

Theoretical Integration Essay

Media Effects Theory and the Nature/Nurture Debate: A Historical Overview and Directions for Future Research

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In this article, I provide a historical overview of the nature/nurture debate by exploring the philosophical history of the debate leading up to the inception of media effects research. I argue that the media effects tradition was born into a milieu that was exclusively sided with the nurture (environmental determinist) position and has largely remained so. Within the past 20 years, there have been advances in neurophysiology leading other disciplines to theorize that human behavior is the result of the interaction between nature (genetics, brain physiology) and nurture (learning, culture). In this article, I sample the media effects research emerging from this perspective and argue why this approach is superior to the learning-only approach currently popular in the field of communication. I then discuss the implications of such an approach for communication researchers, framing the critique in terms of the contribution to mass communication theory building.

A frequent lunch discussion topic at a recent International Communication Association conference was DeFleur's (1998) article about the current lack of "milestone" research in mass communication, research that "provoked wide discussion and changed the way that scholars think about the mass communication process" (p. 86). DeFleur suggested a number of reasons for this state of affairs including a

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shift away from media research in the other social sciences, the decline in programmatic social science research, the subsequent increase in ideology-driven critical and cultural studies, a lack of funding for basic research, and a “brain-drain” from academia to higher paying industry jobs. Still, DeFleur pointed out that communication scientists currently have hardworking, highly intelligent people in our field who have much more powerful tools available than the original milestone researchers did. So why don’t we see the types of significant new ideas and insights into mass communication processes and effects that we saw in DeFleur’s golden age of media effects research from 1930 to 1980?

One explanation that has emerged among media scholars is that we have reached the limits of the scientific paradigm of the initial milestone studies. One can readily point to the limits of the explanatory power of current media effects research. A quick scan of the prominent journals in mass communication shows that the majority of the research results in effect sizes that explain less than 10% of the variance in human behavior. For example, Paik and Comstock’s (1994) meta-analysis is often cited as convincing evidence of a causal link between violent television and aggression, despite a mean effect size of only $r = .30$ (leaving 91% of variance unexplained). A more recent study by Bushman and Anderson (2001) paints an even bleaker picture with a mean effect size of $r = .20$ or 4% of variance explained. In the absence of convincing data, it is easy to conclude that the effects of media are too complex and dynamic to understand with currently available scientific methods.

Are the effects of media too complex to understand with scientific investigation? From a scientific point of view, to admit so would curtail exploration prematurely (for a more detailed examination, see Rudner, 1966). There are innumerable examples in science in which a new insight or measurement tool has created a major shift in understanding and the dominant paradigm. The 6th century BC cosmologist Anaximenes advanced the notion that air was the primary element from which all matter is derived (Wheelwright, 1960). Centuries later, the invention of the microscope revealed an unseen cosmology that changed how scientists conceived the physical world. Kuhn (1970) stated that “scientific revolutions” are gradual shifts in the questions and manner in which science is done, resulting in a moment of revolution that leads to a normalization of science. Historical examples of the prescientific chaos preceding paradigmatic reification described by Kuhn (1970) appear almost comical to the 21st-century mind. Could Newton have believed that light was “material corpuscles” (Kuhn, 1970, p. 12)? Did scientists really believe that electricity was a fluid (Kuhn, 1970, p. 17)? Kuhn suggested that such stalls in the progress of science are overcome by new ways of thinking or new measurement tools.

Bolstered by new insights and measurement tools, such a revolution has been taking place over the past 30 years in the human sciences. Recent advances in ge-

netic research (e.g., the Human Genome Project) and neurophysiology (e.g., MRI technology, psychopharmacology) as well as neuropsychology (behavioral genetics, temperament research, evolutionary psychology) provide dramatic and compelling evidence that there is more to human behavior than common learning-based theories suggest. According to Scarr (1992), "Behavior genetic research has shown that, for a wide variety of traits, including measures of intelligence, specific cognitive abilities, personality, and psychopathology in North American and European populations, the heritability of such traits is between .40 and .70" (p. 3). Taking this claim on face for the moment, and combining the heritable variance explained (between $r = .40$ and $.70$) with what has been observed socially ($r = .30$), it would appear that scientists could be on the cusp of discovering new milestones in explaining mass communication processes and effects.

Unfortunately, the revolution in human sciences has taken place largely without the participation of communication scientists. Why have we been so slow to respond? One of the main reasons may be historical. In this article, I argue that consideration of our biological selves has never been a major force in our field because the philosophical biases present at the inception of the field have left us mired in an ontology that only considers the nurture (environmental learning) portion of the human experience. By returning to the nature/nurture debate, an ancient debate within human science that took place before the advent of communication research, communication scientists may be able to once again "provoke wide discussion and change the way scholars think about the mass communication process" (DeFleur, 1998, p. 86). In this article, I describe the roots of the nature/nurture question that predate communication research and then examine the milieu into which communication science was born and developed its environmental deterministic disposition. Borrowing from developmental psychology, I make an argument for theory that acknowledges both nature and nurture perspectives. Finally, in this article, I examine some recent mass communication researchers who have begun to investigate biological explanation and provide examples of future directions for communication research that considers biological explanation.

HISTORY OF THE NATURE/NURTURE DEBATE

One of the great questions that has been debated by observers of humankind throughout the centuries is the essence of humanity. Artists, theologians, writers, philosophers, and social scientists have all postulated different conclusions that can be collapsed into three major categories: (a) humans as spiritual beings endowed by a creator god, (b) humans as social beings endowed by the culture in

which they are raised, and (c) humans as advanced animals endowed by instinctual survival drives. Because the existence of a creator god is beyond the epistemological parameters of science, social scientists have focused debate on whether we are social beings (nurture) or advanced animals (nature).

On the Origin of the Debate

The 19th century saw the publication of Charles Darwin's *On the Origin of Species* (1859). By arguing for the evolutionary animal nature of humankind, Darwin (1859) stoked the intellectual fires of those who supported his ideas (e.g., Galton, Goodard, G. S. Hall) as well as those who vehemently opposed the consequences of evolution for social psychology (e.g., Watson, Boas, M. Mead). Darwin (1873) theorized that human development is the result of a long chain of natural adaptation to the demands of the environment. In times of competitive scarcity, humans who possess adaptive characteristics survive and breed; those who do not die out (e.g., from lack of nourishment) without passing their genetic information to the next generation. The result is "survival of the fittest" in which the most adaptive characteristics are carried in the gene pool and maladaptive characteristics are eliminated. Over long periods of time, the species becomes better able to cope with the demands of the environment. For Darwin (1873), these adaptations were not limited to physiology (body structure) but also included matters of the mind such as behaviors, memory, and emotions. Thus, both the fear reaction on confronting an angry bear and the subsequent flight are genetic predispositions resulting from natural selection.

At the close of the 19th century, Darwin's (1873) ideas were translated into the study of human psychology in a variety of ways. One school of researchers came to believe that human development was a natural unfolding of a biologically determined sequence of events resulting from evolution. For example, early developmental psychologists such as Gesell believed that a developing embryo and the developing child progress through the same stages as evolutionary humankind (Dixon & Lerner, 1988). G. Stanley Hall, a founder and the first president of the American Psychological Association, was a firm believer in the preeminence of biological explanation of human development. Hall's theory of recapitulation states that physiological mechanisms move human development through a series of universal, predetermined stages mirroring humankind's evolutionary path from "animal-like primitivism, through a period of savagery, to the more recent civilized ways of life that characterize maturity" (Muuss, 1988, p. 21). The catchphrase associated with this approach was that "ontogeny recapitulates phylogeny." These early psychological researchers were primarily interested in description of human

development rather than construction of causal models. The result was a focus on description of discrete and universal stages of human development that provided guidelines for what is to be expected at each age—an approach known as stage theory. Note that although stage theorists believed that biology determines the sequence of development tied to physiology such as the developing brain and hormonal changes in puberty, they did not deny the effect of environmental factors on development. Descendants of this approach took many forms including such diverse schools of thought as Kohlberg's (1969) stages of moral development, the stage-dependent portion of Piaget's (1929) theory of cognitive development, and Erikson's (1950) stage theory of identity development.

Another strong adherent to Darwin's (1873) theory was William James (1890) whose ideas became a major force in psychology by the beginning of the 20th century. Like Darwin (1873), James saw the human mind as active and continually adapting to the social environment (Dixon & Lerner, 1988). What set James (1890) apart from the stage theorists was his belief in genetically inherited individual differences he called "instincts." James conceived of these instincts as natural impulses to respond to sensory demands of the environment and believed that they varied within the species. The instincts included such things as crying, sucking, locomotion, vocalization, imitation, rivalry, pugnacity/anger, sympathy, hunting, a wide variety of fears, appropriation including kleptomania, constructiveness, play, curiosity, sociability, shyness, cleanliness, modesty, love, and jealousy. James saw these instincts as plastic in two important ways. First, they interact with the environment to lead to habits or long-term behaviors. Instincts create impulses to perform certain behaviors (e.g., vocalization of music). If the environment provides support for the behavior (e.g., musical training), the impulse becomes a habit (the individual becomes a singer). In the absence of environmental support, the instinct/impulse dies out. Second, instincts are believed to be transitory. That is, they come and go across the life course to varying degrees. Some instincts such as those involving feeding and self-preservation remain throughout the life course. Others such as those involving mating and rearing young appear at certain programmed times in the life course and are later extinguished. Consistent with Darwin (1873), instincts that are most highly adaptive for human society become dominant across humankind.

Biological determinism had its most dangerous social expression in the eugenics movement. Powerfully influenced by the work of his cousin (Darwin), Sir Francis Galton (Muuss, 1988) asserted that nature is five times more influential than nurture. Galton's strong feelings on the supremacy of biological selection led him to push for "race improvement" legislation known as eugenic laws (Muuss, 1988). In an attempt to improve the human race via controlled natural selection,

the eugenicists were able to influence legislation throughout the United States that enforced sterilization of mentally retarded or criminal persons and proscribed interracial breeding. The worst expression of the eugenics movement came in Nazi Germany's policies. To this day, the fear of a return to eugenics-based public policy remains one of the core arguments against considering the role of biology in determining behavior (Malamuth, 1996).

Behaviorist Challenge

The opposing position, environmental determinism, was philosophically based in the empiricism of Locke (1690) who felt that an individual begins life as a *tabula rasa* or "blank slate," and that the process of development consists of filling the blank slate with information garnered through empirical interaction with the world. In this view, societal influence, particularly of the mother, is the primary determinant of development. Modern paradigmatic descendants of this approach include learning theories derived from behaviorism (e.g., Watson, 1925; Hull, 1943, etc.) and social learning theories (e.g., Bandura, 1977; Miller & Dollard, 1941) as well as a broad array of theories proffered in social interactionist tradition. Environmental determinism is most dramatically illustrated by a quote from behaviorist Watson (1925):

Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in, and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and yes, even beggar man and thief, regardless of his talents, penchants, abilities, vocations, and the race of his ancestors. (p. 82)

Central to Watson's thinking was the desire to bring psychology up to speed with the natural sciences by emphasizing objective, verifiable, and reproducible data based on observation of human behavior (Watson, 1919). That which could not be observed had no place in a psychology that resembled natural science. Therefore, Watson (1925) believed that James' embracing of instinct was naïve and could not be supported by empirical observation. Rather than cataloging characteristics of human behavior, Watson (1925) desired causal explanation. Given the knowledge and methodologies of Watson's time (e.g., the animal conditioning studies), the obvious observable causal mechanism for human behavior was the stimulus-response learning model. Watson (1925) claimed that stage development and instinctual traits could better be explained through stimulus-response learning. According to Watson (1925), the observed stages of human development were a

result of sequenced societal learning; he saw no reason why a child could not develop a skill at a much younger age than stage theorists suggested. For example, Watson (1925) felt that toilet training could be accomplished as early as 3 months of age.

With regard to inborn instincts, Watson (1925) indicated that “there is no such thing as an inheritance of *capacity, talent, temperament, mental constitution and characteristics*” (pp. 74–75). Instead, there were but a few “unlearned responses,” which were primarily basic biological expressions including sneezing, crying, erections, urination and defecation, smiling, movement of extremities (e.g., arms, legs, feet, etc.), and crawling. The instincts described by James (1890) and others such as hunting, appropriation, and sociability were the result of training. This is not to say that Watson (1919, 1925) was not interested in issues of human biology or physiology; two of his major summaries of his psychology contain major treatments on human physiology (Watson, 1919, 1925). Instead, Watson (1925) reported that the environment affected/changed biology, not the opposite, and therefore did not allow for an impact of biology on the behavior of the individual or on the environment/culture.

Watson (1925) also strongly opposed the eugenicists of his time; his learning perspective suggests all humans are capable of becoming positive contributors to society. Rather than biology, it is society that makes it impossible for identified “defectives” or “inferiors” to compete on equal terms. For example, Watson (1925) stated

We have no sure evidence of the inferiority in the negro race. Yet, educate a white child and a negro child in the same school—bring them up in the same family (theoretically without difference) and when society begins to exert its crushing might, the negro cannot compete. (p. 83)

Watson’s (1925) behaviorism was a strong influence in a long line of theories of environmental determinism based on learning including direct descendants such as Hullian learning theory and later social learning theory (e.g., Bandura, 1977; Miller & Dollard, 1941).

Chicago School

The environmental determinist position also struck a chord with the pragmatically oriented scholars of the Chicago School. Like the behaviorists, the Chicago School researchers rejected biology as a determinate of behavior. According to Delia (1987)

The most important general effect of the Chicago school's influence on social psychological thought was to turn aside instinct-based thinking and its emphasis on the concepts of imitation and suggestibility. In place of biological instincts, the Chicago theorists followed Mead and emphasized the social origins of personality and life-organizing attitudes. (p. 33)

The Chicago School's emphasis on environmental determinism is evidenced by their selection of research topics and the explanations of human behavior. The focus of much of their research was on the effect of urbanization and immigration on the people of Chicago, particularly focusing on culture, conflict, and consensus (Delia, 1987). Chicago's sociology department was heavily influenced by George Herbert Mead, who taught in the philosophy department there. Mead's symbolic interactionism held that meaning is not inherent in objects but instead created through the use of language (Blumer, 1969; Mead, 1934). Thus, the use of language is the basis for human society and interaction. Meaning and knowing are negotiated through interaction with others; knowledge of the world and the ways that humans act on that knowledge are the result of negotiated meaning among people in societies. As such, the organization of society and the behavior of individuals can be understood only through understanding the interactions that happen among people in particular contexts (such as the ones studied by the Chicago sociologists). Chicago's urban problems, such as poverty and crime, result from the manner in which language creates those realities. Therefore, the mass media as a powerful purveyor of language became a focus of much research at Chicago (Carey, 1996).

Nature/Nurture and Communication

It was into this intellectual milieu that media effects research was born. Two of the most important schools of thought informing early mass communication theory were openly antagonistic to biological explanation: Watson's (1925) behaviorism and the Chicago School's symbolic interactionism (Delia, 1987; Dennis & Wartella, 1996; Lowery & DeFleur, 1995). By the time social scientists began to seriously address mass communication questions, behaviorism held sway in American social science departments to such an extent that theoretical frameworks that considered biology as a determinate of behavior, such as Piaget's (1929) cognitive stage theory, were unable to get a hearing (Dixon & Lerner, 1984). The Chicago School's contribution to media effects includes the Payne Fund Studies, which was one of the largest research projects examining the effect of film on children (Lowery & DeFleur, 1995); the research of Robert Park, Charles Horton

Cooley, and William I. Thomas that looked into the role of the press in the emerging urban environment (Carey, 1996); and early media propaganda research by Harold Lasswell who spent 10 years at the University of Chicago training such students as Ithiel de Sola Pool (Schramm, 1996). Years later, a group of psychologists at Yale University coming directly out of Watson's behaviorist tradition would play an important role in mass communication theory. Carl Hovland (McGuire, 1996) began a series of media effects projects while working for the War Department during World War II. Hovland was a direct intellectual descendent of Watson; Hovland's mentor, Clark Hull, was a student of Watson (McGuire, 1996). After the war, Hovland returned to Yale and established his Communication and Persuasion research group that included such influential communication scholars as Irving Janis, Charles Osgood, William McGuire, Muzifer Sherif, Harold Kelley, Gerald Lesser, Neal Miller, and David Sears (McGuire, 1996). The Yale School lineage spread from these original scholars to prominent mass communication researchers such as Albert Bandura (Sears' protégé and heavily influenced by Miller) and Percy Tannenbaum (who worked with Osgood) as well as to prominent programs in the field, including Iowa (Sears), Illinois (Osgood), and by extension, Michigan State and Minnesota (Delia, 1987).

Thus, the field of mass communication and its most influential scholars emerged from traditions that were intellectually antagonistic to the idea that biology may play a role in determining behavior. As time went by, researchers moved toward even more environmentally based social interactional theories found in the human action perspective (e.g., constructivism and the coordinated management of meaning), sociocultural theories (e.g., cultivation analysis and media dependency), or even theories that may share more with humanities than the sciences, such as semiotics and the critical/cultural studies schools. Of the seven major traditions of communication research laid out by Craig (1999), none embrace an ontology that acknowledges any contribution of biology in determining human communication behavior. Cappella (1996) observed that paradigmatic discussions found in both the 1983 and 1993 "Ferment in the Field" issues of the *Journal of Communication* fail to mention a biological role in human communication processes. Cappella (1996) suggested "the paradigms vying for explanation did not include any that acknowledged seriously the so-called 'wet wear' within which cognition and culture, text and message, and context and motivation operate" (p. 4).

This is not to say that the field of communication has not considered issues of biology. In fact, communication science contains a number of theories that consider biological processes, but none that give biology credit for determining behavior. Like Watson's (1925) behaviorism, these theories largely consider the theorized biological process as an effect of the environment rather than as a cause of

behavior. Most focus on learning (e.g., social learning theory), memory (e.g., priming effects), physiological reactions (e.g., excitation transfer, desensitization), or individual differences (e.g., uses and gratifications) and posit intrapsychic processes that are formed by interaction with the environment. For example, Berkowitz's priming effects theory (Berkowitz & Rogers, 1986) suggests that environmental experiences (memories) are stored in the mind through semantically related associative networks. Priming of memory nodes activates semantically related memory nodes, thus predisposing the individual to react consistently with the prime. He did not address how genetic neurobiology might contribute to the way individuals may differ in their storage abilities, rate of acquisition, or interpretation of messages, nor did he note differences in how individuals may process messages. Similarly, Tannenbaum and Zillmann's (1975) arousal model simply states that someone aroused by media will be more likely to act aggressively than someone who is not aroused. They do not specify if individually inherited parameters are associated with arousal.

PARADIGM SHIFT OUTSIDE COMMUNICATION

By the 1970s, dominant thinking in psychology and to a lesser extent sociology had begun to come full circle to embrace the ideas of inborn traits and dynamic interaction with the environment that had been the core of Jamesian psychology. Many current psychologists (e.g., developmental, cognitive, neuropsychologists) now embrace a compromise position that stresses that development is a result of the interaction between nature and nurture. Hence, they would argue that the error environmental determinists make is inadequate model specification, which leads to radical loss of ability to account for variance. Many developmental psychologists have extended this biology–environment interaction idea further by incorporating numerous sociocultural levels. The study of the interaction between biology and environment has been referred to outside of the communication field by a variety of labels including psychobiology (Rosenzweig, Leiman, & Breedlove, 1999), behavioral genetics (Plomin, 1990), interactionism (Thomas & Chess, 1977), contextualism (R. M. Lerner, 1987) or ecologicalism (Bronfenbrenner, 1986). For the remainder of this article, I refer to it as the neuroscience paradigm.

Approaches within the neuroscience paradigm “investigate the complex system of interlinked and interdependent relationships of our biological and social environment” (Muuss, 1988, p. 300). Such a perspective attempts to account for the contribution of biology (e.g., sex, temperament, hormones, physical appearance, etc.) and of the social environment (e.g., parents, peers, culture, etc.). The neuroscience paradigm assumes that (a) all human behavior is rooted in

neurophysiological processing, (b) one's neurophysiological makeup is genetically determined, but (c) is plastic across the life span (including in utero) and is therefore susceptible to environmental influence.

Two key concepts are embeddedness and dynamic interaction (R. M. Lerner, 1987). The concept of embeddedness states that humans exist within a context made up of multiple levels of being (inner biological, individual psychological, dyadic, social network, community, societal, cultural, outer ecological, and historical). At any given time, variables from any and all of these levels may contribute to human functioning. The system is also characterized by dynamic interaction in which influence occurs across levels of being with variables at different levels having more or less influence at different times. Hence, the individual has the potential for plasticity or change across the life span (R. M. Lerner, 1987). Importantly, this perspective stresses that the person is the producer of his or her own development. As such, individuals have the potential to interpret stimuli in ways that are consistent with their needs, drives, and desires. Therefore, people actively shape their environment.

With the advent of the neuroscience paradigm, psychologists have discovered patterns of human development resulting from the interaction of biologically determined individual differences and the individual's environment in a variety of contexts. For example, there is growing evidence that physical appearance affects teacher attitudes and responses to students. Studies have shown that male students and attractive students are given more teacher attention than female students and less attractive students, resulting in higher achievement for male students and for attractive students (Leinhardt, Seewald, & Engel, 1979; R. M. Lerner & Lerner, 1977; R. M. Lerner, Lerner, Hess, & Schwab, 1991). In a separate example (Bem, 1996), it is now suggested that biology may interact with the environment to determine sexual orientation. A new and controversial theory states that sexual orientation can be explained by the interaction between the biologically rooted individual differences in temperament and peer group acceptance/socialization. Biology-environment interactions are also implicated in a large body of literature that examines changing social environments for adolescents entering puberty at different ages (Brooks-Gunn & Reiter, 1990). For example, the puberty literature examines how early or late pubertal change affects the opportunities students have to participate in extracurricular activities such as sports as well as early initiation into sex and alcohol consumption (Brooks-Gunn, Petersen, & Eichorn, 1985).

Central to a neuroscience approach is the concept of goodness of fit between biology and environment. According to this concept, behavioral problems (e.g., poor relationships, excessive drinking, irresponsible sexual behavior, etc.) result from a poor fit between biological predispositions (e.g., temperament) and demands of the environment. The approach rejects the one-size-fits-all philosophy of the envi-

ronmental determinists in favor of an individual difference approach. For example, the New York Longitudinal Study in which Thomas & Chess (1977) began tracking a cohort of children beginning in 1957 and continuing today found that a child who displayed the temperamental trait called *high intensity of reaction* (as evidenced by loud outbursts) was a poor fit with the expectations of middle-class parents in their study. The mismatch between the child's behavior and the parents' expectations caused parents to spend less time with these children or even to dislike them (i.e., "the problem child"). The neglected, disliked child never learns to handle his or her behavioral style in a socially acceptable manner at home, and this behavior is brought to school with additional negative consequences. These children were more likely to suffer from social problems as adults. Interestingly, the high intensity of reaction temperament was found to be adaptive in other environments. DeVries (1984) found that children with high intensity of reaction temperament were more likely to survive in a famine region of Africa, because the loud, demanding outbursts caused parents to respond to them more frequently than to the less demanding, low intensity of reaction temperament child.

Scarr (1985; Scarr & McCartney, 1983) has proposed an additional formulation known as "niche-picking." Niche picking refers to the inclination of individuals to choose environments that are most comfortable to them (e.g., college students who are good with numbers deciding to major in mathematics instead of English). Danielak (1972, as cited in Strelau, 1983) found that individuals with a low-reactive temperament were much more likely to choose high-stimulation occupations such as lawyer than were high-reactive individuals, who were predominantly found in low-stimulation professions such as librarian. There is empirical evidence for both niche-picking and goodness-of-fit models (e.g., J. V. Lerner, Lerner, & Zabski, 1985; J. V. Lerner, Nitz, Talwar, & Lerner, 1989; Windle et al., 1986). Evidence supporting the goodness-of-fit model tends to focus on preschool and elementary school participants, whereas the niche-picking studies focus on early and late adolescents. Younger children lack the ability to niche pick because their environment is most often determined for them by parents and other adults. As children move through adolescence and into adulthood, their increased independence allows them to niche pick more. Hence, individuals both shape and are shaped by their environment according to biological dispositions.

NEUROSCIENCE AND MEDIA EFFECTS THEORY

Research informed by the neuroscience paradigm is gaining a foothold in mass communication. In recent years, there has been a movement toward considering

the role of biology in determining, rather than simply reacting to, human communication behavior. There have been two major classes of these investigations: evolutionary psychology and trait perspectives. Evolutionary psychology approaches contend that human behavior must be understood as a result of 200,000 years of adaptive human brain evolution. Communication, culture, and behavior do not just happen; they are the result of natural selection of the most adaptive behaviors. Trait perspectives attempt to isolate genetically based neurophysiological individual differences that act as parameters for behavior. These parameters interact with the environment to delimit certain behaviors for particular individuals. In this section, although it is not exhaustive, I outline some of the emerging research in these two areas.

Evolutionary Perspective

Researchers who investigate communication from an evolutionary perspective explain essential questions of why humans communicate the way that they do as resulting from hominoid evolution. Language and interpersonal communication as well as the creation and maintenance of society and culture are seen as a result of hominoid adaptation to their environment. Like Darwin, they see the human brain as the product of 200,000 years of adaptation to the environment—brain physiology is not just happenstance but a result of a long progression of natural selection. Understanding why the brain evolved as it did offers deep insight into why people communicate as they do. In fact, Ekman (1973) argued that Darwin was the first nonverbal communication scholar. Darwin's (1873) book *The Expression of the Emotions in Man and Animals* argued that facial emotional responses such as anger, fear, and happiness are a result of evolution (Rogers, 1994).

Shoemaker (1996) used the evolutionary perspective to explain humans' fascination with negative news (disasters, tragedies), exemplified in the television news dictum, "If it bleeds, it leads." Shoemaker posited that our early ancestors evolved a surveillance function that provided early warning in case of danger. Humans who were attentive to information about their environment were less likely to be surprised by predators, and their genes were more likely to be passed to subsequent generations. Over time, attention to negative stimuli in the environment became naturally integrated into the brain structure. Thus, people are "hardwired" to pay more attention to these threatening types of negative news stories that may demand some type of response. Culture coevolves with the biological evolution—in this case news organizations learn to present the types of news that people are hardwired to attend to.

Another example of the evolutionary psychology paradigm applied to media effects seeks to explain why men are more fascinated by erotic media than women. Malamuth (1996) argued that differences in sexual responsiveness between men and women are the result of different evolutionary reproductive demands placed on men and women. Because women are responsible for rearing young, it has been evolutionarily adaptive for them to think of sexual relationships as long-term prospects. Men, on the other hand, obtain an evolutionary advantage by short-term mating with a variety of young, fertile women. Pornographers have taken advantage of this evolutionary difference by producing media that features multiple sexual situations with a variety of young, fertile-appearing women. Malamuth provided support for this interpretation by extensively citing supporting research from the literature on effects of sexually explicit media.

Evolutionary forces may also influence how we interact with technology. In a series of experiments during the past 15 years, Reeves and Nass (1996) have examined the manner with which people interact with media and have concluded that people treat media machines (e.g., computers, television) as social actors. Much of their explanation for this nonintuitive behavior is that our brains have not evolved fast enough to keep pace with changes in technology. According to Reeves and Nass (1996), "during nearly all of the 200,000 years in which *Homo sapiens* have existed, anything that acted socially really was a person, and anything that appeared to move toward us was in fact doing just that" (p. 12). As a result of evolution, our "old brains" automatically respond to media images as if they were real and react accordingly. Examples include the use of social politeness rules when interacting with computers and orienting to motion, which has been exploited by television advertising producers.

Trait Perspective

The other area in which researchers have begun investigating the biological basis of communication behavior is the trait perspective. Abundant evidence exists in developmental psychology suggesting people are born with "biologically rooted individual differences in behavior tendencies that are present early in life and are relatively stable across various kinds of situations and over the course of time" (Bates, 1989, p. 4). These differences are known generally as temperament and have been related to a variety of human behavior (for a review, see Bates & Wachs, 1994; Gray, 1991). Within interpersonal communication, researchers have begun to look at temperament as the root cause of individual expression of communication behaviors such as communication apprehension (Beatty, McCroskey, & Heisel, 1998; Beatty, McCroskey, & Valencic, 2001; McCroskey & Beatty, 1998)

and have found correlations between temperament and a number of communication variables (Horvath, 1998; Weaver, 1998).

Media effects researchers have begun addressing temperament traits, particularly that of sensation seeking. As early as 1988, a Sparks and Spirek experiment demonstrated a relation between arousal seeking and physiological response to frightening media. More recently, Krcmar and Greene (1999) found that two dimensions of sensation seeking were related to adolescents' exposure to violent television. In an ambitious set of studies, Palmgreen and his associates (Donohew, Palmgreen, & Lorch, 1994; Everett & Palmgreen, 1995; Lorch, Palmgreen, Donohew, & Helm, 1994; Palmgreen, Donohew, Lorch, & Rogus, 1991; Palmgreen, Lorch, Donohew, & Harrington, 1995) have examined the utility of sensation seeking for designing more effective antidrug campaigns. Because drug users tend to be high sensation seekers, Palmgreen's team (Palmgreen, Donohew, & Harrington, 2001) has had success tailoring more effective health messages to drug users by creating messages to which sensation seekers will pay more attention.

Meanwhile, other media effects researchers have explored the role of other temperament in the peoples' choices of and responses to media. Sherry (2001) found that a variety of temperament traits significantly predicted typical motivations for viewing television. As expected, the patterns among different temperament traits and televisions uses and gratifications suggest a chronic, neural basis for media use primarily related to emotional and vigilance functions in the brain. In another example of the potential role of temperament in responses to media, Zillmann and Weaver (1997) found that the violence desensitization effect only worked for high-trait psychoticism men, such that repeated exposure to superviolent genre films resulted in greater acceptance of violence as a means of solving social conflicts. Low-psychoticism men and both high- and low-psychoticism women were not desensitized to violent media.

DIRECTIONS FOR FUTURE RESEARCH

The current understanding of media effects has largely been informed by the ontology present at the birth of the field of communication. As research has progressed through the 20th century, those ontological assumptions appear fundamentally flawed because they never "acknowledged seriously the so-called 'wet wear' within which cognition and culture, text and message, and context and motivation operate" (Cappella, 1996, p. 4). This does not mean that early theories are necessarily wrong, although some theories may well be wrong. Instead, it suggests that

at a minimum, early theories were incomplete explanations of media uses and effects. An updated theory of media effects, drawing from 21st century state-of-the-science understandings of human behavior, would be informed by the plethora of recent neural research, and new theories would acknowledge that media use is the result of both nature determinants and nurture determinants. Such explanation would have more power, as it would provide “why explanations” (Berger, 1977) of communication behavior. For example, media effects theories would no longer state that individuals may become desensitized to violence as a result of television viewing but why they do in terms of the neural mechanisms that lead people to view violence on television, why some are affected more than others, and what actually transpires neurologically in the habituation process.

Contributions of neuroscientific theories to media effects research would take a variety of forms. In some cases, embracing neuroscientific explanation will allow researchers to improve current theories by explicating mechanisms underlying “black box” theories. In other cases, the neuroscientific paradigm will challenge existing explanations by offering alternative hypotheses to account for observed phenomenon. What would such theory look like? To understand that, one must first return to the three core assumptions of neuroscientific explanation: (a) all human behavior is rooted in neurophysiological processing, (b) one’s neurophysiological makeup is genetically determined, but (c) is plastic and is therefore susceptible to environmental influence across the life span. Areas that neuroscientists investigate and that are ripe for media effects research include the underlying physiological mechanisms involved with attention, motivation, emotion, learning/memory, and perception (see Table 1), most of which are currently studied by media effects researchers without probing the neural basis of these processes.

Reconsideration of Current Theories

Several media effects theories hold open the possibility of neural explanation, although research has not yet exploited the richness of possibilities. For example, uses and gratifications considers variables across multiple levels of analysis, focusing on the impact of individual differences as well as societal variables on media use and effects (Rosengren, 1974). The classic formulation of the uses and gratifications paradigm states that uses and gratifications researchers are interested in

- (1) the social and psychological origins of (2) needs, which generate (3) expectations of (4) the mass media or other sources, which lead to (5) differential patterns of media exposure (or engagement in other activities), resulting in (6) need gratifications

TABLE 1
Research Questions From a Neuroscience Perspective

Neural Process	Research Questions
Attention	Why is our attention drawn to media? How do you account for individual differences in attention? How are attentional processes different by medium (e.g., newspaper vs. video game) and genre (action adventure vs. horror)?
Emotion	How does emotion enhance media experiences? What is the role of chronic emotion (mood) in patterns of media use? Can emotion account for media and genre preferences? What role do emotional processes play in the habituation process? What about addiction to emotional stimulation from media?
Learning/memory	How does individual differences in learning ability and memory translate to cognitive, attitudinal, and behavioral differences in media effects? Are some more susceptible to media effects due to differences in learning and memory processes?
Motivation	How does media use interact with basic drives (e.g., sex, hunger). How does media advertising influence motivational drive states? What about media use for drive reduction?
Perception	How might differences in perceptual abilities translate to positive or negative media experiences? Do perceptual differences lead to genre preference or dislike (e.g., with stimulating virtual reality video games)?

and (7) other consequences, perhaps mostly unintended ones. (Katz, Blumler, & Gurevitch, 1974, p. 20)

The theory explicitly states that media effects must be understood across both microlevels and macrolevels of analysis and embraces the idea of dynamic interaction between these levels. To date, the majority of uses and gratifications research has focused on developing typologies of media use motivations in a variety of media and genres, for example, entertainment genre (Abelman, 1987; Gantz, 1996),

motivation type (Atkin, 1985; Rubin, 1985), differences by media type (Greenberg & Hnilo, 1996; Selnow, 1984), and differences by country (Greenberg, Li, Ku, & Tokinoya, 1991; Tokinoya, 1996; Youichi, 1996).

These distinctions provide useful descriptions of people's media use motivations, but typologies alone do not constitute useful theory. A consideration of the interaction between neural biology and environment would provide an etiology of these motivations by examining how motivations to use media are formed. For example, it is likely that the biological variable temperament plays an important role in media use because of its neural substrates in the emotional and attentional systems of the brain, particularly in the limbic system, brain stem areas, and monoamine neurotransmitters including serotonin and norepinephrine. Recently, Sherry (2001) showed that temperament is a moderate to strong predictor of media use motivations in a sample of young adults. Most important were limbic structures associated with mood management, the behavioral inhibition system, stem structures associated with vigilance, and serotonin action. Unfortunately, Sherry studied temperament traits in isolation. A better approach would be to examine how certain temperament traits interact with environmental variables such as parental mediation, peer group pressure, or other environmental demands to form patterns of media use.

Zillmann and his colleagues (e.g., Zillmann & Bryant, 1985, 1994) have demonstrated the importance of biological variables in a number of studies examining emotional responses to the entertainment experience. For example, Bryant & Zillmann (1984) showed that mood predicted television program choice. Experimental participants who had been placed in a state of boredom were significantly more likely to choose an exciting program than participants who had been stressed. Stressed participants choose to view more relaxing programs. The relation between biologically based mood states and television use was demonstrated by Meadowcroft and Zillmann (1984, as cited in Zillmann & Bryant, 1994). Meadowcroft and Zillmann found that premenstrual and menstrual women suffering from negative moods due to the loss of progesterone and estrogen were significantly more likely to prefer comedy television programs than were other women who instead chose drama. This finding was later replicated by Helregel and Weaver (1989). Because mood has been shown to be a biologically rooted temperament trait influenced by neuroendocrine system activity (Gunnar, 1994), it follows that chronic use of relaxing or exciting programming may result from temperament. As such, future research may find that people's patterns of media use are influenced as much by individual difference in hormonal expression as by environmental factors such as friends and family. For example, male preference for the action adventure genre may be related to differences in testosterone level as compared to women.

Theories emerging from the behavioral orientation of media effects history would also benefit from a neuroscience approach. For example, Bandura's (1977) social learning theory makes references to a number of black box type processes involved in the imitation of media models. However, the majority of the research has not explicated these processes in terms of neural systems, nor has the research seriously addressed these theorized underlying mechanisms. Essentially, social learning theory posits that behavior is learned through imitation of attractive, rewarded models (Bandura, 1977). These behaviors become a relatively enduring part of the learner's behavioral repertoire. The conditions under which this learning can take place are highly complex. Bandura (1977) proposed four processes governing observational learning: attention, retention, production, and motivation. Attentional processes determine which models are observed and what information is retained. Retention processes deal with committing observed behaviors to memory. Production processes deal with the ability of the individual to replicate the observed behavior. Finally, motivational processes address incentives to exhibit modeled behavior including direct and vicarious rewards. Within each of the theorized processes, variables are listed that might be important. For example, attentional processes include both attributes of the model (salience, affective valence, complexity, prevalence, accessibility, and functional value) and attributes of the observer (perceptual set, cognitive capabilities, cognitive preconceptions, arousal level, and acquired preferences). However, all these variables are studied at the environmental level and the neural basis of these attributes is not explored. Examples of processes implicated in this theory that could be studied from a neuroscience perspective include arousal, perception, memory, and cognitive capability.

Alternative Hypotheses

The neuroscience approach may offer challenges to some current explanations of media effects by revealing a spurious relation among observed variables. For example, a commonly cited theory of the effect of violent media is desensitization. Desensitization suggests that long-term exposure to violent media "will undermine feelings of concern, empathy, or sympathy viewers might have toward victims of actual violence" (Kunkel et al., 1996, p. I-10). This may take the form of lowered physiological response to violent media (Cline, Croft, & Courier, 1973) or slower reaction to real-world violence (Drabman & Thomas, 1974). In the classic study, Cline et al. (1973) divided children into a high television exposure group (25 or more hours of television per week over the past 2 years) and a low television exposure group (4 or fewer hours of television per week over the past 2 years), then took physiological measures of participants' reactions to a 14-min film that contained both violent and nonviolent scenes. Results showed that there were signifi-

cant differences in physiological reaction between low- and high-exposure groups during violent scenes but no differences between groups during nonviolent scenes. Cline et al. concluded that children who had been exposed to heavy amounts of television (and therefore television violence) over the past 2 years were desensitized to the effects of the violent portrayals.

What if there was a fundamental trait difference between children in the television exposure groups that could also account for a difference in physiological reaction to the violent film stimulus? Temperament research shows that people differ in central nervous system sensitivity to stimuli (Strelau, 1983, 1989) and are adept at choosing environments that are consistent with their level of sensitivity (Scarr, 1992). This being the case, one would expect individuals with high stimulus-sensitive temperaments to avoid watching television because it is too stimulating, whereas those with low stimulus-sensitive temperaments would seek out television for the sensation value. Under these conditions, it would not be surprising that Cline et al.'s (1973) low-viewing group was mainly composed of high stimulus-sensitive individuals who would also react more strongly to the violent scenes than the high-exposure group. As stated earlier in this article, Zillmann and Weaver (1997) found that strength of desensitization effects was a function of the personality trait psychoticism and biological sex.

CONCLUSIONS

Nearly 30 years ago, Alexander Thomas and Stella Chess (1977) offered a version of human development that consisted of a compromise between the nature and nurture perspectives. In the time since, great advances have been made in understanding human psychology. It is past time for media effects researchers to embrace the interactionist perspective offered by Thomas and Chess and embraced by legions of human behavior researchers. There is no longer any question among most developmental psychologists, cognitive scientists, neuroscientists, and biologists that nature interacts with nurture to determine human behavior. Unlike other human sciences, communication has never seriously engaged the nature/nurture debate. As a result, communication researchers have developed a one-sided way of thinking about human communication that has major implications for the richness of our theory and for our ability to account for variance. If communication researchers continue to remain enamored of an early 20th-century ontology and ignore the building evidence of biological influence on behavior, our theories risk becoming outmoded. It is likely, then, that the next set of milestones that provoke "wide discussion and change the way that scholars think about the mass communication

process" (DeFleur, 1998, p. 86) are likely to come from those who look to the interaction of biology and environment to understand effects of media.

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