

CHAPTER 1

LEMONADE

INTRODUCTION ●

Like ancient Gaul, this book is divided into three parts, or *modules*, as they will be referred to herein. The first module—Chapters 2 through 11—explains, to the biologically impaired, what genes are. I intend no personal slight here. I wrote this book for college-level academics whose main intellectual pursuits focus on social science. If you already know about biochemistry, cell biology, and molecular genetics, then the first module will bore you. Few of us social scientists have that background.

The second module—and the skimpiest one—deals with evolution and evolutionary psychology. The skimpiness should not be taken to underplay the importance of the topic. We have gained—and are still gaining—a considerable amount of knowledge about evolution, but our knowledge of how this pertains to human behavior is much more nebulous than the hard science overviewed in the first module. Several topics, most notably anthropological genetics, cannot be presented in detail because of space limitations.

The third module deals with the traditional behavioral genetics of individual differences. From our day-to-day interactions with relatives, friends, and acquaintances, it is obvious that some people are more outgoing than

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others. To what extent do genes contribute to these individual differences? This is the type of question to be discussed in this module. The largest fault in this module is its lack of integration with the first module. I offer no apologies for this shortcoming because the body of empirical data demands it: Although there has been considerable research on the molecular genetics of human behavior, it is hard to find a body of consistent, replicable results to report. Rather than survey the most recent findings in this area and report that results have failed to replicate or that there are no data from other laboratories to assess replication, I have deliberately ignored this research. I hope that a body of well-replicated data emerges on the molecular genetics of, say, intelligence or schizophrenia, one that can be carved into the stone of textbooks, much like the physical structure of DNA has been.

In the interim, we are left with one consistent theme that spans all three modules—lemonade. Let's discuss that for a minute.

● LEMONADE

Imagine that you are taking one of those standardized, multiple-choice, computer-scored tests that are part of the process of getting into college (e.g., the SAT), medical school (e.g., MCAT), or law school (e.g., LSAT). The following item appears in the test booklet:

Lemonade is:

- (a) lemon juice.
- (b) water.
- (c) sugar.

According to the test instructions, you must fill in one and only one of the bubbles on the answer sheet. You have two options. First, you could respond to the pragmatics of the test situation—to compete with all others taking the test, you must pick one and only one answer and hope that your choice matches the one on the scoring key. The second option requires more chutzpah: you recognize that the question is phenomenally stupid and protest the question to the test constructors. Lemonade is a compound, a solution, and an inextricable combination of lemon juice, water, and sweetener. It is something more than any one of its parts.

One can construct analogous multiple-choice questions on human behavior. For example:

Intelligence [or extraversion, or antisocial behavior] is:

- (a) genetic.
- (b) cultural.
- (c) familial.
- (d) due to all your idiosyncratic learning experiences.

According to all the empirical scientific evidence on genes, and on environment, and on behavior, this question is as stupid as the one on lemonade.

A HISTORICAL PERSPECTIVE ON LEMONADE ●

In 1957, Anne Anastasi initiated her presidential address to the American Psychological Association by stating:

Two or three decades ago, the so-called heredity-environment question was the center of a lively controversy. Today, on the other hand, many psychologists look upon it as a dead issue. It is now generally conceded that both hereditary and environmental factors enter into all behavior. The reacting organism is a product of its genes and its past environment, while present environment provides the immediate stimulus for current behavior. (Anastasi, 1958, p. 197)

Carefully note the date of this quotation—1958, more than 40 years ago. Anastasi tried her best to drive a stake through the heart of the nature versus nurture debate, nail it securely into its coffin, and bury it so deep that it would never resurface. Despite her good intentions, the debate, like the evil vampire in a B movie, continually resurrects itself and intrudes upon rational discourse to an extent far beyond its true merit.

Lemonade is not a philosophical statement. It is a concept about the relationship between genes and the environment that has—since Anastasi's time—been proved again and again in the empirical literature. I restate Anastasi's conclusion in terms of two fundamental laws about genes and behavior that have yet to be disproved. These are not new laws—Anastasi stated them. Almost 20 years later, they were repeated by Loehlin and Nichols (1976), and they have recently been reiterated by Turkheimer (2000). The first law states that

Environmental factors always contribute to individual differences in human behavior.

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Again, this law is not a philosophical position: It is a generalization from almost 100 years of empirical research on identical twins. For all behavioral traits studied thus far, identical twins are never identical in behavior. As a group, they may be very *similar* to each other, but the two members of every twin pair do not behave *identically* to each other. To say the same thing in statistical parlance, the correlation for identical twins on every behavioral measure studied thus far has always been less than 1.0.

The second conclusion of the empirical data is that

Genes contribute to individual differences in almost every dimension of human behavior that has been studied thus far.

Once again, this is not a philosophical postulate but a generalization from decades of research. The dimensions of human behavior include intelligence (Bouchard, 1998; Bouchard & McGue, 1981); the personality traits of extraversion, emotionality, openness to experience, agreeableness, cultural pursuits, and many others too numerous to name here (Eaves, Eysenck, & Martin, 1989; Jang, Livesley, & Vernon, 1996; Loehlin, 1992; Loehlin & Nichols, 1976, Tellegen et al., 1988); almost all patterns of vocational interests (Loehlin & Nichols, 1976); divorce (McGue & Lykken, 1992), amount of TV watched (Plomin, Corley, DeFries, & Fulker, 1990), age at first sexual intercourse (Dunne et al., 1997), and combat exposure in Vietnam (Lyons et al., 1993).

In short, during the 40 or so years since Anastasi's original overview of the area, the empirical data have verified her conclusions. In fact, the growing knowledge of biology of the gene within neuroscience confirms her conclusions far more than any number of twin or adoption studies—the only types of data available to her at the time—could ever do. In terms of genes and environment, behavior is lemonade.

● THE IMPLICATIONS OF LEMONADE

One may wax eloquent about the lemonade analogy, but the best way to illustrate lemonade is to take published media accounts—and sadly, some academic publications as well—and answer their rhetorical headlines in terms of the empirical evidence.

Is intelligence genetic? Stupid question—intelligence is lemonade. Do genes determine your personality? A completely idiotic thing to ask because personality is lemonade. Is alcoholism a genetic disease? Balderdash! Alcoholism is lemonade. Do males cheat on their spouses because of their genes? Bull. All male behavior—as well as all female behavior—is lemonade. Is language genetic? Absurd! Language is lemonade because it needs

environmental inputs and feedback to develop. In short, generic questions of the form “Is this genetic?” should never be asked for any type of behavior. Claims by any researcher that this or that behavior is “genetically determined” are false or, at best, pejorative to the meaning of the word “determined.”

At the opposite end of the spectrum, assertions by opponents to genetic research that geneticists have attempted to propose some form of “genetic determinism” for behavior are equally ludicrous. Genetic determinism for any behavior implies that the correlation for identical twins on that behavior will be 1.0, but such a correlation has never been reported for any substantive human behavior. If there is any “genetic determinism” for a human behavior, it has yet to be reported. All human behaviors studied thus far are lemonade.

Perhaps more insidious are tacit assumptions that individual differences in many human behaviors are environmental in origin simply because one or two environmental reasons explain some of those individual differences. The fact that environmental factors explain *some* portion of individual differences cannot be used to conclude that environmental factors must explain *all* of the individual differences. Almost all—not 100%, but pretty close—human individual differences show some heritable influence.

LEMONADE AND THIS TEXT ●

A century of research suggests that human behavior is lemonade. It is an inextricable combination of genes, culture, family, and personal learning experiences—a compound, a solution. So what does one do now?

Anne Anastasi’s suggestion is to focus research on the question of *how* genes and environment produce a phenotype. Indeed, much of the focus of this text will be placed on the *how* issue. Genes are biological entities. They are strands of DNA that are the blueprint for important chemicals in every cell of our bodies. To understand the *how*, we must first understand the gene and its biology. This is the topic of Chapters 2 through 8. Known mechanisms of the “how” are portrayed in the chapter on Mendelian traits (Chapter 5), for which the relationship between genes and behavior can be viewed unequivocally.

The transmission of genes follows certain mathematical rules that were first outlined by Gregor Mendel in 1864 and later elaborated by Thomas Hunt Morgan and others shortly after the turn of the 20th century. These transmission rules permit scientists to calculate risk for genetic diseases in relatives as well as quantify the magnitude of the genetic influence on a trait from the correlations among different types of relatives. This line of genetics is covered in Chapters 9 through 11.

Genes not only influence individual differences among us humans but also help to define the very nature of our species. Genes decide that we

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humans have four appendages instead of six or eight, that we walk upright instead of on all fours, and that we have a cerebral cortex that is very large relative to our body size. These types of influences are evolutionary in nature and are discussed in Chapters 12 through 16.

Finally, a selected sample of the empirical literature on behavioral genetics is reviewed in Chapters 17 through 24. The emphasis in these chapters is less on raising a flag toting “Genetic influence on intelligence discovered” than it is on tackling the major ways in which genes for intelligence relate to society today. Sadly, the “how” in these chapters is lacking, but not because of any desire of this author or the efforts of researchers in the field. The lack of “how” studies derives simply from the nascent nature of the research on this question. One cannot explore the mysterious ocean about the “how” of genes and environment concerning issues of personality, intelligence, schizophrenia, and antisocial behavior when such research is at the stage of placing one’s toes into the water to test its temperature.

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