptitudes. In essence, Treffert describes a few examples of exceptional achievements manifested by autistic individuals, youth and adults, which he labels "innate talents" or "islands of genius." He considers these talents as innate because they appear suddenly, often in early youth, and express themselves at a high level of quality, a few of them rapidly reaching a prodigy level with a minimum of systematic learning. He proposes a novel interpretation, namely the existence of a "genetic memory" that ensures "the inherited transfer of specific *talents* and actual *knowledge* in addition to all the other physical characteristics, instincts, traits, proclivities, inclinations, and dispositions that our inherited genes carry forward in each of us from conception" (p. 13). He further proposes "that there exists in each person already at birth an enormous amount of inherited, 'factory-installed, hard wired' circuitry for certain abilities, coupled with considerable likewise genetically transferred knowledge itself regarding the 'rules' of those talents, unconsciously remembered" (p. 13).

   Since I have not yet read the book on which Treffert's chapter is based (Treffert, 2012), I do not feel informed enough to express a definitive opinion on this "genetic memory" interpretation. The rarity of the savant syndrome in the population, which represents a small percentage within an already small autistic population, incites me to caution with regard to his second hypothesis about each one of us having such inherited, but dormant, hard-wired circuitry for certain complex skills. On the other hand, I found myself comfortable with his label "innate talents" instead of "gifts"; the complex abilities described look much more like high-level competencies and skills than aptitudes (see Table 10.1) because of their close similarity with achievements in specific fields (e.g., mental computing, playing a musical instrument, photographic memory, graphic skills). In other words, these exceptional achievements coincide quite well with my own view of talented behavior, at least in terms of content if not in terms of origin. If we agree that these "islands of genius" are truly "innate talents," where are the underlying aptitudes—the DMGT's gifts—that should manifest themselves prior to the progressive growth of these exceptional achievements? That will remain an open question until I have time to examine these examples more closely, keeping that question in mind as I go through Treffert's book. It might be that the DMGT cannot, in its present form, explain every expression of talent. Yet, for the time being, it represents a theoretical framework that fits well with the vast majority of talent development situations, whatever the field.
3. As an additional case in point, Antinat researchers totally disregard all accounts of savant syndrome, as those described in Treffert's chapter (this volume).

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