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Lesson 01

INTRODUCTION TO ENVIRONMENTAL PSYCHOLOGY

Until relatively recently only a few scientists and perhaps fewer public officials were concerned with the influence of advancing technology, population growth, and urbanization on the quality of the environment and ultimately on the quality of human existence. Technological advances were hailed for making dramatic improvements in the quality of life and for facilitating the endless search for comfort and luxury, without appreciation of the effects these advances were having on the quality of the environment. The term *environment* was rarely mentioned in the media and few legislators were making any concerted efforts to pass laws to protect it. Gradually, though, we have become aware of the delicate balance between the quality of the environment and the quality of human life, and we have come to realize that this balance can be easily upset by human actions.

The dangers of acid rain, the fallibility of nuclear power plants, and the difficulties in handling and disposing of toxic chemicals are coming to be appreciated. Other stark realizations are also being confronted. Among these are that the pace of suburban sprawl and urban decay is quickening; the depletion of nonrenewable resources is an inevitability; and cheap energy is a thing of the past. Chemicals such as dioxin, formaldehyde, PCB (polychlorinated biphenyl),/ and sulfur dioxide, once found only in the lexicon of scientists, are becoming household words, and heretofore unknown places like Love Canal, Chernobyl, Bhopal, and Three Mile Island are making nearly everyone's list of places they would rather not be. The credible capacity and propensity of humans to misuse and abuse the environment is now painfully apparent. Despite these seeming revelations, though, we have only begun to understand the human role in maintaining the health of the planet, to comprehend the effect of present actions on future outcomes, and to consider alternatives to environmentally destructive behaviors.

But begun we have, and today daily newspapers and the nightly news regularly report the abusive treatment received by our water, land, and air, as well as the rapid depletion of energy resources. Numerous local, state, and federal laws governing the use of our physical environment have been enacted and the Environmental Protection Agency (EPA) has been created. Steps are being taken to prevent massive oil spills at sea, to keep blast furnaces from belching ugly smoke and harmful particulates into the atmosphere, to preclude raw sewage and deadly chemicals from being discharged into water, and to forestall the accumulation of mountainous heaps of solid waste. Efforts are also being made to reduce energy consumption, to design buildings to promote human functioning, to plan for urban development, and to establish and preserve wilderness areas.

Despite the accelerated efforts of scientists, engineers, political and spiritual leaders, and the general public, environmental problems are far from being solved. Without doubt there has been increased concern by humans for their environment, but the wherewithal to turn this concern into effective remediating actions has not always been available.

The Environment Debate

There are those who claim that the environment has already received sufficient abuse to render the planet uninhabitable by the twenty-second century They point with indignation to the number of species that have become extinct in the past 100 years, the desertification of once arable lines, the denuding of forests and eutrophication of waters caused by acid rain ami the iru. rvasim; ^htoud of smog smothering more and more of the world's atse: a^ evidence that the day of reckoning is approaching. They see the environment as a helpless pawn in the struggle between the haves and the have-nots. Usurpation of natural resources by the powerful and a desire to maintain them by the weak, they claim, has turned the environment into a ^ battleground and the ultimate loser in this struggle.

There are those, of course, who just as emphatically point with pride to the great strides that have been made in alleviating human suffering and promoting human welfare in the areas of agriculture, medicine, and even design technology. If there is a problem, they claim, human ingenuity will solve it. To them:

There is no energy shortage, only an extraction problem

There is no population problem, only an uneven distribution of the species
There is no toxic waste problem, only a few bugs to be worked out of the transportation and storage mechanisms.

Obviously, the jury is still out with respect to who is right in this debate. It is possible that technology will be made available to alleviate some of the pressure that humans are placing on the earth's resources. It is also possible that the destructive behavior of humans will change sufficiently to reverse the trend in environmental degradation. One thing for certain is that the debate is heating up. The convening of the United Nations Earth Summit in June 1992 in Rio de Janeiro is ample evidence that more people are becoming aware of the situation. Accompanying this recent heightened concern with human influences on the environment has been a resurgence of interest in the effect of the environment on human functioning. A multitude of biological, psychological, and social horrors have been augured given continued environmental degradation and unchecked population growth. Information is beginning to amass regarding the physiological, psychological, and behavioral effects of unwanted noise, air pollution, excessive temperatures, barometric pressure, building design, among other environmental factors. Short-term effects are being studied as well as long-term accumulative effects. Additionally, a growing literature suggests that some environmental conditions produce detrimental aftereffects in those exposed to them (i.e., the effects do not manifest themselves immediately, but rather show up much later after their causes have been removed). These, too, are being studied with renewed interest. Similarly, the potential to alter values, attitudes, and behavior vis-a-vis the environment is being explored.

The recent emergence of environmental psychology as a discipline signals a growing discontent with mere speculation and uninformed rhetoric (often emotional) and reflects the efforts of social, behavioral, and biological scientists (along with their colleagues in the design and engineering professions) to gain data-based answers to questions regarding human/environment interactions. This increased concern, coupled with increased research, has led to a substantiation of some popular opinions and to a refutation of others. This book provides an introduction to what is currently known regarding person-environment relationships and invites the reader to think about, add to, and act upon this information.

DEFINITION OF ENVIRONMENTAL PSYCHOLOGY

Environmental psychology constitutes an area of inquiry that is rooted in numerous disciplines. Biologists, geologists, psychologists, lawyers, geographers, economists, sociologists, chemists, physicists, historians, philosophers, and all of their sub disciplines, and all of their engineering brethren share an interest in understanding the complex, often delicate, set of relationships between humans and their environments.

While this understanding is sought for its own sake the goal of basic research to say is that most "scientists get involved in the environmental concerns, Its proponents, therefore, tend to focus on socially relevant problems arid to emphasize practical application of knowledge. They emphasize the interrelationship of environment and behavior, the physical environment as influencing people's behavior and people as actively and sometimes passively, influencing the environment.

Because of this multiplicity of origins, and because of its relative youth as a discipline, environmental psychology is still evolving. Any definition of the field must therefore reflect its breadth and its changing nature, must include an acknowledgement of its strong pull to application (while being careful not to dismiss the need for basic research), and must stress the reciprocal relationship of organisms to their environments.

Environmental psychology could, therefore, be defined as *a behavioral science that investigates, with an eye toward enhancing, the interrelationships between the physical environment and human behavior.*

Even though this definition includes the concerns expressed above, it does not capture the richness of thinking of those involved in the discipline, nor does it reveal the desire of its partisans to develop systemic and inter-systemic models of understanding. For example environmental psychologists are interested in the various physiological, psychological and behavioral processes by which people respond to the complexities of their environment. Researchers in the field, therefore investigate questions that involve physiological content (e.g., changes in heart rate, endocrine functioning, galvanic skin response, mortality)",

psychological content (e.g., spatial behavior patterns, mental images, environmental stress, attitude change) behavioral content (e.g. altruism, aggression, performance). They are concerned with understanding human attitudes about, experiences within, and behaviors toward the environment, with an eye toward changing those attitudes and behaviors to promote environmental preservation and to maximize human functioning. Furthermore, they are likely to deal with this content from an interdisciplinary perspective; that is, they might be concerned with meteorological, physical, geographical, architectural, and/or ecological features of the environment that might have an impact on its inhabitants. Without doubt these aspects are also of concern to geologists, physicists, chemists, and biologists. The field of environmental psychology, however, attempts to deal with these concerns simultaneously to develop a systematic and integrated understanding of the interrelated processes governing organism /environment relationships.

Additionally, researchers in the field of environmental psychology are often simultaneously pulled toward both the resolution of practical problems and the formulation of broad-based integrative theory. Theoretical refinement often requires further (often nit-picking appearing) research, whereas practical concerns demand solutions to present problems. The environmental psychologist tends to deal with these facets simultaneously. For example, theoretical advances in our understanding of human responses to crowding can contribute to practical applications to prevent adverse reactions to high population density. Similarly, applied studies of "crowd control" techniques can help to refine theories accounting for responses to crowding.

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It is clear that as a discipline the uniqueness of environmental psychology is found in its diversity. This diversity The diversity is manifest in terms of the disciplines that impact on it, in the research methods and tactics utilized within it, in the areas of human concern to which its findings are applied and in the theories developed to account for its research findings. Given these various considerations, and the knowledge that any definition of the field of environmental psychology is subject to criticism and change, we will define environmental psychology as:

"A multidisdplinary behavioral science, both basic and applied in orientation, whose foci are the systematic interrelationships between the physical and social environments and individual human behavior and experience"

THE ENVIRONMENT

The simplest expression of this definition is found in the work of psychologist Kurt Lewin (1951) who sometime ago made the following statement:

"In principle it is everywhere accepted that behavior (B) is a function of the person (P) and the environment (E)

$B = f(P,E)$

P and E in this formula are interdependent variables"

However, as Wohlwill (1970) has noted: "the role of the environment has almost invariably referred to social or interpersonal influences, or else to effects presumed to be ascribable to the milieu in an altogether unspecified sense"

And Saegert (1987), noting the lack of specificity for the term, has lamented that the social sciences tend to define the environment almost exclusively in terms of social transactions and institutions. Thus, although the term environment has been used for some time, it has remained vaguely "defned, referring to an unspecified physical and social backdrop for behavior. And even when referring to nonsocial conditions the term environment has been used to apply to sets of conditions as diverse as the climatic conditions of a given geographic area, the cockpit of an airplane, the area surrounding a toxic waste site, the structure of large corporations, reward /punishment contingencies, the design of nursery schools, the "turf" of street gangs, a church congregation, the temperature in experimental environmental chambers, and the size and placement of commodes in the residential bathroom, to name but a few.

Lesson 02

COMMON ASSUMPTIONS OF ENVIRONMENTAL PSYCHOLOGY

It really should come as no surprise that the term *environment* lacks specificity. Among others, historians, biologists, architects, sociologists, economists, and psychologists have used term idiosyncratically in defining variables of interests in their own disciplines. Historians have sought the environ mental *Zeitgeist,* biologists the *ecological niche,* architects the *design features* and economists *the ratio of supply to demand* to account for external influences on human behavior. Whereas the term "environment" lacks specificity, it is nonetheless possible to be explicit regarding the assumptions that underlie its study.

The assumptions that we see as underlying all environmental science, independently of specific orientation, are as follows:

(1) The earth is the only suitable habitat we have;
(2) The earth's resources are limited;
(3) The earth as a planet has been and continues to be profoundly affected by life
(4) The effects of land use by humans tend to be cumulative
(5) Sustained life on earth is a characteristic of ecosystems and not of individual organisms or populations.

Implicit in these assumptions is a call not only for multidisciplinary but also interdisciplinary strategies, methods, and philosophical perspectives in perceiving, understanding, and maintaining the delicate relationships that exist between humans and their environments. In the following pages we will elaborate each of these assumptions.

1. ***The earth is the only suitable habitat we have, and its resources are limited.*** Throughout the history of the earth various forms of life have begun, evolved, prospered, and died out, with the present dominance by humans being a very recent development. But, despite this current domination two fundamental truths must be faced:

   (1) Humans, too, will succumb to extinction either through geologic, meteorologic, or interstellar cataclysm, natural biological processes, internecine quarrels, or because the earth's resources will no longer support human life in its present form
   (2) Although there may be other habitable islands in the cosmic sea, they are spaced at such great distances throughout the universe as to be virtually irrelevant to human survival.

   Notwithstanding these certainties, the earth is very important to those of us who are now living and to our children and to theirs. We must learn to live with the opportunities as well as the limitations the earth affords, with the inexorable fact that it is dynamic and changing. And, we must do so in a way that allows for continued human existence. The newly emerging area of environmental psychology holds the promise of providing information that will allow sustained human tenure on earth.

2. ***The earth as a planet has been profoundly affected by life.*** Human contributions to the visual landscape of the planet are everywhere: tall skyscrapers, intricate networks of highways and electrical lines/ engineered lakes/ and the vapor trails of high-flying jet planes are constant reminders of human presence. More subtle indicators are the changing quality of the chemical composition of the atmosphere, geologic changes in the earth's crust engineering changes in hydrologic processes and chemical changes in the waters that cover the planet.

   Clearing of forests, plowing of land, black-topping of highways and parking lots not only affect the earth visually but change the amount of carbon dioxide in the atmosphere, the light reflecting and absorbing characteristics of the earth's surface and hydrologic drainage patterns. These changes in turn influence the rate of heating and cooling and therefore the temperature of the earth and its atmosphere. Weather and climate are thus influenced by the presence of humans. It is hoped that a more thorough understanding of the ways in which humans influence earth's natural processes will lead to more intelligent and life-preserving behaviors on their part.

3. ***The outcomes of land use by humans tend to be cumulative and therefore we have obligations to***

ourselves as well as future generations to minimize their negative effects. A number of changes in the environment are brought about by human habitation; fall plowing/ the development of sanitation systems/ and the building of shelters are but just a few. These practices influence the earth immediately as well as having long-term impact. A dam built today not only supplies electrical energy for today's population but also influences the course of the waterways on which the dams are built/ often in irreversible fashion. The inescapable conclusion of all this is that while humans have multiplied/ their life's resources have shrunk/ and there is every indication that this trend is continuing. For example/ the same conditions that helped to create the Sahara are expanding it southward. Every year two to three more square miles are lost to the drought and sands. The "Thar" Desert of India is advancing at the rate of about one-half mile annually along its entire perimeter. We have an obligation to ourselves and to future generations to see that this trend is halted/ if not reversed. An understanding of environmental psychology represents a start toward reversing these trends.

4. ***Sustained life on earth is a characteristic of eco system and not of individual organisms and populations.*** No single organism/ population/ or species is capable of both producing all its own food and completely recycling all of its own metabolic products. Green plants and light produce carbon dioxide/ sugar and water; from sugar and inorganic compounds many organic compounds are manufactured including protein and woody tissue. But no plant can degrade the woody tissue developed in this fashion back to its inorganic compounds. This degradation requires other organisms such as bacteria and fungi. To complete the recycling of chemical elements from inorganic to organic and back to inorganic requires the use of several species. The smallest system capable of complete chemical recycling is known as ECO System. Humans are part of a very complex and delicately balanced ecosystem. Thus to understand humans fully it is necessary to study them within the context of the ecosystems in which they survive. Environmental psychology is the field that attempts to develop an understanding of this interdependency. It should be clear by now that to comprehend fully the relationship of humans to their environment the student of the environment should be aware of contributions from a large number of disciplines. *Environmental studies* by their very nature are the domain of a generalist with a strong interdisciplinary interest. All environmental problems must be looked at from numerous perspectives so that a clear and total picture can be put together from the many pieces.

CURRENT EVENTS INFLUENCING ENVIRONMENTAL PSYCHOLOGY

If present trends continue: The world will become increasingly crowded, more polluted (Leonard, 1986; Peterson, 1987), less stable ecologically (Manabe & Wetherald, 1986), and more vulnerable to disruption (World Commission on Environment and Development, 1987). Supplies of drinking water will diminish drastically, and despite greater material output, the world's people will become poorer than they are today (Postel, 1985, 1986, 1987). The forests of the world will become increasingly denuded as a result of the requirements of wood for building and burning (Bowander, 1987; Myers, 1984) and as a result of the increasing acidity of rainfall worldwide. Increases in arable land will be offset by the usurpation of land for dwelling sites and the desertification of lands resulting from overpopulation. Following factors are important to be considered I n this regard.

1. Population Trends

World population projections concur that, given current trends, our numbers will reach 10 billion by 2030 and 30 billion by the end of the twenty-first century. These numbers are close to the estimates of the carrying capacity of the entire earth. In some places on the globe, however, the carrying capacity has already been exceeded. Population in Sub-Saharan Africa and in the Himalayan regions of Asia have exceeded the capacity of the immediate area to sustain life. Overgrazing, fuel wood gathering, and destructive cropping practices have coalesced to cause a series of ecological transitions leading from open woodlands, to scrub, to fragile semi arid range, to worthless weeds, and finally to bare earth. Matters are mad worse where animal dung and crop wastes must be burned for heating and cooking. Croplands are then deprived of organic materials, lose their ability to hold water; and become less fertile. In Bangladesh, Pakistan, and large parts *of* India, large numbers of people to meet their basic needs have damaged the cropland, pasture, forests, and water supplies upon which their livelihood depends. Dramatic increase in world population has been an impetus for the emergence environmental psychology.

Resource Depletion and Environmental Degradation

Other examples of serious deterioration in the earth's basic resources can be found throughout the world, including the industrialized nations. Erosion of agricultural soil, salinization of the highly productive

irrigated farmland, and lake acidification becoming more prevalent. Extensive loss of tropical forests and more or less permanent soil degradation have occurred throughout much of the Amazon River Basin (McHale, 1979). The world's deserts now make up 800 million hectares ancl are increasing in size.

Regional water shortages and deteriorating water quality/ already a problem in many parts of the world are likely to worsen. Increases of 200 to 300 percent in the world water withdrawals are projected to occur in the next twenty years with much of it being contaminated as a result of waterways being used to provide coolants and as waste transports. The potential for human conflict over the use of freshwater reservoirs is accented by the fact that of the 200 major river basins of the world/ 148 are shared by two countries and 52 are shared by three to ten countries. Long-standing difficulties over the shared rivers of Plata (Brazil and Argentina)/ Euphrates (Syria and Iraq)/ and Ganges (Bangladesh and India) have the potential to intensify as the need for additional freshwater occurs. Thus/ the depletion of natural resources essential for survival has been another factor influencing the development of environmental psychology.

The by-products of an industrialized/ increasingly urbanized/ and highly populated planet bring with them a host of problems. Chemical and human waste is being produced at rates faster than we can safely dispose of them; non-renewable resources are being consumed at increasing rates; plans for reestablishing renewable resources are shortsighted/ and the fate of our waterways/ wildlife/ climate/ and perhaps the earth itself appears in jeopardy. The deterioration of the environment is thus another reason for the increased interest in environmental psychology.

2. Public Policy and the Environment

The problems in preserving the carrying capacity of the earth and sustaining the possibility of a decent life for human beings are indeed enormous and imminent but they are just that—problems.. Policy changes coupled with government business and individual actions can do much to alleviate many of them. Policies that mandate reforestation after cutting that require detoxification of chemical by-products before disposal and that involve judicious soil management have begun to be implemented. Interest in energy and material conservation is growing, industrial and household recycling is becoming more prevalent/ and the need for family planning is becoming better understood. High-yield hybrids are continuously being introduced and methods for farming the seas are being developed. The need for reliable scientific data upon which to base public policy has given a sense of urgency to the development of environmental psychology and has contributed to its growth as a discipline.

3. Human Behavior and the Environment

Encouraging as these policy developments are, they are far from adequate to meet the growing challenges of humankind. Needed changes go far beyond the responsibility of one nation, and new initiatives must be taken if worsening poverty, environmental degradation, and international conflict are to be averted. The solutions if they exist are complex and long-term and inextricably tied to the problems of poverty, injustice, and social conflict. The problems of the globe are human problems, many of which have been caused directly or indirectly by human presence. Advanced technology, while potentially a part of the solution to some of these problems, is also the cause of many of them. Because many of these problems are the result of human behavior, the psychologist, whose domain of interest is human behavior, has potentially a great deal to contribute in their resolution.

Environmental psychologists are very much attuned to the health of mother earth. They realize there are no quick fixes and that only through under-standing and changing human behavior can there be any hope of maintaining a habitable planet—that is, even though psychologists recognize that many of the problems are technological they also emphasize that the source of these problems is human behavior. Equally important is their realization that without an understanding of the mechanisms and laws that govern the life-sustaining processes of the earth, there is no hope that any changes in human behaviors or policies will have any medicinal effects.

Lesson 03

THEORIES IN ENVIRONMENTAL PSYCHOLOGY

On the one hand, the interdisciplinary nature of environmental psychology is laudable in that various perspectives are brought to bear on a single phenomenon, leading, it is hoped, to fewer "tunnel-vision" theories, and to more generally applicable solutions. On the other hand, it is this very multiplicity that leads to difficulties in the systematic application of knowledge and in the development of well articulated unifying theories.

Historical Influences

Thinking among environmental psychologists has been influenced by theories both within and outside of the discipline of psychology. Some of these theories are very broad in scope whereas others are more focused; some are lacking in empirical basis and others are more data-based. We will review a number of them to provide the context for a consideration of current theories of environment-behavior relationships. These perspectives include:

Geographical Determinism
Ecological Biology
Behaviorism
Gestalt Psychology

Geographical Determinism: Some historians and some geographers have attempted to account for the rise and fall of entire civilizations on the basis of environmental characteristics. For example, Toynbee (1962) theorized that the environment (specifically, topography, climate, vegetation, availability of water, etc.) presents challenges to its inhabitants. Extreme environmental challenge leads to the destruction of a civilization, whereas too little challenge leads to stagnation of culture. Thus Toynbee proposed that an intermediate level of environmental challenge enhances the development of civilizations, and extremely diminished or excessive levels are debilitating. The notion of environmental challenge and behavioral response, although rooted in the thinking of such *geographical determinists,* appears often in one form or another in various theories in environmental psychology.

As one example Barry, Child, and Bacon (1959) have suggested that agricultural, non-nomadic cultures seem to emphasize responsibility, obedience, and compliance in child rearing practices, whereas nomadic cultures often emphasize independence and resourcefulness. These differences, they suggest, result from the fact that people who live and work together in organized non-mobile communities require more structured organization and therefore stress the importance of obedience and compliance. On the other hand, independence and resourcefulness are esteemed and inculcated by nomads in preparation to meet the changing and unpredictable demands of an environment confronted by a "roaming" people. Thus, the argument goes, the environment sets the stage for the development of cultures having the best chance of surviving it.

In a very real sense, this is no different from saying that ghetto culture cultivates a set of skills in its inhabitants that are best suited to, the ghetto. Someone not skilled in the craft of street fighting, it can be argued, is not likely to survive the environment of the streets. We will see later in this text that some have carried this argument to-the point, and other institutional environments develop in their inhabitants that are ostensibly survival Certified to these environments, yet to be maladaptive in the larger environment.

Ecological Theories: The development of *ecological theories,* theories concerned with biological and sociological interdependence between organisms and their environment, has also significantly influenced thinking in environmental. With the development of ecological science, organisms were no longer viewed to be separate from their environment, but were seen as integral to it. This notion of organism-environment reciprocity now appears in many current environment-behavior theories. The environment and its inhabitants are still often studied as separate components, but no one doubts their interdependency. These various components are seen as constituting a total system and changes in any single unit are assumed to change the nature of the entire system.

Behaviorist Perspective: comes from the discipline of psychology and involves the reaction of *behaviorists* to the failure of personality theories to account fully for human behavior. It is now generally accepted that considering both the

environmental context in which behavior occurs and person variables (i.e., personality, dispositions, attitudes, etc.) leads to more accurate predictions of behavior than does measurement of either alone. This is central to most current theories of environment-behavior

Gestalt psychology was developed primarily in Germany and concurrently with behaviorism. Gestalt psychologists were more concerned with perception and cognition than with overt behavior. The most important principle of this body of work was the objects, persons, and settings are perceived as whole. From the Gestalt point of view, behavior is rooted in cognitive processes; it is determined not by stimuli, but from the perception of those stimuli. The Gestalt influence on environmental psychology can be seen primarily in the area of environmental cognition (i.e., explaining how people perceive, think about, and process environmental information).

Critical Appreciation

These approaches tend to be rather broad in scope and lacking in empirical referents. Each has its focus of convenience and no single perspective is satisfactory in accounting for the complexity of environment-behavior relationship. No "grand theory" exists that can incorporate the distinctive contributions of each of these influences on environmental psychology.

This is so for at least four reasons: (1) There is not enough data available regarding environment-behavior relationships to lead to the kind of confidence needed for a unifying theory, (2) the relationships that researchers have looked at are highly varied, (3) the methods used are inconsistent, and (4) the ways in which variables have been measured have not always been compatible from one research setting to the next.

Despite the fact that well-articulated, all-encompassing theories are not available at this time, there are a number of "mini-theories," or mini-approaches, that have been used successfully in conceptualizing specific organism-environment relationships. Included in these are the *arousal* approach, the *stimulus load* approach, the *behavioral constraint* approach, the *adaptation level* approach, the *environmental stress* approach, and the *ecological* approach. Each of these is able to handle some, but not all, of the available data. Some are more useful in dealing with group behavior (the ecological approach), whereas others focus on the individual level of analysis (the stimulus load approach). Some find their greatest utility at the psycho-physiological level (the stress approach); others are useful for accounting for individual differences (the adaptation level approach). Before turning to an orientation that attempts simultaneously to embrace aspects of many of these approaches, a brief description of each of these approaches will be provided.

Lesson 04

AROUSAL THEORIES

Arousal Theories

Arousal theories have typically been concerned with the influence of arousal on performance. Generally, performance is maximized at intermediate levels of arousal but falls off as arousal is either increased or decreased. This relationship, sometimes referred to as an inverted-U relationship, has been shown to differ slightly depending on whether performance is measured on simple or complex tasks (see Figure 2-3) and is often referred to as the Yerkes-Dodson law. These relationships are consistent with other findings that humans tend to seek out intermediate levels of stimulation (Berlyne, 1974), and is reminiscent of Toynbee's assertion, referred to earlier that cultures only develop in environments that provide intermediate environmental challenges.

Performance changes that vary curvilinearly with temperature increases have also been shown. One explanation of these findings is that increases in ambient temperature lead to increases in arousal levels. Initially, the higher arousal leads to performance enhancement, but as it increases further, overarousal occurs, causing performance decrements. Similarly, it has been shown that personal space invasions lead to increases in arousal (Middlemist, Knowles, & Matter, 1976) and to performance decrements (Evans & Howard, 1972; McBride, King, & James; 1965). Additionally, increases in noise level have been associated with changes in arousal and performance (see Evans & Cohen, 1987). Thus, a number of variables associated with arousal changes have been shown to be related to performance changes, and performance has consistently been curvilinearly related with arousal.

Other theorists utilizing an arousal perspective have featured physiological response to environmental stimulation. Changes in heart rate, blood pressure, respiration rate, galvanic skin response, and adrenaline secretion among others have been shown to occur with changes in the environment. Increased ambient temperature leads to blood vessel dilation, perspiration, increased heart rate, and in extreme conditions, lowered blood pressure and insufficient oxygen supplied to the brain. Personal space invasion has been linked to delayed onset and shorter duration of maturation for males. And exposure to noise alters blood pressure, heart rhythm, and the flow of gastric juices to the stomach.

Neurologists such as Hebb (1972) have linked arousal with increased activity of the reticular activating system of the brain. Still other theorists have equated arousal with changes in motor activity or with self-report of arousal. Berlyne (1974) has, for example, characterized arousal as lying on a continuum anchored at one end by sleep and at the other by excitement, and Mehrabian and Russell (1974) have identified arousal as a major component in people's affective responses to their environment.

Independent of the orientation taken with respect to arousal, a number of consistencies are apparent:

1. Changes in arousal are associated with changes in the environment

2. pleasant as well as unpleasant stimulation increases arousal — that is, room temperatures above 100 degrees Fahrenheit and loud, obnoxious noises influence arousal in ways similar to roller-coaster rides and passionate kisses

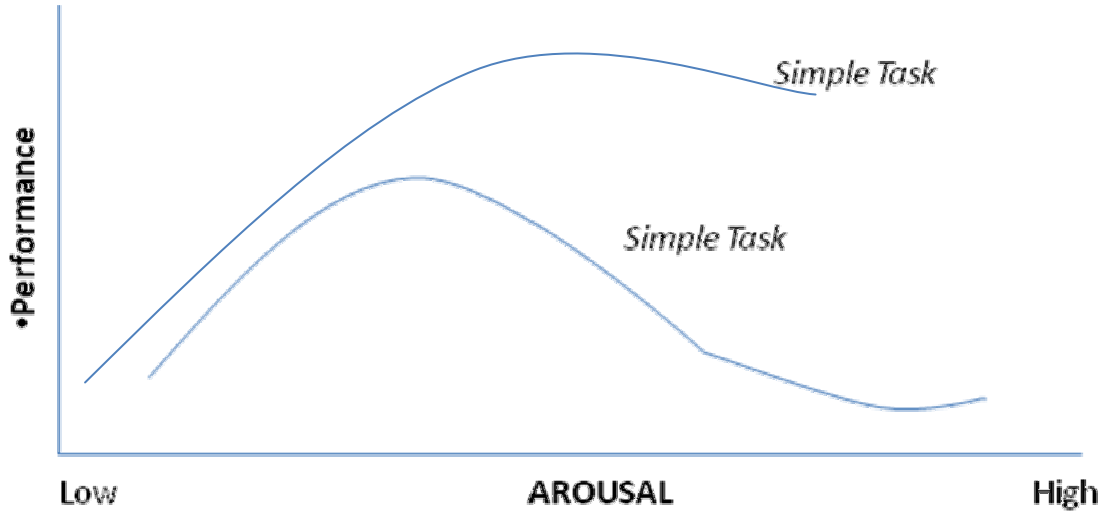
3. changes in arousal lead people to seek information about their internal states (Schacter & Singer, 1962) as well as to seek information from others (Festinger, 1954)

4. people tend to evaluate moderate levels of arousal positively

5. often great expenditures of energy are utilized by individuals to bring the environment to a level of moderate stimulation.

The Yerkes Dodson Law

Performance is predicted to be optimal for both simple and complex tasks at intermediate levels of arousal. Arousal above the level leads to decrements in performance



Factors Impacting Arousal Level

Furthering the point various researchers have tried to identify the impact of different environmental factors on the arousal level:

i. Temperature:

Increase in ambient temperatures lead to increases in arousal level. Usually higher arousal leads to performance enhancement but as it increase further over-arousal occurs causing performance decrements

ii. Personal Space Invasion:

Increase in personal space invasion leads to increase in arousal and performance decrements (Middlemist, Knowels, and Matter 1976)

iii. Noise Level:

Increase in noise level leads to increase in arousal and performance decrements
(Evans and Kohen 19*87)*

Physiological Response to Environmental Stimulation

Changes in heart rate, blood pressure, respiration rate, galvanic skin response, and adrenaline secretions have been shown to occur with changes in environment

i. Temperature

Increase ambient temperature leads to following physiological changes:

- Blood vessel dilation
- Pupil dilation
- perspiration
- Increased heart rate

ii. Extreme conditions:

- Lowered blood pressure
- Insufficient oxygen reaching to the brain

iii. Invasion in personal space has been linked to

- Delayed onset and shorter duration of micturation for males

iv. Exposure to Noise:

- Alters blood pressure, heart rhythm, flow of gastric juices to the stomach

Arousal and Nervous System

Arousal is linked with increased activity of the reticular activating system of the brain.

Changes in arousal are associated with changes in the environment. Pleasant as well as unpleasant stimulation increases arousal i.e. room temperatures above 100 degrees Fahrenheit, changes in arousal leads people to seek information about their internal states. People tend to associate moderate levels of arousal positively. Great `expenditure of energy are utilized by individuals to bring the environment to a moderate level of stimulation.

Lesson 05

STIMULUS LOAD, BEHAVIORAL CONSTRAINT, AND ADAPTATION LEVEL THEORIES

1. Stimulus Load Theories

Central to stimulus load theories is the notion that humans have a limited capacity to process information. When inputs exceed that capacity, people tend to ignore some inputs and devote more attention to others (Cohen, 1978). These theories account for responses to environmental stimulation in terms of the organism's momentary capacity to attend to and deal with salient features of its milieu. Generally, stimuli most important to the task at hand are allocated as much attention as needed and less important stimuli are ignored.

For example, while driving during rush-hour traffic a great deal of attention is paid to the cars, trucks, buses, and road signs around us and less attention is paid to the commentator on the car radio, the kids in the back seat, and the clouds in the sky. If the less important stimuli tend to interfere with the task at hand, then ignoring them will enhance performance, (e.g., ignoring the children's fighting will make you a better and safer rush hour driver. If, however, the less important stimuli are important to the task at hand, then performance will not be optimal; for example, ignoring the road signs because you are attending to the more important trucks, cars, etc., may lead you thirty miles out of your way in getting home (Figure below).

Sometimes the organism's capacity to deal with the environment is overtaxed or even depleted. When this occurs only the most important information is attended to, with all other information filtered out. Once attentional capacities have been depleted even small demands for attention can be draining. Thus, behavioral aftereffects including errors in judgment, decreased tolerance for frustration, ignoring others in need of help, and the like, can be accounted for by these theories. For example, the exhausted rush-hour driver eventually might reach the point where he or she doesn't notice the traffic light turn from red to green (or worse yet, from green to yellow to red), even though this is a very important stimulus. Additionally, decreased tolerance for frustration may lead to

While driving during rush hour traffic a great deal of attention is paid to the cars, trucks, buses, and road signs and less attention is paid to the commuter or the car radio, the kids in the back seat, and the clouds in the sky.

"laying on the horn" or "lane hopping" and motorists in the break-down lane may be ignored, if not looked upon with disdain.

Stimulus load theories are also able to account for behavioral effects in stimulus-deprived environments (e.g., certain behaviors occurring aboard submarines and in prisons). That is, this approach suggests that understimulation can be just as aversive as overstimulation. So-called cabin fever resulting from monotonous living conditions can also be seen as the result of understimulation. Wohlwill (1966) has argued that environments should be depicted in terms of measurements applied to the dimensions of *intensity, novelty,*

complexity, temporal variation, surprisingness, and *incongruity,* all of which contribute to stimulus load. Subsequent behaviors can then be related to the stimulus properties of environments in systematic and comparable ways.

2. Behavior Constraint Theories

Behavior constraint theories focus on the real, or perceived, limitations imposed on the organism by the environment. According to these theories, the environment can prevent, interfere with, or limit the behaviors of its inhabitants (Rodin & Baum, 1978; Stokols, 1978). Friday afternoon rush-hour traffic interferes with rapid commuting; loud, intermittent noises limit effective communication; over-regimentation in hospitals can interfere with recovery, excessively high ambient temperatures prevent extreme physical exertion, and extremely cold temperatures limit finger dexterity. In a sense, these theories deal with situations where persons either actually lose some degree of control over their environment, or they perceive that they have.

Brehm and Brehm (1981) assert that when we feel that we have lost control over the environment, we first experience discomfort and then attempt to reassert our control. They label this phenomenon *psychological reactance.* If the rush-hour traffic interferes with getting home in a timely fashion, we may leave work early, or find alternate, less-congested routes. Loud, intermittent noises may be dealt with by removing their source or by changing environments. Extreme temperatures are handled by adjusting the thermostat. All that is needed is for individuals to perceive that they have lost some degree of control, or for that matter, to anticipate the loss of control, and reactance will occur. If repeated attempts to regain control are unsuccessful, *learned helplessness* may develop (Seligman, 1975). People begin to feel as though their behavior has no effect on the environment. They begin to believe they no longer control their own destiny, and that what happens to them is out of their personal control. These feelings can eventually lead to clinical depression, and in the most extreme form can lead people to give up on life, and to die.

On the opposite side of the coin, perceived control over one's environment (even when real control does not exist, or is not used) can alleviate the negative outcomes that the environment might otherwise bring about. Perceived control over noise (Glass & Singer, 1972), overcrowding (Langer & Saegert, 1977), and over one's daily affairs (Langer & Rodin, 1976) has been shown to influence in a positive manner a variety of behavioral responses. For example, residents of a nursing home who were given greater control over, and responsibility for their own well-being displayed enhanced mood and greater activity in comparison with residents who were not given control. Similarly, people who had control over the thermostats in their working and living environments reported fewer health complaints during the winter months than did those who did not have control. These results occurred despite the fact that they did not actually manipulate the thermostats and kept their environments at ambient temperatures similar to those without control (Veitch, 1976). Behavior constraint theories thus emphasize those factors (physical as well as psychological; real as well as imaginary) associated with the environment that limits human action.

3. Adaptation-Level Theories

Adaptation theories are similar to stimulus load theories in that an intermediate level of stimulation is postulated to optimize behavior. Excessive stimulation as well as too little stimulation is hypothesized to have deleterious effects on emotions and behaviors. Major proponents of this position include Helson (1964) and Wohlwill (1974). While all environmental psychologists emphasize the interrelationship of humans to their environment, adaptation-level theorists speak specifically of two processes that make up this relationship—the processes of adaptation and adjustment. Organisms either adapt (i.e., change their response to the environment) or they adjust, (i.e., change the environment with which they are interacting). Adaptation to decreases in ambient temperature include piloerection (hair on the body standing up or what is commonly called getting "goose pimples"), muscle rigidity, increased motor activity, vasoconstriction; adjustments include throwing another log on the fire or turning up the thermostat. Either process brings the organism back to equilibrium with its environment.

Another value of this approach is that it recognizes individual differences in *adaptation level* (i.e., the level of stimulation/arousal that the individual has become accustomed to and expects or desires in a given environment). Thus, this approach is capable of explaining the different responses of two individuals to the same environment. For example, a boisterous party may be perceived as pleasant to a person high in need for sensation, but as overwhelming to the person who prefers a low level of sensation. By the same token, some people revel in the crowded atmosphere of last-minute Christmas shopping while others abhor the

inconvenience of having two or more shoppers in the same store with them. These individual differences in adaptation level lead to quite different behaviors. The person high in need for sensation will seek out boisterous parties whereas the person preferring low levels of sensation would avoid them or seek out havens of solitude within them. We have all seen the "life of the party" and the "wallflower." Some of the differences in their behaviors can be ascribed to differences in their adaptation level.

Stress theories emphasize the mediating role of physiology, emotion, and cognition in the organism-environment interaction. Basically, environmental features are seen as impinging, through the senses, on the organism, causing a stress response to occur when environmental features exceed some optimal level. The organism then responds in such a way as to alleviate the stress. Part of the stress response is automatic. Initially there is an alarm reaction to the stressor, wherein various physiological processes are altered. Resistance then follows as the organism actively attempts to cope with the stressor. Finally, as coping resources are depleted, a state of exhaustion sets in (Selye, 1956).

Increasingly, though, psychologists have concerned themselves with additional aspects of the stress response. Lazarus (1966), for example, has focused on the appraisal process. According to him, people must cognitively appraise the environment as threatening before stress occurs and behaviors are affected. Our harried rush-hour driver of a few pages back would not, by this criterion, be stressed unless this individual appraised the traffic as threatening. Behavior would, thus, presumably not be affected. By the same token, if the traffic was what the driver was accustomed to, or had come to expect and desire, the situation would be within the individual's adaptation level as discussed above. Later we will deal with stress theories in great detail. For now, it is enough to say that stress theories provide a very powerful tool for studying person-environment relationships.

Lesson 06

ECOLOGICAL THEORIES AND COMPARISON OF THEORIES

Ecological Theories

Central to the thinking of ecological theorists (Barker, 1963, 1968) is the notion of organism-environment fit. Environments are designed, or grow to accommodate, certain behaviors. *Behavior settings,* as Barker termed them, are evaluated in terms of the goodness of fit between the interdependent environmental features and the behaviors that take place. For example, a school yard, a church, a classroom, an office, or an entire business organization might be considered a behavioral setting; each would then be evaluated in terms of how suitable it is for the play behavior of children, how well it accommodates the religious sacraments, or how well it serves the functions of business.

While any number of behaviors can occur within any physical setting, cultural purpose is defined by the interdependency between *standing patterns of behavior* and the *physical milieu.* Standing patterns of behavior represent the collective behavior of the group rather than just individual behavior. The standing pattern of behavior in a classroom would include lecturing, listening, observing, sitting, taking notes, asking questions, and taking tests; the physical milieu of this behavior setting would include the room and such accoutrements as a lectern, chairs, chalkboard, microphone, overhead projector, and slide screen. Because this standing pattern of behavior occurs primarily in this behavior setting, social ecologists would suggest that knowing about the setting helps us predict what will occur in it. Once individuals making up this classroom leave this physical setting, most of the physical characteristics of the environment remain unchanged, but the behaviors likely will change dramatically In other words, the students will move to a new physical milieu eliciting a different standing pattern of behavior.

Critical to Barker's thinking is the question of what happens when there are too few or too many individuals for maximum efficiency within a particular behavior setting. For example, what happens to students at small schools as opposed to students at large schools? Are there predictable differences in behaviors? Does the type of behaviors of participants from small churches differ from that of participants from large churches? Studies of these questions from a social ecological perspective led to theories of ***undermanning*** and ***overmanning*** (contemporary writers are more likely to use the gender-neutral terms *understaffing* and *overstaffing)* and are the topic of the book *Big School, Small School,* authored by Barker and Gump (1964).

According to these researchers (see Gump, 1987), as the number of individuals in a setting falls below some minimum, some or all of the inhabitants must take on more than their share of roles if the behavior setting is to be maintained. This condition is termed ***understaffing.*** The college roommate of one of your authors went to a very small high school, which in many ways exemplifies an understaffed setting. This roommate played football and, like most high-schoolers, played before fans on Friday night. Also, like most high schools, there was a high school band that performed at half-time. Your author's roommate, however, was also the best trumpet player in the school; so, at half-time while the rest of the football players were obtaining instructions as to what they should be doing the second half, he was out marching with the band. In understaffed settings inhabitants often have to assume a variety of roles.

If the number of participants in a setting exceeds the capacity for that setting, then the setting is considered ***overstaffed***. Different strategies are brought into play when a setting is overstaffed than when it is understaffed. Too many swimmers waiting to get into the pool on a hot summer afternoon, commuters on the five o'clock train, football fans at the Super Bowl, and shoppers in department stores at Christmas time might all represent overstaffed settings. One obvious solution to overstaffing would be to increase the capacity of the physical setting, perhaps by enlarging it or by moving the setting. Another adaptive mechanism might be to control the entry of clients into the setting by forcing either stricter entrance requirements or through some sort of 'Tunneling process/' Still another mechanism would be to limit the amount of time participants can spend in the setting. This kind of regulatory mechanism is often seen at playground basketball games where teams are formed and wait to take on winners. Winners gain control of the court while the losers have to wait their turn to get on the court again.

Independent of whether a behavior setting is understaffed or overstaffed, the notion of social ecology has played an important part in the development of theories of environmental psychology. More will be said with regard to

this theorizing later. For now, let it be said that in considering all of the theoretical approaches outlined here, the ecological approach is the broadest in its approach and most unique in its methods.

Comparison of Theories

Each of these mini-theories has its benefits as well as its shortcomings. In this section we will briefly look at each. The ***arousal, stimulus load,*** and ***adaptation level*** approaches all share the advantage of the ability to incorporate a wide variety of physical and social environmental characteristics under the rubric of overall stimulation level. Thus, diverse factors such as noise, temperature extremes, room color, verbal information rate, and crowding can all be conceptualized as contributing to environmental stimulation level. Further, all three approaches are useful in predicting potential adverse responses when environmental stimulation deviates from some optimal level. The **arousal approach** is the most general in identifying physiological and affective mediators of environment-behavior relationships that Is, Increases or decreases in stimulation produce corresponding changes in physiological and psychological arousal, written in turn produce predictable variations in behaviors such as task performance and aggression.

The **stimulus load approach** is synaptic, focusing on cognitive in information-processing abilities, and yields predictions regarding -the social/behavioral consequences of over/unstimulation—excessive attentional demands have differential effects on performance of primary versus secondary tasks and the likelihood of attending to various social stimuli..

The **adaptation level approach** to the most specific, predicting that the consequences of a particular stimulation level depends on the specific level to which a given individual has become adapted. The generality-specificity dimension is a theoretical, trade-off. The more general theories account for aggregate responses of large numbers of people to the same environmental conditions, but in doing so gloss over some potentially important individual differences in people's responses to those conditions. For example, while arousal theory might accurately predict worse performance, on the average, in noisy compared to quiet settings, there may be some individuals who, because of their adaptation level, might even perform better in the noisy setting. The more specific theories account for some of these individual differences, but in so doing are more limited in scope, thus creating difficulties in making inferences about what are generally optimal
Environmental conditions for most people. For example, adaptation-level theory could lead to as many predictions about performance level as there are people in the same level of noise. All three approaches have limitations regarding the reliability and validity of measures of their concepts. Thus, for example, measurements of physiological arousal (e.g., heart rate, galvanic skin response) and psychological arousal (e.g., self-reported emotional state) that are simultaneously obtained sometimes yield contradictory results. Also, systematic and valid measures of stimulus load and adaptation level are difficult to obtain. As a result, all three approaches have difficulty predicting what optimal stimulation levels are and exactly when these levels deviate significantly from optimum. This, in turn, limits the ability to predict behavioral responses to various stimulation levels.

The **stress approach** incorporates elements of all of the above. That is, stress can be characterized in terms of objective physical and social environmental conditions that deviate from some optimal level (e.g., a noisy and crowded subway) and are thus potentially disruptive to human functioning. Stress can also be conceptualized in terms of physiological responses (e.g., arousal and health), affective responses (e.g., subjective discomfort), and cognitive responses (e.g., appraisal) to environmental conditions. As such, this approach is also useful for accounting for the effects of a wide variety of objective environmental conditions on several important mediators of environment behavior relationships under the general construct of stress. The approach has the further advantage of predicting behavioral coping and the consequences. Of course, this approach suffers from the same prorems of measurement as those discussed above. For example, it can be difficult to determine objectively which conditions are stressful (e.g., heavy metal vs, *AZZ* music), as well as individual differences in response to them (e.g., ad descents vs. their parents). Nonetheless, the stress approach has been widely used in environmental psychology.

The **behavioral constraint** approach is the most limited of all in scope, (i.e., it is primarily useful in situations where the perception of loss of control or threats to control are present). However, when such conditions do exist, the concepts of reactance and learned helplessness yield useful predictions of behavioral responses to such conditions.

The **ecological approach** has the broadest scope with the concept of behavior setting, and as such is a useful

descriptive approach to understanding the behaviors of large numbers of people in different settings. As discussed above, however, this generality limits the approach's ability to account for individual differences in the behavior setting. Another disadvantage is that its reliance on field observation methodology does not permit causal inferences regarding the determinants of behavior. However, the approach provides a distinctive perspective in emphasizing the reciprocity of environment-behavior relationships. In the remainder of this chapter we will describe a model of environment-behavior relationships which incorporates the best parts of these theories and attempts to minimize some of the more troublesome aspects of each of them.

A Slight Digression: Putting The "P" Back Into B=/(P,E)

Please recall from Chapter 1 Kurt Lewin's famous statement: "In principle it is everywhere accepted that behavior (B) is a function of the person (P) and the environment (E), B =/(P, E) and P and E in this formula are interdependent variables/[7] Implicit in this statement is the theoretical issue of whether behavior is caused by the situation in which it occurs. The various theoretical perspectives we have looked at would seem to suggest that the situation does indeed.

Lesson 07

THE PRESENT FRAMEWORK AND FUTURE DIRECTIONS IN ENVIRONMENTAL PSYCHOLOGY (I)

The present framework for understanding organism-environment relationships stems from a number of theoretical positions and data bases established within the domains of general and social psychology, as well as from the newly emerging area of environmental psychology, and attempts to bring them under the motif, however, is developed from theories emphasizing the affective components of the human experience, where overt behaviors, characterized as approach or avoidance responses, are seen as being mediated by the emotion-arousing properties of the environment. Specifically, environmental factors (e.g., density, personal space, noise, temperature, etc.) will be postulated to influence individual affective states, which in turn will be asserted to influence overt behavior. Following are assumptions and assertions relevant to this guiding framework.

First postulate:

A. The environment consists of both physical and social variables existing in reciprocal relationships with behavior.
B. The physical and social environments can and should be characterized in terms of measurements applied to its salient characteristics.

Second postulate:

A. The environment, physical as well as social, typically exerts a steady-state influence on the behavior of its inhabitants.
B. When the measured values of environment's most salient characteristics undergo dramatic change, the environment influence on behavior can no longer be characterized as steady-state.
C. Disruptions of steady state occur when present perceptions do not correspond to desired or expected level of social and physical stimulation.

B. The influence exerted by the environment is indirect i.e. Environment acts to influence people's emotional states, which in turn mediate their overt behavior.
C. Environment-evoked emotions are best depicted in terms of three distinct dimensions: pleasure – displeasure, degree of arousal, dominance –submissiveness.
D. the environment –influenced behavior of the individual is dependent upon the extent and the configuration of the dimensions of emotions aroused.
E. When the goal directed behavior is in-effective or when great expenditures of energy are required to maintain steady state, the environment can be considered pathological and a disruptive influence on human functioning.

First postulate

1) A. The environment consists of both physical and social variables existing in reciprocal relationships with behavior. Attempts to understand human/environment relationships that have focused exclusively on either the human components or the environmental aspects have not met with great success. Humans are not only influenced by their environment, but through their behavior they also alter that environment. The altered environment in turn produces subtle changes in the environmental inhabitant and in its behaviors; these behaviors again produce subtle changes in the environment, and so on, indefinitely. For example, the classroom behaviors of teachers and students alike are influenced by such physical properties of the environment as room temperature, chalkboard space, windows (or the lack thereof), the arrangement of desks, available light, and ambient noise level. But the total classroom environment also includes social and demographic variables (e.g., the age and gender of classmates, the friendship groups, the type of activity being engaged in, and others). Each one of these factors, singly and collectively, influences the behavior that is enacted in this setting. By the same token, the resultant behavior changes the nature of that setting. For example, to enhance discussion, chairs may be moved, thus changing the environment; these changes may lead to changes in friendship groups or to a change in the ambient noise level. Teachers may now have to talk louder, perhaps also changing the tone of their voices, making them appear grumpy; this perception may in turn lead students to avoid the space around the teacher or may keep them from asking questions. Thus, the environment and its inhabitants never stay the same; each is constantly changing as a result of its interactions with the other. Any attempt to understand these relationships, there fore, requires a systematic approach emphasizing the bidirectional, often symbiotic, nature of this interaction.

1)B. The physical environment can and should be characterized in terms of measurement applied to its salient characteristics. It is an obvious scientific advantage to be able to specify relationships between or among variables in precise mathematical terms. The symbolic representation of the effect *x* has on *y* is not as potentially ambiguous if *x* and *y* have properties that can be measured by agreed-upon and reliable techniques. Further, the symbolic representation of the effect can assume precise mathematical properties which permit greater precision in prediction. Thus, ambiguity in the discussion of the relationships between variables is reduced by precise measurement.

Statements like "high ambient temperatures may exert a detrimental influence on learning" carry global, but not precise, meaning. How "high" must the temperature be to exert this influence? Do variations in relative humidity combine with differences in temperature to produce different effects? Does the clothing the person is wearing moderate these effects? (Or for that matter, determine what temperature is designated as "high"?) Is length of time of exposure related to these effects? What is meant by the term "learning"? Does it mean something other than "performance"?

The essence of knowledge is that it is or can be precisely communicated. Without the application of agreed-upon measurement to the environment and its inhabitants, this type of precision in communication is impossible and knowledge is neither created nor shared.

To be sure, complete agreement in the early stages of development in any science is not possible. There will be arguments as to whether the appropriate measure of noise, for example, is the "sone," the "phon," the "pNdB;" as to whether the "clo" is an appropriate scale for the insulative properties of clothing; or, whether pollution standards should be set with respect to measured health and behavioral changes or with respect to measurable changes in the chemical composition of the atmosphere. In spite of expected controversy, measures of such constructs as noise, insulative value, and pollution must be developed for knowledge to progress. For now, it is better to have several different measures (and disagreement) than it is to have no measures at all.

Lesson 08

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First postulate:

C. The environment consists of both physical and social variables existing in reciprocal relationships with behavior.
D. The physical and social environments can and should be characterized in terms of measurements applied to its salient characteristics.

Second postulate:

A. The environment, physical as well as social, typically exerts a steady-state influence on the behavior of its inhabitants.
B. When the measured values of environment's most salient characteristics undergo dramatic change, the environment influence on behavior can no longer be characterized as steady-state.
C. Disruptions of steady state occur when present perceptions do not correspond to desired or expected level of social and physical stimulation.

F. The influence exerted by the environment is indirect i.e. Environment acts to influence people's emotional states, which in turn mediate their overt behavior.
G. Environment-evoked emotions are best depicted in terms of three distinct dimensions: pleasure – displeasure, degree of arousal, dominance –submissiveness.
H. the environment –influenced behavior of the individual is dependent upon the extent and the configuration of the dimensions of emotions aroused.
I. When the goal directed behavior is in-effective or when great expenditures of energy are required to maintain steady state, the environment can be considered pathological and a disruptive influence on human functioning.

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The physical environment can and should be characterized in terms of measurement applied to its salient characteristics. It is an obvious scientific advantage to be able to specify relationships between or among variables in precise mathematical terms. The symbolic representation of the effect *x* has on *y* is not as potentially ambiguous if *x* and *y* have properties that can be measured by agreed-upon and reliable techniques. Further, the symbolic representation of the effect can assume precise mathematical properties which permit greater precision in prediction. Thus, ambiguity in the discussion of the relationships between variables is reduced by precise measurement.

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Second postulate:
The environment, physical as well as social, typically exerts a steady-state influence on the behavior of its inhabitants. This assertion is not unlike the claim of Ittleson, Proshansky, Rivlin, and Winkel (1974) that the environment frequently operates below the level of awareness. The environment is seen as being taken for granted—we operate within an environmental context without paying much attention to it. "Normative" or "normal" behavior occurs in these circumstances. We behave in accordance with the cultural purpose of the setting. However, if the environment changes (or we change environments), we become aware of it because it is at that point that we must consciously begin to adapt or adjust

Roger Barker's (1968) notion of "behavior settings" is also congruent with this assertion. The arrangement of chairs at a table (Sommer, 1974) or desks in a classroom (Sanders, 1958), for example, have very powerful but non-conscious effects on their users; in a very real sense we inherit the use of space. Thus, the environment clearly influences our behavior even when its physical and social characteristics are within a normal range, but under these conditions we are typically unaware of that influence. Thus, you were probably not aware of the fact that your first day in the room in which this class meets, your behavior of note-taking vs. ballroom dancing was determined, in part, by the setting itself. Nor did you probably give much thought to the fact that you were dancing instead of taking notes the last time you attended a night club.

As you sit reading these pages your senses are being bombarded from a variety of sources. If you pause to listen you may hear, as I do, the whistle and rumble of a freight train some six blocks away, the ringing of a telephone four doors down the hall, the sound of footsteps out in the hall, the drone of a heating fan overhead, and sundry other sounds emanating from unknown sources. Switching senses, the smells of freshly brewed coffee, two-day-old cigarette smoke, Right Guard, and stale, musty, manuscripts take turns tugging at the nose. The chair in which I am sitting has become harder (perhaps yours has, too) as the *glutens maximus* presses against it, and the cold of my left hand is now felt as it provides a resting place for my forehead. Looking up from these pages we may be confronted with a cacophony of sights varying in color, size, luminance, distance from the retina, etc. While engrossed in reading, however, we are virtually oblivious to these various sources of stimulation. The

phone rings, unheard; the cigarette smoke goes undetected; and, except for occasional and minor shifts in our sitting position, the tactile stimulation provided by the chair goes unnoticed; that is, the environment is exerting a steady-state and unnoticed influence. Only when we consciously pause to note this stimulation does it exist in any meaningful sense.

When the measured values of the environment's most salient characteristics undergo dramatic change the environmental influence can no longer be characterized as steady-state.

Helson's (1964) adaptation-level theory represents a general framework for the study of diverse responses to any set of stimuli varying along some dimension. Put briefly, Helson maintains that for any specified dimension of stimulus variation, individuals establish an adaptation level (AL; a preferred or expected level of stimulation), which determines their judgmental or evaluative response to a given stimulus located on that dimension. Deviations from AL in either direction (i.e., either increases or decreases in stimulation level) are evaluated positively within a certain range, but beyond these boundaries changes are experienced as "unpleasant."

When environmental-stimulus properties change to the extent that they have exceeded the AL boundaries, the individual experiences "unpleasantness," and the influence of the environment is no longer steady-state. It is only at this point that changes in the normative modes of behavior can be expected, that the regularized, routinized *behavioral-setting* influence begins to break down. The kinds of changes in behavior to be expected are considered under proposition 5b in Table 2-1.

If, as you sit reading these pages, your phone rings instead of the one four doors down the hall, or someone walks into the room wearing an unusual perfume (or no deodorant), or the room temperature increases to 85 degrees Fahrenheit or is reduced to 60 degrees Fahrenheit, or there is a knock on your door, then the environment no longer can be characterized as steady-state. Your response to the environment is now conscious and deliberate. You get up to answer the phone or the door; you look up to see who is wearing the unusual perfume; you open a window or turn up the thermostat (or put on or take off clothes) to return to a condition of thermal comfort. In other words, you become aware of your environment and begin adapting to it or making adjustments in it to achieve a new equilibrium.

Disruptions from steady-state occur when present perceptions do not correspond to desired or expected levels of physical and social stimulation. Disruptions in steady-state influence are brought about by the processes of sensation, perception, and cognition (the subjects of Chapter 4). Sensation involves those processes by which the world can be known to the perceiver. These processes typically involve the following modes: touch, smell, taste, vision, and hearing. We *know* silk by touching it, rotten eggs by smelling them, an orange by tasting it, and so forth. Environmental perception involves the initial gathering of information. It differs from sensation in that the perceiver is an active participant in the process whereas in sensation the perceiver is not. Ittleson (1978) distinguishes between more traditional perception, which he labels *object perception,* and *environmental perception.* In object perception, emphasis is placed on the properties of simple stimuli, such as color, depth, form, apparent movement, loudness, etc. In environmental perception, the emphasis is on larger entities, treated as wholes. In addition to the size and complexity of the stimulus, the two differ in that in the latter, participants often move around in and through the stimulus display and in fact become a part of it. Thus, the perceiver experiences the environment from multiple perspectives. Finally, in environmental perception the perceiver is often connected to the stimulus display by a clear goal or purpose—that is, the perceiver is in the environment to achieve some outcome. We go into a restaurant to obtain food, a swimming pool to cool off, and a theater to be entertained.

Environmental cognition involves further processing of information (e.g., storing, organizing, and recalling). It also involves appraisal processes. Is this environment good or bad, cold or hot, strong or weak? It includes the emotional impact of environments, attitudes toward environments, the preferences we have for some environments over others, and the categories we use to organize our knowledge about various settings. Through these various processes we appraise environments and compare them with mental images of what we desire or expect them to be. Most of the time, because we have planned well, environments are acceptable approximations of what we expect. Under these conditions the environment exerts a steady-state influence. Disruptions occur when we learn through these processes that present conditions do not correspond to our desired or expected levels of stimulation or are incapable of meeting the objectives of the plan with which we entered the situation.

The influence exerted by the environment is indirect; i.e., the environment acts to influence people's emotional states, which in turn mediate their overt behavior. One of the major assertions of Byrne and Clore's reinforcement-affect model of attraction (Byrne, 1971; Byrne & Clore, 1970; Clore & Byrne, 1974) as well as Mehrabian and Russell's (1974) framework is that a link exists between positive affect and such positive social interactions as interpersonal attraction and approach behaviors. Additionally, work by Baron and Bell also postulates emotion (affect) as a mediating link between the physical environment and aggressive behavior (e.g., Baron & Bell, 1976; Bell & Baron, 1976).

It has been shown that such diverse environmental conditions as temperature (Griffitt, 1970; Griffitt & Veitch, 1971), crowding (Baum & Valins, 1973; Griffitt & Veitch, 1971; Valins & Baum, 1973), noise (Bull, et al., 1972; Geen & O'Neil, 1969; Mathews & Cannon, 1975), air pollution (Rotton, Barry, Frey & Soler, 1976), and radio news broadcasts (Veitch, DeWood, & Bosko, 1977; Veitch & Griffitt, 1976) influence the affective state and interpersonal behaviors of individuals. If you feel annoyed by the phone ringing you might answer it in gruff tones, or not at all; if you are gladdened by the distraction you will probably answer with greater civility. If you like the smell of an unusual perfume, you are likely to strike up a pleasant conversation; if instead what you are confronted with is the smell of stale cigarettes and body odor, your disposition is likely to be less shining and your overt behaviors less positive.

A whole host of interpersonal behaviors might be negatively influenced by environmental conditions, but only to the extent that those environmental conditions elicit negative affective feelings, and conversely, behaviors might be positively influenced through their association with positive affective feelings. Indeed, studies of verbal as well as a wide range of nonverbal behaviors (Mehra-bian, 1972) in social interaction situations have been shown to be related to the emotional states of the interactants. Put simply, how we *behave* is determined in part by how the environment makes us *feel*.

Environment-evoked emotions are best depicted in terms of three distinct dimensions: pleasure, arousal, and control. Researchers who study emotions and have attempted to categorize them have traditionally focused on facial expression of emotions and verbal self-reports. Those examining facial expression (e.g., Abelson and Sermat, 1962; Engen, Levy and Schlosberg, 1957, 1958; Gladstones, 1962; Schlosberg, 1954) have found pleasantness-unpleasantness and level of arousal to be two of the basic dimensions of emotions. Williams and Sundene (1965) and Osgood (1966) have likewise found evidence for these two plus a third characteristic resembling the potency factor of the Semantic Differential. Self-report measures of emotions, however, have typically yielded more dimensions than the three listed above (e.g., Izard, 1972; Nowlis, 1965) and have included such emotions as "stressed/7 "uncomfortable/' "anxious/' and "angry" Mehrabian and Russell (1974) and Russell and Mehrabian (1977) have provided evidence to reconcile these two sets of research findings and have reported that the three dimensions of pleasure-displeasure, degree of arousal, and dominance-submissiveness constitute both the necessary and sufficient dimensions to describe all emotions. Results of their studies show that the larger number of dimensions obtained in verbal-report studies can be accounted for by these three dimensions. Thus, self-reports of emotions that employ different words (e.g., *joy* and *happiness)* may actually yield similar underlying configurations of pleasure, arousal, and dominance, which differ primarily in the intensity of affect. Further, differences between global emotional states can be best understood in terms of differences in the underlying configuration of these three dimensions. Thus, the best available evidence to date suggests that the emotional (affective) state of individuals can be adequately described by these three dimensions.

The environment-influenced behavior of the individual is dependent upon the extent and the configuration of the dimensions of the emotions aroused. In most of the studies to date where the emotional state of the individual is seen as a mediating factor for behavior, emotion has been conceptualized in a uni-dimensional manner (see assertion 3 in Table 2-1). Typically, the one dimension utilized has been pleasure-displeasure, although sometimes a variant of the dominance/submissiveness dimension has been used (e.g., studies of control, constraint, and reactance). However, researchers have seldom considered the interrelationships of these dimensions. The current framework attempts to utilize a multiple-dimension approach to emotion as a way of accounting for more of the reliable variance in the relationship between emotional states and overt behavior. As Mehrabian and Russell note, this approach has the advantage of integrating a variety of research findings dealing with the influence of a diversity of stimuli on the same three dimensions; for example, excessive noise, crowding,

pollution all have similar effects on the degree of pleasure, arousal, and dominance a person experiences. This multidimensional description of emotion is not only important in theorizing but also in considering the effects of emotion on overt behaviors. We would expect different behaviors to ensue as a result of changes in the environment that elicited displeasure, high arousal, and submissiveness ("anxiety") from changes resulting in displeasure, high arousal, and dominance ("anger"). A teacher experiencing the former, for example, may attempt to "leave the field," whereas experiencing the latter may lead him or her to combat, or at the very least, to attempt to change the environment.

Using earlier unidimensional conceptualizations (e.g., pleasure-displeasure) no differences in behavior would have been predicted. In short, the proposed framework calls for the simultaneous consideration of three major factors of emotions in an attempt to clarify some of the earlier research, which relied on a single factor.

Behavior is goal-directed; i.e., behavior resulting from environmental change is performed to return the environmental influence to steady-state. This proposition follows from 5a and 2b in Table 2-1, but the underlying assumption is that steady-state environments are preferred and actively sought (i.e., humans don't passively react to environmental stimulation, but rather attempt to alter their experiences to maintain a state of equilibrium). They do this by altering their evaluation, by altering the setting, or by changing settings altogether. This view is hardly new, and it provides the underpinnings of all homeostasis models of motivation and behavior. For example, Adaptation Level (AL) Theory (Helson, 1964) assumes that individuals have developed some frame of reference for evaluating a wide array of stimulus dimensions. Preferred stimulus values for a particular dimension, however, are narrow in range, and when the values deviate from this range, unpleasant feelings result.

In response to displeasure aroused by stimuli whose preferred values are exceeded (in either direction), the behaving organism attempts to decrease the unpleasantness. For example, the temperature of a particular environmental setting exceeding AL elicits discomfort. Simultaneously, degree of arousal and dominance-submissiveness will also be influenced. If the organism experiences great displeasure, high arousal, and high dominance, then aggressive behaviors may occur, which might be directed at removing the social source of that emotion. On the other hand, if displeasure is not felt, if the degree of arousal is low, or if submissiveness is felt, acquiescent behavior might occur. This could involve withdrawal to a different setting more conducive to the desired emotional configuration.

When goal-directed behavior is ineffective or when great expenditures of energy are required to maintain steady-state, the environment can be considered pathological and a disruptive influence on human functioning. What are the long-range effects of exposure to a given environment featured by a particular level of intensity, complexity, and incongruity of stimulation? According to AL theory, the individual's AL will be shifted to a value corresponding more nearly to that of the environment. This, of course, is what adaptation is. However adaptable humans may be, it is still possible that the range of environmental stimulation could be such that the energies expended in adaptation would have detrimental effects on the individual, or that the behavioral repertoire of the individual is too limited, thereby making adaptation impossible. It is under these conditions that the environment can be considered pathological. Evidence (to be detailed in later chapters) concerning the effects of prolonged exposure to noise (e.g., Glass & Singer, 1972; Weybrew, 1967) exemplify this state of affairs, as does the work of Calhoun (1962) who looked at the long-term effects of increased population density on social adaptive behaviors of Norway rats.

Lesson 09

PERCEPTION AND ITS COGNITIVE BASSES

Perception

When we think of perception we usually think first of visual perception. This is probably because we gather so much information from the environment via this sensory system. With the exception of listening to speech, the vast majority of our everyday activity is guided by vision. Vision guides our motor behavior (getting us from here to there while avoiding running into things on the way), providing us with information concerning what is out there and where it is. Through the mediation of photographs, television, newspapers, books, and magazines, vision provides information about what is going on beyond the grasp of our immediate senses. We can know about the cold of Antarctica, the heat of the Sahara, or the crowdedness of Calcutta, without ever having been there. Additionally, much of our interpersonal behavior is guided by the visual information we receive. Our judgments of the emotional states of others (and ourselves, for that matter), and our intentions, likes, and dislikes, are determined in good part by what we see. No wonder *we* rely so heavily on our sense of vision to inform us of the world that we inhabit! There is an old adage that "seeing is believing," and when it comes to conflicting cross-modal information, we do indeed tend to believe our eyes over the other senses (Freides, 1974).

Despite this great reliance on vision, perception is more than just sensory input to the visual system. Often we must depend on other systems when interacting with the environment. For example, we cannot see heat, so we must depend on thermal receptors on the skin's surface to warn of the dangers of placing the hand on a stove; we cannot see natural gas and must depend on olfactory cues and odorous additives to warn of a gas leak in the home; we cannot see the Civil Defense siren warning of an impending tornado, and therefore must rely on our sense of hearing. But perception of the environment is even more than the summation of all these sensory inputs. It involves labeling, describing, and attaching meaning to the world around us. Perception, in addition to being sensory, is also highly cognitive.

Cognitive Bases of Perception

All environments carry a set of meanings acquired through their specific physical, social, cultural, aesthetic, and economic attributes. These meanings are extracted from the environment by the perceiver in terms of his or her own attitudes, beliefs, values, and physical limitations. We may admire an apple orchard in spring for its floral beauty and its aromatic fragrance, while simultaneously realizing its worth in terms of the honey that will be produced by bees from its nectar and the apples to be harvested in the fall. Additionally, we may see the orchard as symbolic of the economic power of its owner, his or her ability to buy and sell, and ultimately the political influence that person is likely to exert in the community. Finally, we may see it as representing the outcome of years of research in the development of hybrid apples. We perceive all of these meanings and respond to them in some degree as the sight and smell of the spring blossoms reaches our eyes and noses.

Our assessment of the environment is achieved within the context of three broad but not always congruent ways of viewing the world. First, we develop attitudes as a result of living within a *culture,* and these attitudes determine, in part, whether we see a sea of white fragrant apple blossoms or whether we see the raw materials from which bees will make hundreds of pounds of honey. Our contemporary perceptions are thus conditioned by forces that have shaped us and the culture in which we reside. To this extent, we perceive the present through the eyes of the past. We also perceive and assess our environment in terms of our immediate *needs and preferences.* This viewpoint represents that of the functionalist, who views nature as being subject to human exploitation, limited only by technological ability. Finally, we observe and recognize the environment in terms of its and our *future.* Not only is the question of "What's in it for me?" asked, but also, "What effect will my presence and interaction have on the environment being viewed?" If trees are seen only in terms of the apples they will produce and care is not taken to preserve them, soon there will be no apples and eventually no trees. This view of the environment is much like the ecologist's view.

Humans are cognitive beings and thus define and give meaning to environments with respect to their role in them. How environments should look and be used, what other people should be involved, what activities should go on in them, and what they stand for symbolically are all determined in great part by the viewer. However, there is a regularity and consistency of perception within physical settings over time and space, because

perceptions are tightly interwoven with the fabric of the social, organizational, and cultural systems that circumscribe the everyday life of all humans. In Chapter 2, we described the environment as "typically neutral." In the present context we should take that phrase to mean that within a given social, cultural, and organizational climate, an environment typically has agreed-upon meaning. This meaning is easily ascertained and usually judged to be nonendangering. In Lewin's (1951) terms the environment has a "cultural purpose."

Contextual and Social Bases of Perception

It is important to emphasize that perception is contextual. Cultural, social, gender, and individual differences all influence what we do and do not see in our environment (see Figure 4-2). For example, Deregowski (1980) has shown that relatively isolated and uneducated African observers have difficulty seeing depth in two-dimensional pictures; Segall, Campbell & Herskovits (1966) have shown that urban groups are more susceptible to some perceptual illusions than are rural groups; and, Turnbull (1961) has noted the inability to maintain size constancy at varying distances among the Bambuti of Africa. Numerous studies show that adults who grow up with exposure to only one language have difficulty in discriminating certain non-native linguistic contrasts (Strange & Jenkins, 1978), and gender differences in perception have been found in vision, taste,

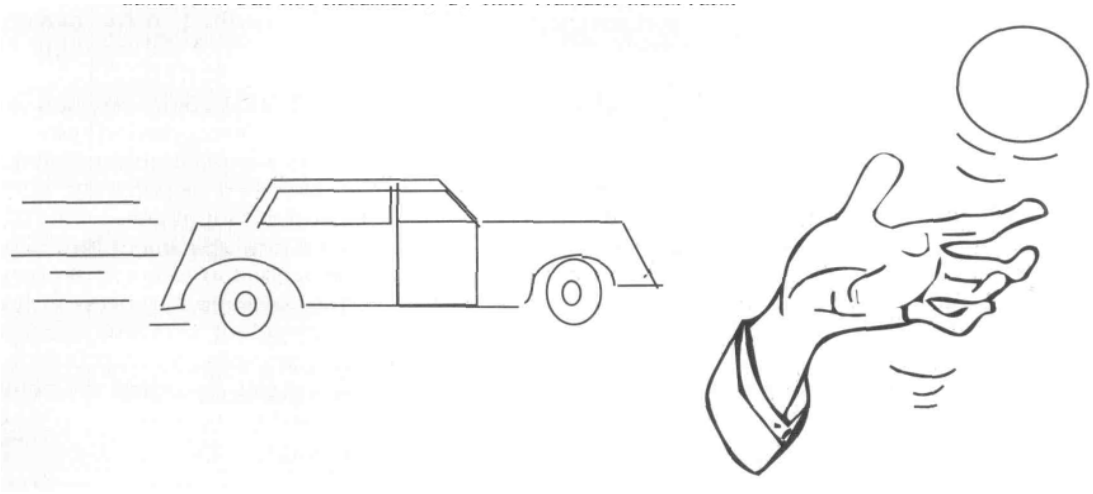


FIGURE 4-2 Figures commonly recognized as being in motion by Western observers, but not necessarily by non-Western observers.tactile sensitivity, hearing, olfaction, and visual-spatial ability (Ippolitov, 1973; Linn & Peterson, 1986; McGuinness, 1976; Money, 1965; Weinstein & Sersen, 1961). Additionally, age and occupational differences have been shown to account for variations in perception (McGuinness & Pribram, 1979; Yuille, 1983).

Thus, perception is not simply a matter of the individual responding to sensations created by energy from stimuli impinging on the sensory organs. Rather, this process is embedded in a cultural context, and various social factors have been demonstrated to produce differences in the ways two individuals will perceive the same stimulus. Individual differences in backgrounds, experiences, values, and purposes can have a profound influence on the end result of the processing of information from the world around us. These differences, however, do not detract from the fact that perception is a fundamental psychological process in which all humans engage.

Complex Perceptual Processes

The exercise below illustrates the complexity of processes taken for granted and engaged in almost automatically when perceiving individual stimuli in the environment. As indicated, such processes are extremely important, and psychologists have exerted considerable effort to understand them. However, the primary concern of environmental psychologists understands how people perceive molar aspects of the environment. That is, in addition to understanding how discrete stimuli or objects are perceived, environmental psychologists attempt to understand the processes by which whole environments are perceived. In a sense, they are interested in the forest, not just the individual trees. Further, since it is important to account for the relationships among the perceptual, cognitive, and evaluative processes that affect experience and determine behavior, discussion of these processes will follow. Although highly interdependent, they will be discussed separately, making note of their

interrelationships where appropriate.

Lesson 10

THEORIES OF ENVIRONMENTAL PERCEPTION

Gestalt Theory

Much research and theory exist regarding basic processes involved in perception. Among the earliest and most significant contributors to this area was a group of German psychologists working within a framework known as *Gestalt* theory (e.g., Koffka, 1935; Kohler, 1929). These theorists emphasized the active role of the brain in searching for meaning in stimuli.

The term Gestalt means "good form" and Gestalt theorists proposed that the brain is organized in such a way as to construct meaning from stimuli, and even to impose meaning where it might not appear to exist objectively in order to achieve this "good form.

It is not uncommon for students, when proofreading their term papers, to "read" words that do not exist on the paper. The sentence "The bear climbed up tree" might be read, "The bear climbed up *the* tree."

A second characteristic of the Gestalt approach is its *holistic* orientation (i.e., the assumption that the perceptual process must be understood in its entirety rather than broken down into discrete elements). This assumption is often expressed in the statement that in perception, "the whole is greater than the sum of the parts."

A number of principles of perceptual organization, including proximity, similarity, and closure, were developed by these theorists, and they illustrate the manner in which the brain actively organizes sensory inputs to perceive meaningful perceptual relationships.

Another illustration of the tendency to impose meaning on sensory inputs is the principle of *size constancy,* in which changes in the size of the retinal image of an object are interpreted as changes in distance rather than changes in the size of the object. In this case, the brain is actually "overriding" sensory inputs to maintain a Gestalt.

Functionalism

A theoretical orientation that differs from the previous approach views perception as a much more direct process that involves less mediation by higher brain centers to perceive meaning in the environment. It is argued that meaning already exists in the environment, and that our sensory mechanisms are "prewired" to respond to meaningful aspects of our environment. This approach is related to ecological biology, which studies organisms' adaptation to their environment. For example, the concept of an *ecological niche* refers to the instinctive tendency observed in animals to seek out that area of their environment which affords them the greatest chance of survival. Gibson (1979) applied this notion to human perception. She suggests that humans are innately endowed with the ability to perceive those aspects of our environment that *have functional value* for them. Thus, according to this view, an infant should be born with the ability to perceive its mother's face, since this stimulus has obvious survival value.

Gibson proposed the concept of the perception of *affordances*—that is, invariant properties of objects that afford adaptation to the environment. These affordances are discovered by the organism as a result of active commerce with the environment, and they have survival value. The same object often offers different affordances for different species. For example, a tree affords food to the termite, shade to the dog, and building material to the carpenter. There is evidence that at least some innate perceptual response tendencies exist in humans.

Gibson and Walk (1960) employed a device known as a "visual cliff," which creates the impression of a sharp drop on a solid glass surface, to demonstrate that the ability to perceive depth is innate. Human infants show a reluctance to approach the "cliff" as soon as they are able to crawl (i.e., before they have had experience with falling). Additionally, researchers have demonstrated that newborn infants exhibit a marked tendency to spend more time looking at pictures of human faces than pictures of nonhuman objects. Both of these perceptual abilities have clear survival value (the former to avoid the dangers of falling, and the latter to recognize the source of sustenance), so it should not be surprising that we are born with these tendencies.

In Gibson's view, all the information necessary for environmental perception is directly contained in the physical energy impinging on the sense organs. Often, though, the sensory input from the environment is overwhelming in terms of amount, intensity, or duration. Thus, we are not always able to direct our attention to the most informative information. This view, like that of Brunswik (to be discussed later), is embedded in an information-processing perspective (i.e., the utilization of information from the environment requires more than simply responding to or interpreting sensory excitation). By actively exploring the world over time and space the individual is able to extract invariant properties and thus obtain a progressively more accurate picture of what the environment is really like. Unlike Brunswik, though, who believes that the information contained in stimuli is probabilistic, Gibson asserts that the information is absolute; only the processing of this information is subject to error or inexperience.

Learning Theory

Much research on human perception concerns the role of *experience* in perceptual development. From this perspective, our perceptions are not innately determined, but rather we must learn to perceive critical aspects of our environment.

For example, the principle of size constancy referred to above is not seen as an inborn perceptual ability, but one that develops only through the experience of seeing many objects from a variety of distances. Gradually the infant learns that the objects are not growing or shrinking, but remaining a constant size regardless of their distance. This happens despite the fact that the retinal images, and thus the neural impulses sent to the brain, vary dramatically.

Learning theorists propose that an important result of experience and learning in perception is the development of *assumptions* about the world around us.

These assumptions facilitate our interactions with the environment because they save us time and effort in coping with new stimuli. That is, we do not have to approach new situations as though we had never encountered them before. We assume that many elements of the situation are similar to those of situations that we have previously experienced.

Thus, we bring to the present situation learned assumptions in the form of *expectancies* about what is likely to happen. These expectancies are usually correct, making for easy processing of information and adaptive functioning. In these ways, learning theories are not unlike those of the functionalists.

Our assumptions, however, can sometimes be misleading, resulting in misperceptions or illusions (e.g., Ames, 1951). The research described above regarding contextual and social bases of perception supports the role of experience in the development of perceptual expectancies. For example, cross-cultural comparisons of susceptibility of particular illusions indicate that experiences with different kinds of environments are related to differences in susceptibility. Airport & Pettigrew (1957) demonstrated that children in ***curvilinear*** **cultures** (i.e., primitive African cultures where dwellings are round rather than rectilinear) are less susceptible to illusions dependent on the perception of lines and angles such as the trapezoid illusion, and as mentioned earlier, urbanites are more susceptible to the Mueller-Lyer illusion than are rural inhabitants. Also, in a study referred to earlier, it was shown that even size constancy is related to the experiences that individuals have had viewing the same object from varying distances (Turnbull, 1961).

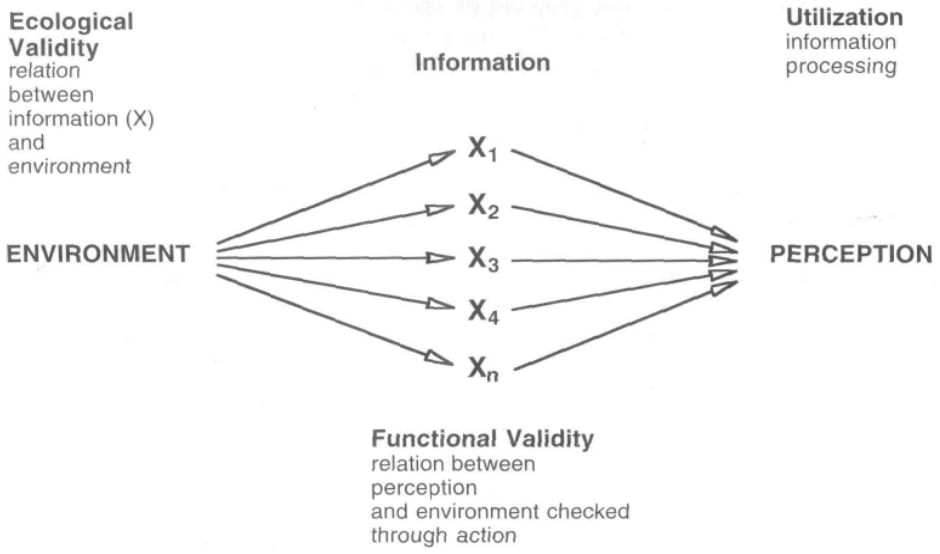
Lesson 11

PROBABILISTIC FUNCTIONALISM AND ENVIRONMENTAL COGNITION

Probabilistic Functionalism

Earlier we noted that at any given moment vast amounts of stimuli simultaneously impinge on our senses. In fact, even in relatively calm environments, more stimuli are present than our perceptual systems have the capacity to process. Given the complexity of environments, the goal stated earlier that environmental psychologists must account for the processes by which molar environments are perceived is an exceedingly difficult one to achieve. Therefore, one of the most important learning theories of perception, and potentially the most fruitful for environmental psychology, is Brunswik's lens model (1956, 1969). Brunswik's approach provides a model for mathematically describing individuals' perceptual processes when making judgments in response to molar environments containing multiple stimulus dimensions.

FIGURE: Brunswik's probabilistic theory illustrates one way of relating the information available from the environment to the way the individual perceives the environment.



Brunswik argues that complex stimulus patterns are processed as though through a "lens" (see Figure above), where the scattered stimuli are "focused" into a single perception of the environment. In this way we manage to reduce the complexity of our environment by filtering the various available stimuli through the lens, discounting or ignoring some perceptual cues while emphasizing others. We do this not only to simplify judgmental tasks, but because we learn from experience that some sensory information is misleading (in Brunswik's terms, they are lacking in *ecological validity),* and other cues are of minimal value, (i.e., of low ecological validity) in correctly perceiving the true state of the environment. Given the ambiguities and inconsistencies present in environments, people assign probabilities to the various cues in the attempt to achieve a perception that "mirrors" the true environment. Sensory cues that are assigned high probabilities are assumed to possess high ecological validity, and are given more weight (i.e., they are attended to more closely than cues assigned low probabilities). Through continued experience in the environment, we learn whether or not our perceptions are appropriate. When we do not achieve a match between our perceptions and the world (i.e., our perceptions are inaccurate), we alter the probability weights assigned to the different cues.

This approach is of value not only because it provides an elegant conceptual model for describing the processes by which we perceive complex environments and change our perceptions through learning, but also because it permits researchers to describe these processes in precise mathematical terms. Although the statistical techniques employed are beyond the scope of this book, researchers can derive "weighting values" that correspond to the probabilities that the perceiver assigns to various stimulus cues. Further, the researcher can vary the stimuli and

their levels to assess changes in subjects' perceptions. The model can also be applied to study the accuracy of environmental perception, as well as individual differences. For example, we shall see in a later chapter that the general public relies heavily on certain cues in perceiving the presence of air pollution (e.g., the sight of smog). These cues, however, are far less *ecologically valid* than the presence of other cues (e.g., the presence of automobiles, in predicting actual pollution levels). Finally, Craik & Appleyard (1980) have suggested that Brunswik's lens model may provide the methodology needed to account for the interrelationships among environmental perception, cognition, and evaluation that we noted earlier.

The perception of a wide array of stimulus dimensions in the environment is important for information processing and acquiring knowledge about the environment. Such knowledge is essential for our survival and adaptive functioning. Formation of mental images of the settings in which we live involves the process of ***environmental cognition,*** and this process is closely linked to that of ***environmental evaluation.*** We now turn to these two processes.

ENVIRONMENTAL COGNITION

The term, *cognition,* refers to thought processes. Thus, environmental cognition concerns thinking about the environment (i.e., the ways in which individuals process information and organize their knowledge about characteristics of their environment). Also of interest is how this knowledge is acquired, or learned, as well as how individuals differ in their knowledge of the environment. Finally, environmental cognition concerns how variations in the environment affect the ability to understand the setting. For example, important differences in knowledge clearly exist between familiar versus novel environments. We will consider novel environments first.

Responses to Novel Environments

From the participant's point of view, the environment is typically neutral and enters into awareness only when it deviates from some adaptation level. Your first few days on campus can be thought of as a non-neutral situation, one that from your perspective at the time deviated from the norm and made you self-consciously aware of your new surroundings. Ittleson, Proshansky, Rivlin, & Winkel (1974) claim that in situations of this kind, six different but interrelated types of responses occur: *affect, orientation, categorization, systemization, manipulation, encoding.* While in the following paragraphs we will discuss each of these in the order just presented, these responses are probably not made serially. In fact, each tends to blend with the other as we attempt to bring the environment and ourselves into a state of equilibrium.

Affect. The nature of our *affective* response to new environments will depend on many factors, some of which will be discussed later in this chapter. At a minimum, the affect will consist of a heightened degree of awareness and arousal occasioned by the need to know, predict, and therefore to feel in control of and secure in an unknown setting. Aside from this general reaction, a number of other feelings may emerge because of the particular characteristics of a new setting. Discovering that the tennis courts are close to the dorm may lead to happiness, whereas finding that you live adjacent to the cemetery might lead to fear and trepidation.

The thought of long walks to the library through a grove of oak trees might conjure romantic images and feelings of love, or graven images of rapists and muggers, leading to fear and anxiety. Such affective responses, both general and specific, may govern the direction that subsequent relations with the environment will take. First impressions (feelings) about places can and do have enduring consequences.

Lesson 12

RESPONSSES TO NOVEL ENVIRRONMENTS AND ENVIRONMENTAL COGNITION

Environmental Cognition

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Affect. The nature of our *affective* response to new environments will depend on many factors, some of which will be discussed later in this chapter. At a minimum, the affect will consist of a heightened degree of awareness and arousal occasioned by the need to know, predict, and therefore to feel in control of and secure in an unknown setting. Aside from this general reaction, a number of other feelings may emerge because of the particular characteristics of a new setting. Discovering that the tennis courts are close to the dorm may lead to happiness, whereas finding that you live adjacent to the cemetery might lead to fear and trepidation. The thought of long walks to the library through a grove of oak trees might conjure romantic images and feelings of love, or graven images of rapists and muggers, leading to fear and anxiety. Such affective responses, both general and specific, may govern the direction that subsequent relations with the environment will take. First impressions (feelings) about places can and do have enduring consequences.

Orientation. Individuals in a new setting actively seek to find their place, their "niche." This is primarily a cognitive process and to use a slang expression involves "scoping out" a place. You probably asked yourself on those first days: Where, relative to my dorm, is the dining hall, the recreation center, the library? Where do you go to buy books, to get athletic tickets, to pay parking fees? Which dorm is the one that your cousin Fred lives in? Ittleson, et al. (1974) describe the process of finding answers to questions such as these as *orientation.* Orientation, in short, expresses a person's desire to "know where one is" physically in relation to the total milieu. Here we see the beginning of environmental cognition, with the individual actively attempting to identify the location of important stimuli in the new environment in relation to where one is at.

Categorization. In new situations, though, a person does more than just orient; he or she also *categorizes.* The individual evaluates the new environment and imposes his or her own unique meaning to various aspects of it. Not only do people ask where they can get a pizza, but they also ask where to find the best or the cheapest pizza. To which pizzerias do you take dates, and which are primarily solo? Knowing where there is a "pizza joint" is not half as useful as knowing where there is one where you can get pizzas that are tasty, cheap, and will bring you the accolades of your date. Categorization is therefore the process of extending the meaning of the environment by functionally relating its various aspects to one's own needs, predispositions, and values. Thus, categorization represents a more sophisticated understanding of the environment than simple orientation, in that the individual now knows several instances of stimuli in a particular category and is able to distinguish among them in terms of their relative utility to the satisfaction of one's needs.

Systemization. It is difficult to say where categorization leaves off and sys-temization begins, but at some point individuals organize their environments into more meaningful and more complex structures. They know, for

example, the best time to go to the library, not only in terms of when it is the quietest, but also when it is easiest to find a place to park, or when the most helpful librarians are working, or when the latest issue of *Sports Illustrated* arrives.

Manipulation. Out of such systemization, individuals achieve a sense of order and understanding; they not only know the new setting but they can predict it and make it work to their benefit. If people have ordered their environment, they usually can manipulate it or control it to their advantage. If the cheapest pizza parlor in town is closed, they know how to get to the second cheapest, or know their options with respect to having Chinese or Mexican food instead.

Encoding. Finally, to communicate with others and to form mental maps of new environments, people must agree on what the component parts of the environment are called. This naming is called *encoding;* it permits us to do our sys-temizing and manipulating cognitively, by simply thinking about our environment. Encoding represents the highest level of understanding about the environment, because the individual is no longer tied to concrete perceptions of the setting. People can function more effectively with this knowledge, and can also communicate with others about using shared symbols. Encoding allows us to "think-travel" through environments (see Figure 2-5) and to prepare us for changes in our interrelationships with our environments. We will return to these notions in the next section of this chapter.

Of course the reason for your difficulties that first day you arrived on campus is that you didn't know the names of the buildings, nor their locations relative to one another. You had not yet had time to categorize or systematize the campus environment. And although there was an encoding schema in place, you were not, at that time, privy to it. Environmental cognition refers to knowledge about the environment, and the purpose of this example is to illustrate the importance of environmental cognition to the individual in performing such seemingly simple actions as getting from one place to another. Without an understanding of spatial relationships between objects of importance in the environment, we would not only be lost, but we would be literally paralyzed, unable to function in the setting. These mental representations of the environment are referred to as *cognitive maps*. The processes of perception, learning, and memory are all involved in the study of spatial cognition. We will now discuss the characteristics of cognitive maps, some factors affecting their development, and the functions that such environmental cognitions serve.

Characteristics of Cognitive Maps

A common approach to studying spatial cognition is to ask people to draw "sketch maps" of environments. Research indicates that sketch maps are a reliable method of data collection (Blades, 1990). Lynch (1960) conducted one of the first comprehensive studies of the nature of cognitive maps when he asked residents of three American cities (Boston, Los Angeles, and Jersey City) to draw maps of their city environments. He analyzed these drawings for commonalities in the features of people's mental images of their cities. This resulted in the identification of five major characteristics: (1) *paths:* major arteries of traffic flow through the city (e.g., Main Street); (2) *edges:* major lines (either natural or built) that divide areas of the city or delimit the boundaries (e.g., river); (3) *districts:* large sections of the city that have a distinct identity (e.g., "Chinatown"); (4) *nodes:* points of intersection of major arteries (e.g., the corner of Twelfth Street and Vine); and (5) *landmarks:* architecturally unique structures that can be seen from a distance and can be used as reference points (e.g., a tall building).

Thus, the objective physical setting comes to be represented as "cognitive space," organized and structured mentally in terms of distinct "regions" of the environment. According to the **"anchor-point" hypothesis** (Golledge, Gale, & Tobler, 1987) the regionalization and hierarchical organization of cognitive space is brought about by the active role of salient cues in the environment. For example, primary nodes or other reference points "anchor" distinct regions in cognitive space. These components or reference points provide the "skeleton" of the individual's map. As we shall see, the degree and accuracy of the detail of the remainder of the map is a function of both aspects of the environment and individual differences.

Lesson 13

CHARACTERISTICS OF COGNITIVE MAPS

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Factors Affecting Cognitive Maps

Environmental Differences. Environments differ from one another in the ease with which people are able to develop cognitive maps of them. Lynch (1960) coined the term *legibility* to refer to the extent to which the spatial arrangement of a city facilitates a clear and unified image in the minds of its inhabitants. For example, Boston provides a clear center, the Boston Common, around which people organize their cognitive maps. On the other hand, Los Angeles does not appear to have any central core, but sprawls out in all directions, which inhibits an organized mental representation. Similarly, Warren, Rossano, and Wear (1990) suggested that errors in building floor-plan maps can be understood in terms of variations in salience of building features. Milgram and his associates (Milgram, Greenwald, Kessler, McKenna, & Waters, 1972) argued that recognizable areas of an environment are important for developing accurate cognitive maps. They proposed the following formula for predicting the recognizability of an area:

R=f(CxD).

This formula is read, "The recognizability of an area *(R)* is determined by its centrality to population flow (C) and its architectural or social distinctive-ness (D)." Thus, environments that have structures that stand out (such as a hilltop church) and are frequently passed by people facilitate a clear picture of the setting in the minds of the inhabitants

Both of these environmental differences can be understood in terms of the "anchor-point" hypothesis in spatial cognition. That is, salient, objective physical cues in the environment facilitate the accurate organization of cognitive space, and the absence of such reference points inhibits accuracy

Errors in Cognitive Maps The physical characteristics of a setting are not the only determinants of the accuracy and detail of cognitive maps. People are prone to a number of cognitive errors in the process of developing cognitive maps. Downs & Stea (1973) point out that most of us form *incomplete* maps, leaving out both minor and major details; we tend to *distort* our maps, by placing some areas closer together than they actually are and others farther apart than they actually are; and, we sometimes *augment* our maps by including elements that do not actually exist. Further, we often *give undue prominence* to areas of the environment that are personally meaningful or important to us. For example, Saarinen (1973) asked students from different countries to draw maps of the

world. He found that the students tended to draw their own countries in the center of the map, drawing them larger than countries that are actually larger than their own. More recently, Herman, Miller, & Shiraki (1987) demonstrated distortions in distance judgments in relation to the affect associated with different environmental locations. College freshmen who were asked to choose their four most-liked and four least-liked campus locations subsequently underestimated distances to the locations associated with positive affect to a greater degree than they did to the places associated with negative affect. Other recent studies have demonstrated errors in estimations of the differences in elevation between locations (Garling, Book, Lindberg, & Arce, 1990) and memory for turns of varying angularity encountered during pathway traversal (Sadalla & Montello, 1989).

The above errors are most likely due to limitations in human spatial cognitive abilities, rather than to objective environmental characteristics. As with any kind of information-processing task, the accuracy of our spatial knowledge of the environment is unlikely to ever be complete, and some tasks are easier than others. For example, Teske & Balser (1986) asked individuals to identify various destinations in a city and their strategic ordering (i.e., plan itineraries), and Veitch & O'Connor (1987) asked students to do the same on their college campus. Subjects found planning itineraries more difficult, because this requires a higher-level cognitive organization. That is, while the former task requires knowledge only of the route from point A to B, the latter also requires knowledge of the route from B to C and the interrelationships among A, B, and C. Moeser (1988) has suggested such "survey maps" do not automatically develop in complex environments. She reported that student nurses failed to form survey maps of a hospital with a unique configuration, even after traversing it for two years. Further, these students performed worse on objective measures of cognitive mapping than did a control group of "naive" college students who were first asked to memorize the floor plans of the building.

Finally, Stanton (1986) investigated the relationship between "socio-spatial neighborhood" (the perception of a street network without continuous boundaries) and the experience of "homeground" (defined as the mental form and geographical extent of those places that evoke a feeling of being near home). She reported that only residents of city blocks that were no more than 460 feet long were able to think of their homeground as an experiential network, concluding that there may be a mental time limit to such cognitions. Thus, these studies all suggest that general cognitive limitations of information processing • are involved in spatial cognition as in any other type of complex task, and these limitations are a major source of errors in cognitive maps.

Individual Differences. Investigators have also suggested that some people seem to be better at forming cognitive maps than others. For example, gender differences have been reported. Appleyard (1970) reported that the cognitive maps of men are generally more accurate than are those of women. More recently, Ward, Newcombe, & Overton (1986) examined how men and women gave directions from maps that had been memorized. Male subjects exhibited higher levels of cognitive organization, such as using more mileage estimates and cardinal directions (i.e., east, west, north, and south) and made fewer errors of commission or omission than did female subjects. Antes, McBride, & Collins (1988) reported that distance judgments of women were more affected by a change in travel paths through a city occasioned by the construction of a new connecting street than were men. They suggested that women based their judgments on inferences from travel paths, while men approached the task in a more spatial manner. Orleans & Schmidt (1972) reported that women's maps were more detailed for the home and neighborhood than were those of men, whereas men's cognitive maps were more comprehensive and complete for the larger surrounding environment. Finally, some investigators have reported socioeconomic differences, suggesting that the cognitive maps of people low in socioeconomic status are also less complete and accurate than are those individuals of higher socioeconomic status (Goodchild, 1974; Orleans, 1973).

Note that the individual differences listed above may not be due to differences in ability, but rather to differences in *familiarity*. That is, there is much evidence that people draw more detailed and accurate maps of areas with which they have had more experience (and thus are more familiar to them) than areas where they have spent little time (e.g., Appleyard, 1970; Evans, 1980; Holahan & Dobrowolny, 1978; Moore, 1974). Of course, it stands to reason that we would have better images of settings that are familiar to us than of unfamiliar places. Indeed, some of the studies on errors in cognitive maps discussed earlier also indicated that the extent of error can be moderated by experience. For example, the study by Herman et al. (1987) indicated that the estimations of distances to campus locations associated with positive and negative affect were not significantly different for upperclassmen. Teske & Balser (1986) reported that subjects who lived closest to the city where they were asked

to identify locations and plan itineraries performed at a higher level on these tasks than did subjects who had less contact with the city. Finally, Fridgen (1987) asked travelers who stopped at a travel information center in Michigan to indicate which parts of Michigan they perceived to be tourism and recreation areas. Subjects familiar with the state differentiated more regions along the coast, whereas less familiar subjects perceived more regions to be present in the southeastern urban portion of the state.

Moreover, typically there are differences in *mobility* among the groups discussed above (i.e., in opportunity for travel through the setting). Thus, for example, if a husband works and the wife stays at home, it is not surprising that the husband would develop a better cognitive map of areas beyond the immediate neighborhood while the wife would develop a more detailed map of the local environment. Similarly, people of higher socioeconomic status have much greater mobility to gain experience in the larger environment than do individuals of lower socioeconomic status. These suggestions are supported by the research of investigators who have controlled for mobility (e.g., Appleyard, 1976; Karan, Bladen, & Singh, 1980; Maurer & Baxter, 1972). While the individual differences reported above could be due to inherent differences in spatial ability, this seems unlikely to be the major reason. A study by Pearson and lalongo (1986) measured spatial ability and environmental knowledge independently. Spatial ability accounted for only 14 percent of the variance in environmental knowledge. Thus, learning brought about by relevant experience in an environment is likely to be a more important determinant of the accuracy of cognitive maps than are the individual or cultural differences discussed above.

Developmental Aspects of Environmental Cognition. A number of changes occur in environmental cognition as children mature and as adults become familiar with a new place. Two essential features of such cognitive growth are the increasing *differentiation* and *abstractness* in cognitive representations of the environment, and the increasing ability to conceive of the environment from different topographical perspectives. The first of these is illustrated by a progressive shift from enactive to iconic to symbolic representation of the environment and coincide with Piaget's developmental stages: sensorimotor, preoperational, concrete-operational, and formal-operational (Flavell, 1977). The latter is illustrated by a shift from an egocentric spatial reference (possible only with respect to one's own bodily position), to a fixed spatial reference (possible with respect to some fixed object or direction), to a coordinated system of reference (spatial reference possible with respect to a system of polar coordinates such as the cardinal directions of east-west or north-south). These trends represent progressive increases in the complexity and sophistication of the cognitive styles and sets for organizing and interpreting environmental information (Leff, 1978). These trends also correspond to the stages of responses to novel environments discussed above.

In addition, Hart & Moore (1973) posit that as adults or children become more familiar with a new environment, their topographical representations tend to shift from a *route* to a *survey* orientation (i.e., places will be first conceived in terms of paths from point to point and eventually mental maps will be formed that embody an awareness of broad areas and their interrelationships). Various researchers have found support for this notion (Gould, 1973; Gould & White, 1974; Leiser & Zilbershatz, 1989). Finally, a number of investigators are beginning to look at the role of affect in the determination of mental maps. Such structural elements as paths, nodes, landmarks, edges, and districts may require considerations of social and personal meaning to account for their inclusions in people's mental maps (see also our earlier discussion of Herman, et al., 1987, regarding affect and distance judgments).

Functions of Cognitive Maps

The above exercise reiterates the importance of cognitive maps for our very ability to move around in our environments. It also illustrates that cognitive maps serve the important function of facilitating the ease of *adapting* to our environments. That is, life would be much more difficult if, because I had to wander around in circles trying to find my way from the post office to the bank, I didn't have time to both post my bills and deposit my paycheck. Thus, perhaps the most important function of cognitive maps is their adaptive value. Kaplan (1973) suggested that the ability of prehistoric humans to develop cognitive maps had a crucial survival value in a hostile world. How do I get from where I am to the safety of my cave and where, relative to where I am now, did I hide those ostrich eggs I found the other day? These are the kinds of questions that primitive humans must have asked themselves—the answers to which must have required some sort of cognitive map.

Downs & Stea (1977) discuss the role of cognitive maps in *problem solving* (i.e., in helping us make decisions about where things that we need are and how to get them). This function is also illustrated in the above example, in that I used my cognitive map to solve the problem of where I needed to go in relation to the amount of time I

had available between classes. Thus, maps facilitate coping strategies involved in planning our daily lives.

Finally, cognitive maps also serve the important social function of *communication.* While we all develop our own idiosyncratic maps of the environment, we also learn certain *shared symbols* (Strauss, 1961) that allow us to communicate with others about the same physical environment. It is this system of symbols that permits the out-of-towners to navigate their way to a place in response to the statement "turn left at the second intersection, then make a right at the first stop sign and look for the carry-out store." These shared symbols also help us to decide whether to visit a particular city in the first place. For example, we might tell a European friend planning to visit the United States to be sure to include New York, the "Big Apple," on the itinerary, but forget Cleveland, the "Mistake by the Lake" (see Table 4-1, by Downs & Stea, 1977). Both the development and the use of shared symbols to communicate with others about the environment depend on the encoding processes discussed earlier.

Thus far we have considered the important and interrelated processes of environmental perception and cognition. We have seen that the ability to form mental images of our environment is closely related to the ability to perceive and interpret the spatial components of the setting, and that both of these processes are strongly influenced by our learning experiences in the environment. In the next section of this chapter we turn our attention to the processes by which we arrive at an evaluation of a particular setting. Again we will see that perception and cognition are important determinants of environmental evaluation, and that all of these processes interact to determine our behavior in the environment.

Lesson 14

Environmental Evaluation

The question of how we come to evaluate an environment favorably or unfavorably is a complex one, yet it is an important one for predicting behavior. At a very general level, people prefer and approach environments they evaluate favorably and avoid environments they evaluate negatively. Environmental psychologists have dealt with the first question using a variety of operational definitions. For example, a favorable evaluation could be viewed as a preference for certain configurations of stimuli in some environments over that of other environments, a cognitive judgment of beauty, or as a positive affective reaction to the environment. Each of these approaches has led to the identification of different, though related, aspects of the physical environment as determinants of evaluative responses. The answer to the question "What aspects of the environment lead to a favorable evaluation?" is going to depend on the answer to the question "What is meant by a favorable evaluation?" Consideration of each of these approaches, as well as their implications for the relationship between environmental evaluation and behavior, follows.

Kaplan's Model

Environmental Preference: *Would you rather be here or there?* Kaplan (1975) developed a model for predicting preferences of some environments over others. This model provides a link between environmental cognition and evaluation, in that it assumes an important dimension of environmental preference to be the informational content of those environments. For example, Kaplan (1979) suggested that one basis for preferences is the ability of the individual to "make sense" out of the environment and the extent to which the environment involves the individual by motivating him or her to try to comprehend it. Kaplan & Kaplan (1978) identified four important factors influencing our preferences: coherence, legibility, complexity, and mystery.

Coherence **and** ***legibility*** refer to the degree to which the elements of a setting are organized (i.e., "fit together") in an orderly fashion, and the ease with which the individual can process and categorize the elements of the setting. Both of these factors contribute to the ability to make sense out of the environment. People prefer environments high in coherence and legibility to those low on these dimensions.
The factors influencing involvement with the environment are *complexity* (the number and variety of elements) and *mystery* (the degree to which the setting has hidden information that captures the viewer's imagination).

As with the first two factors, greater degrees of complexity and mystery produce a preference for a setting. Kaplan (1987) has recently argued for a biological basis to such preferences (i.e., there is a survival value to preferring environments that offer informational advantages over others). The Kaplans' recent research points to the importance of *mystery* in predicting landscape preferences (Kaplan, Kaplan, & Brown, 1989), but others have applied their model to predict preferences for urban environments (Her-zog, 1989) and interiors (Scott, 1989).

Environmental Aesthetics: *Is beauty in the eye of the beholder?* Apart from the intuitive appeal of the notion that *beauty* is a subjective and relative concept, psychologists have attempted to identify objective dimensions of environments that lead to judgments of their aesthetic appeal. The assumption is that although there may indeed be individual differences in judgments of beauty, it is still possible to identify commonalities in what most people consider to be beautiful. For example, most people consider the Grand Canyon to be beautiful and a junk yard to be ugly. By researching a variety of settings, it is possible to identify dimensions along which different environments judged to be beautiful are similar.

Berlyne (1960) conducted one of the first important series of studies along these lines. He identified four basic *collative properties* of environments that is, characteristics of the environment that cause us to compare present settings to previous settings we have encountered:

1. *complexity* refers to the degree of variety in the elements of the environment
2. *novelty* is the extent to which stimuli not previously encountered or noticed are present
3. *incongruity* concerns the extent to which the environment contains stimuli that do not seem to "go together" harmoniously
4. ***surprisingness*** refers to the environment that contains elements that we do not expect to be present.

In subsequent research, Berlyne (1974) argued that aesthetic judgments are most positive for environments at intermediate levels of each of these dimensions. That is, according to Berlyne, we judge either too much or too little complexity, novelty, incongruity, and surprisingness as detracting from the beauty of a setting. This finding falls in line with the notion of adaptation levels and behavior in response to environments that deviate from that level, as outlined in Chapter 2. However, Wohlwill (1976) has suggested that this curvilinear relationship holds only for the dimension of complexity, and that judgments of beauty increase monotoni-cally with increases in novelty and surprisingness, as well as with decreases in incongruity. Only additional empirical studies using a broad range of environments varying on these dimensions will tell us who is right.

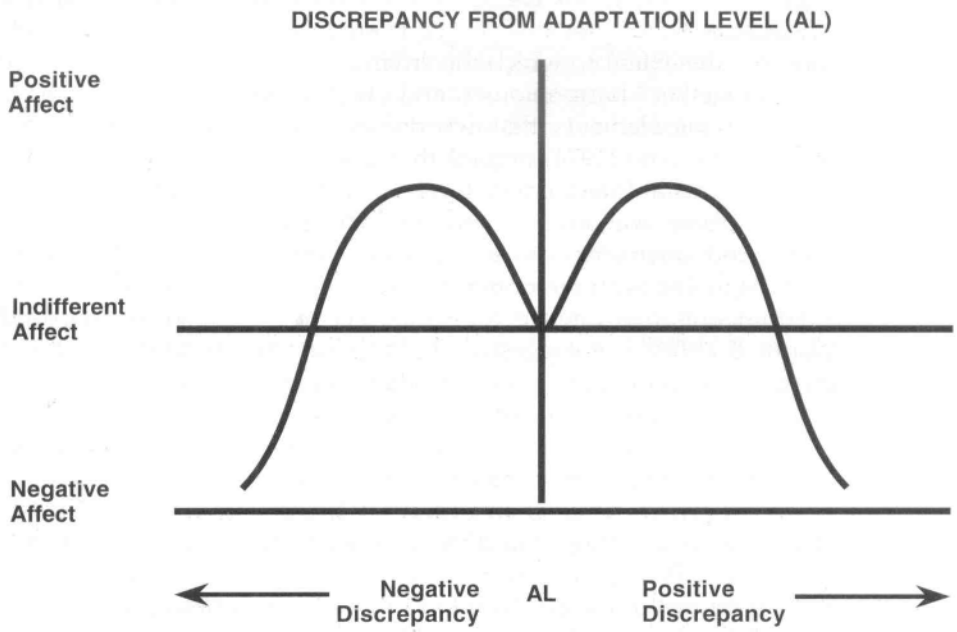
Berlyne (1974) attempted to relate collative properties to exploratory behaviors in a setting. He distinguished between *specific* and ***diversive*** exploration. Specific exploration increases as the level of uncertainty in the environment increases. Presumably, uncertainty creates arousal, which leads to specific exploration to identify the source of the arousal. Berlyne proposed that the pleasantness of a setting is greatest at intermediate levels of uncertainty, and that diversive exploration occurs when uncertainty-arousal levels are low. In other words, when the collative properties of an environment are at low levels, we feel understimulated or bored, and we search the environment for ways to increase our arousal level.

There has been a recent upsurge in research on environmental aesthetics. These studies have ranged from development of reliable and valid measures of scenic beauty (e.g., Ribe, 1988; Ruddell, Gramann, Rudis, & Westphal, 1989) to cross-cultural comparisons in aesthetic judgments (e.g., Hull & Revell, 1989; Wong, 1990). Others have argued for the value of studying environmental aesthetics in architectural design (e.g., Broadbent, 1989; Stamps, 1989). Finally, Bourassa (1990) has recently proposed a paradigm for landscape aesthetics that integrates biological, cultural, and personal modes of aesthetic experience.

Lesson 15

AFFECTIVE BASES OF ENVIRONMENTAL EVALUATION

Working within the framework of Helson's (1964) Adaptation Level Theory, Wohlwill (1966) proposed that our affective responses to environments are determined by the degree of discrepancy between current levels of stimulation and the adaptation level (i.e., the level of stimulation we have become accustomed to).



Wohlwill proposed the ***butterfly curve hypothesis*** predicting a curvilinear relationship between positive affect and discrepancies resulting in either increases or decreases in arousal from adaptation level (see Figure below). That is, we view moderate increases or decreases in stimulation from adaption level as pleasant. However, extreme deviations in either

direction result in negative affect. This approach is useful in accounting for individual differences in evaluations of a setting. Individual differences in adaption level result from living in different environments, leading to what might be called the "one person's ceiling is another person's floor" effect. That is, the same environment might be perceived as overstimulating to one person while understimulating to another. For example, a person raised in a small rural town in Iowa might perceive a city of 20,000 people overwhelming, while the same city might be perceived as boring to a person raised in Chicago. Note, however, that both individuals would experience negative affect, because the discrepancies from their adaptation levels are extreme, even though in different directions.

The work of Mehrabian & Russell (1974) has added considerably to our understanding of the relationship among stimulation levels, arousal, and positive/negative affective responses to environments. Further, their model accounts for the relationship between these variables and behavior. Mehrabian and Russell propose the concept of *information rate* to define environmental stimulation level. Information rate refers to the average amount of information impinging on the senses per unit of time. This concept can be used to integrate the various dimensions of environmental stimulation discussed above, such as complexity, novelty, incongruity, surprisingness, mystery, and coherence, in that all of these dimensions contribute to the information rate of a setting. Mehrabian & Russell(1974) present a great deal of research demonstrating that arousal is a direct correlate of information rate, and that approach behaviors in an environment (i.e., seeking out or desiring to remain in a setting) are greatest for intermediate levels of arousal.

However, Mehrabian and Russell suggest that the curvilinear relationship between approach and arousal is moderated by the degree of pleasure a person experiences. Specifically, this relationship appears to hold only when pleasure is at an intermediate level. When pleasure is extremely high, approach behaviors strengthen with either increases or decreases in arousal, and when pleasure is extremely low, both increases and decreases in arousal lead to avoidance behaviors.

These ideas have been extended by Russell & Pratt (1980), who proposed a model of emotional reactions to environments in which arousal and pleasure are viewed as independent dimensions. This is illustrated in Figure 4-6. As can be seen, the model depicts all possible combinations of pleasure and arousal. Thus, environments high in arousal can be perceived as pleasant (i.e./'exciting" settings, such as a football game), as can environments low in arousal (i.e./'relaxing" settings, as a picnic in the park). Note that we are likely to engage in approach behaviors to both types of environments. The same can be said of avoidance behaviors to unpleasant environments high in arousal

FIGURE : Circular ordering of eight terms to describe the emotional quality of environments (from Russell and Pratt, 1980).

("distressing" settings, such as a final exam) and low in arousal ("gloomy" settings, such as a funeral). This *circumplex model* has been recently demonstrated to reliably differentiate between people's experiences in and preferences for suburban parks (Hull & Harvey, 1989).

We have seen that environmental perception and cognition influence our evaluative and affective responses to a setting. The relationships between these processes can be difficult to grasp. A useful model for describing these relationships has been proposed by Purcell (1986). Referred to as a *schema discrepancy model,* ongoing environmental experience is posited to result from a matching process between currently available environmental characteristics and a representation stored in memory of the gist of previous similar experiences (called a "schema," which is based on prototypical examples). Purcell proposes that affective responses occur when there is a mismatch, or discrepancy, between the attributes of a current instance and the attributes of the schematic prototype.

Lesson 16

ENVIRONMENTAL ATTITUDES

The relationships among the processes of environmental perception, cognition, and evaluation as well as their effects on behavior can be best summarized in the notion of environmental attitudes. An attitude is typically defined as consisting of a *cognitive component, an affective component, and a behavioral component.* That is, an attitude involves the way we think about, feel about, and behave toward an object. Consider, for example, your attitude toward the city of Karachi. Your attitude about this environment includes your thoughts about Karachi (e.g., cognitions about its size, traffic and pollution levels; things to see and do there), your feelings about Chicago (e.g., excitement, anxiety, fear), and your behavior vis-a-vis Chicago (e.g., you may plan a trip there to watch the Bears, or you may plan a trip so as to bypass Chicago altogether).

Thus far we have discussed the processes by which we perceive our environment and how these perceptual processes are involved in developing our cognition or understanding of the environment. These are the processes by which the cognitive component of an attitude is formed. In the following sections we will discuss the particular characteristics of cognitions that have implications for one's overall attitude toward the environment. We have also discussed the role of perception and cognition in the formation of favorable or unfavorable evaluations of the environment, as well as the relationships between environmental characteristics and emotional responses to a setting. These evaluative and emotional responses constitute the affective component of an environmental attitude.

Environmental Attitude Formation

Social psychologists have devoted considerable time and effort toward understanding the processes by which attitudes are formed. We will consider environmental attitude formation as a special case of the general process by which any attitude is formed. Most explanations of attitude development invoke learning principles such as classical conditioning, operant conditioning, and observational learning. Each of these principles will be discussed below, but we will first consider two important cognitive foundations of attitudes: beliefs and values.

Beliefs and Values

Daryl Bern (1970) has suggested that beliefs constitute the cognitive "building blocks" of attitudes. Bern distinguished between ***primitive beliefs*** and ***higher-order beliefs***. Primitive beliefs are nonconscious (i.e., they are accepted as givens, and are seldom consciously questioned). Primitive beliefs are either based on direct experience (e.g., the belief in the validity of our sense impressions) or on external authority (e.g., the belief that if Mommy says so, it must be true). The processes of sensation and perception discussed earlier are involved in the development of primitive beliefs. Because we have faith in our sensory impressions, if something smells or tastes bad, we will hold a negative attitude toward that thing. Alternatively, if Mommy tells us that we will get sick if we eat something, since we believe (at least as young children) that "Mommy is always right and never lies," we will also develop a negative attitude toward that thing. These primitive beliefs usually serve us well. Indeed, as we discussed earlier in this chapter, we would be immobilized if we could not trust our senses, and young children might end up eating something poisonous if they could not trust Mommy. However, our perceptions and beliefs based on sense impressions are not always correct, and we learn later in life that Mommy can be wrong and is even capable of lying! Of greater importance to the present discussion is the notion of *higher-order beliefs.* According to Bern (who is always right and never lies), these beliefs involve the insertion of a conscious premise in the thought process of arriving at the belief. Thus, a belief can be thought of as a conclusion to a syllogism. For example, if I believe that air pollution leads to respiratory illness, it is unlikely that I arrived at that belief through direct experience or because Mommy said so. Rather, it is more probable that I heard a newscast reporting the results of a study conducted by the office of the Surgeon General warning of the health hazards of air pollution. Thus, the belief that air pollution is hazardous to one's health is itself based upon several other beliefs, such as the belief in the accuracy of the newscast, the trustworthiness of the Surgeon General, and the validity of the research itself.

This analysis suggests that the cognitive component of attitudes can be quite complex, sometimes exhibiting great depth (i.e., many premises all leading to the same conclusion) as well as breadth (i.e., many syllogisms all leading to the same conclusion). To complicate matters further, although the language of syllogisms, premises, and conclusions suggests that the process of arriving at higher-order beliefs is inherently logical and rational, this is not necessarily the case. Bern invokes the idea of *psychologic* to account for irrational beliefs that are nonetheless

internally consistent in the individual's cognitive structures. Further, it is possible to believe that something is bad for you but still evaluate the thing favorably. For example, I may know that smoking is bad for me, but simultaneously enjoy it (or alternatively, I may believe that exercise is good, but I may hate it anyway!).

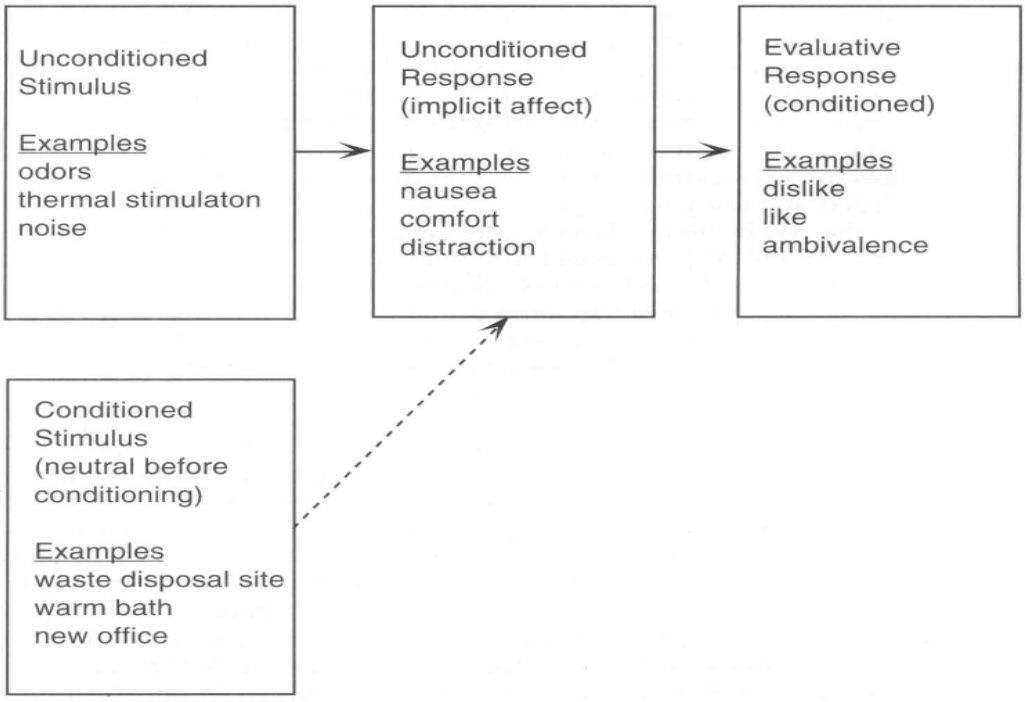
Despite the cognitive complexity or potential irrationality of attitudes, the evaluative component of an attitude is usually quite simple: The person either likes or dislikes the attitude object. We will soon discuss the affective basis of this evaluation, but first a word should be said about the cognitive foundation of evaluation**: *values***. Values can be defined as basic preferences for certain end states (see Rokeach, 1968). For example, *equality* is a value referring to an end state such as equal opportunity. Values serve as the functional basis for attitudes. That is, holding a particular attitude is a means for attaining a preferred end state. Thus, a person who strongly values equality is likely to be in favor of civil rights legislation. Similarly, if one values clean air, then that person is likely to evaluate actions to control pollution favorably. Indeed, Neuman (1986) has reported that values pertaining to environmental quality are positively related to beliefs about the efficacy and necessity of conservation and actual conservation behavior.

Lesson 17

AFFECTIVE BASES OF ATTITUDEES

Affective Bases of Attitudes

Most social psychologists believe that the affective component of an attitude is learned. One important theory of attitude formation is The Byrne-Clore reinforcement-affect model (Byrne, 1971; Byrne & Clore, 1970). This model is based on principles of *classical conditioning.* Specifically, if an affectively "neutral" stimulus (called a *conditioned stimulus)* is paired with a stimulus that does elicit an affective response (called an *unconditioned stimulus),* then the previously neutral stimulus will acquire the same ability to produce the response. The affective response to the unconditioned stimulus is referred to as an *unconditioned response,* because it occurs unconditionally (i.e., without the organism having to learn the response). The acquired response is called a *conditioned response,* because the organism must be conditioned to make the response in the presence of that stimulus (i.e., the organism must "learn" the response through association). This model can be readily applied to the conditioning of the affective component of environmental attitudes (see Figure below).



Do not think about the environment if the stimulation levels are within some optimal range). However, if some quality of the environment changes to deviate from the optimal stimulation level, a negative affective response automatically occurs. Through association, the entire environment comes to elicit the same negative affect. For example, when you first encountered your dormitory room, your affective response to the desk in the room (the "conditioned stimulus") was likely to have been neutral. However, if when you sat down to study at the desk, your neighbor turned rock music (the "unconditioned stimulus") on his or her stereo at full volume, you may have experienced negative affect (the "unconditioned response"). If this happened repeatedly, you would develop a negative affective response to your desk (the "conditioned response"). Further, through a phenomenon known as *stimulus generalization,* you might come to experience a generalized negative affective response to your entire room. Thus, not only would you come to avoid studying at your desk, but you might even come to avoid your room altogether.

Behavioral Bases of Attitudes

Another important way in which attitudes are learned is through the process of *operant conditioning* (Skinner, 1938). According to this model of learning, any behavior that is followed by a pleasant consequence (i.e., *positive reinforcement)* will increase in frequency. Behaviors that lead to unpleasant consequences (i.e., *punishment)* will become *extinguished,* that is, they will not be repeated. The expression of a particular attitude is a form of behavior, and can therefore be operantly conditioned as any other behavior. Thus, we learn to express attitudes that lead to favorable consequences for us, and we avoid attitudes that pose aversive consequences. For example,

attitudes toward a "windfall profits tax" on oil during an energy crunch could be predicted according to the potential consequences of being in favor of or opposed to the tax. If the tax dollars were earmarked for highway construction projects, individuals likely to benefit from these projects would be expected to be in favor of the tax. On the other hand, oil company executives would be likely to oppose the legislation, since they would stand to lose money as *a* result of the tax.

A considerable amount of research supports this notion. For example, Van Der Pligt, Eiser, & Spears (1986a, 1986b) reported that attitudes toward the building of a nuclear power plant in one's locality are related to differential evaluations of the perceived cost and benefits to the differing sides on the issue, as well as the perceived importance of the potential consequences. Pro-nuclear groups were more optimistic about and attached greater value to the possible economic benefits, whereas anti-nuclear groups were more pessimistic about the risks and attached greater value to the dangers of building and operating the station. As we shall see in Chapter 14, many environmental attitudes can be understood in terms of the social, political, and economic consequences of those attitudes. Similar results were reported by Napier, Carter, & Bryant (1986) regarding perceptions of the impact of a reservoir on the local environment. Finally, Jackson (1986) reported that participants of "appreciative" activities (e.g., cross-country skiing, hiking) had stronger pro-environmental attitudes than did participants of "consumptive" activities (hunting, fishing) or "mechanized" activities (snowmobiling, trail hiking). Clearly, the attitude held by any of the above groups can be understood in terms of the potential rewards or costs of consequences of these attitudes.

Lesson 18

SOCIAL BASES OF ATTITUDES

Social Bases of Attitudes

Another important way in which attitudes are formed is through observation of other people's expression of attitudes and the consequences of their attitudes. The process of learning via observation of a model's behavior is known as *social learning,* and the means by which we are influenced by the consequences of the model's behavior is known as *vicarious conditioning* (Bandura, 1974). Thus, if an individual observes another person expressing a particular attitude, and also observes that the attitude led to favorable consequences, then the individual will imitate the model's behavior in anticipation of incurring the same favorable consequences. For example, if a person who works for an oil company observes a co-worker express opposition to a windfall profits tax, and the co-worker is praised by the boss, then the individual is likely to imitate this opposition in anticipation of also gaining the boss's approval.

Another way in which social influences can impact attitudes is through the dynamics of interpersonal processes. Put simply, if my friends have pro-environmental attitudes, and I enjoy my friends' company, then I am likely to adopt similar attitudes. Manzo & Weinstein (1987) studied differences in active and nonactive members of the Sierra Club and reported significant differences in commitment to environmental protection as a function of club-related friendships. Thus, friends tend mutually to reinforce attitudes toward the environment.

Attitudes and Behavior

A major assumption of research on attitude formation is that attitudes mediate behaviors which are consistent with those attitudes. Thus, if I hold an attitude favoring energy conservation, it would be expected that this attitude would mediate behaviors such as walking instead of driving to work, or turning my thermostat down during the winter and up during the summer. Although this may seem like an obvious and reasonable assumption, in recent years research has led social psychologists to question the degree to which attitudes do, indeed, reliably predict behavior (e.g., Wicker, 1969). These studies have suggested that there is much less consistency between measured attitudes and subsequent behaviors than had previously been assumed.

Attitude-Behavior Consistency

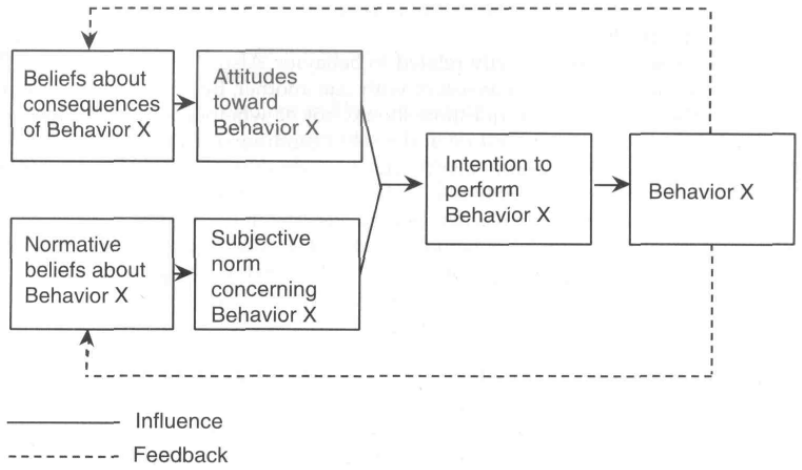
The major principle of *consistency theories* of attitude-behavior relationships (see Festinger, 1957) is that people strive to maintain logical consistency between cognitions about their attitudes and cognitions about relevant behaviors in which they engage. Thus, if a person has the opinion that air pollution should be brought under control, a logically consistent behavior would be to vote for measures requiring utility companies to install pollution-control equipment in energy plants. However, if this person knows that he or she voted against such a measure, the perceived attitude-behavior inconsistency would create a state of ***cognitive discomfort,*** which would motivate the individual to attempt to restore consistency. This would be accomplished either by changing the attitude (e.g., deciding that pollution control is not as important as controlling the costs of energy production), or by changing the behavior (e.g., by voting in favor of the next such measure). More will be said about attitude/behavior change in Chapter 15, but for now the main point is that consistency theories imply that attitudes should reliably predict relevant behaviors that would be consistent with those attitudes.

The fact that the research mentioned above suggests that there is frequently a lack of consistency between attitudes and behavior might seem to raise a considerable theoretical problem, as well as the practical question of whether there is any value in attempting to predict behavior from attitudes at all. Fortunately, Ajzen & Fishbein (1977) have developed a theory of attitude-behavior relationships that helps to clarify when this relationship will or will not hold. Ajzen & Fishbein propose that attitudes can, at best, yield good predictions of classes of behaviors, but are not necessarily predictive of specific behaviors. For example, energy conservation is a class of behaviors consisting of a variety of different specific actions, such as walking rather than driving, turning down the thermostat, switching off lights when leaving a room, using energy-efficient appliances, etc. If we measured a person's overall attitude toward energy conservation, we might find that a favorable attitude toward this issue may predict all, many, or perhaps only a few of the specific behaviors in this class. However, Ajzen & Fishbein have shown that a *behavioral index* consisting of a combined score of measurements of all individual behaviors can, indeed, be accurately predicted from the overall attitude. Evidence supporting this assertion was provided in a study by Gill, Crosby, & Taylor (1986), in which consumer behavior on container deposit (bottle) bills in

California and Colorado demonstrated that "ecological concern," measured as a global attitude, was mediated by more specific attitudinal, normative, and behavioral intention variables.

The Reasoned Action Model

Another clarification of attitude-behavior relationships is suggested by Ajzen and Fishbein's Reasoned Action Model of attitudes and behaviors (see Figure 4-8). They argue that decisions to engage in particular behaviors are



made by the individual reasoning about the potential outcome of the behavior (i.e., judgments of how good/bad and likely/unlikely the outcome would be, called the *behavioral attitude)* and thoughts about social pressure to engage in the behavior (i.e., judgments about whether others think we should/should not engage in the behavior and our motivation to comply with their expectations, called the *subjective norm).* The behavioral attitude and subjective norm combine to determine the *intention* to perform the behavior or to avoid the behavior. Thus, an important implication of this model is that atti tudes are too far removed from the actual behavior to provide reliable prediction. That is, attitudes affect behavior indirectly via intentions and jointly with the subjective norm. This model has been recently applied to understanding the relationships among beliefs, attitudes, and behavioral intentions toward nuclear energy vs. coal in the production of electricity (Verplanken, 1989).

Attitude-behavior inconsistency would actually be predicted by this model if the behavioral attitude and subjective norm were in conflict, and if the subjective norm were stronger than the behavioral attitude. Thus, I may negatively evaluate the outcome of turning my thermostat down during the winter months (i.e., it will make me cold), but I may intend to do it anyway if people who are important to me pressure me to do it (and if I am more concerned about living up to their expectations than I am about my personal comfort). In this case, a measure of my intention to turn my thermostat down would have accurately predicted my behavior, whereas a measure of my attitude would have led to an erroneous prediction.

We have seen in this section that attitudes are not always predictive of specific behaviors, but if appropriate measures are taken, attitudes can be shown to be at least indirectly related to behavior. Also, attitudes and behaviors may in some instances be consistent with one another, but this is not necessarily always the case. Thus, the question should not be whether or not attitudes reliably predict behavior, but, rather, under what conditions attitudes will be consistent with behaviors. For example, attitudes that are salient in the person's cognitive structures, that are strongly held, and that are stable over time generally are very predictive of behaviors, whereas attitudes low in salience, strength, and stability are poor predictors of behavior. Finally, it was also pointed out that attitudes can predict general classes of behaviors, but may not be very predictive of individual actions within a behavioral category.

Lesson 19

IMPACT OF ENVIRONMENT ON PERSONALITY

- Personality Development and Individual Differences
    - Personality
    - Personality development - relationship between human behavior and environment
    - Personality Research – Theoretical Perspectives
        - » Traits Theory Perspective
        - » Interactionist Perspective
            - Murray's Theory of Personality
            - Mischel's Contention
            - Interactionist Perspective
            - Metron's Notion of Self Fulfilling Prophecy
        - » Environmental Changes and Stress
- Stress: Theoretical Perspectives
    - Physiology of Stress
    - Researching Stress: The Environmental Context
    - Moderators of the Stress Response
    - Role of Stress in Understanding Organism-Environment Relationship

Personality can be defined as a dynamic and organized set of characteristics possessed by a person that uniquely influences his or her cognitions, motivations, and behaviors in various situations [. The word "personality" originates from the Latin *persona*, which means mask. Significantly, in the theatre of the ancient Latin-speaking world, the mask was not used as a plot device to *disguise* the identity of a character, but rather was a convention employed to represent or *typify* that character.
Two questions are of great importance to personality psychologists:

1. Individual Differences

When several people encounter the same situation, why don't they all react alike?

2. Environmental impact

What is the relationship between human behavior and environment?

The pioneering American psychologist, Gordon Allport (1937) described two major ways to study personality, the nomothetic and the idiographic. *Nomothetic psychology* seeks general laws that can be applied to many different people, such as the principle of self-actualization, or the trait of extraversion. *Idiographic psychology* is an attempt to understand the unique aspects of a particular individual.

The study of personality has a rich and varied history in psychology, with an abundance of theoretical traditions. The major theories include dispositional (trait) perspective, psychodynamic, humanistic, biological, behaviorist and social learning perspective. There is no consensus on the definition of "personality" in psychology. Most researchers and psychologists do not explicitly identify themselves with a certain perspective and often taken an eclectic approach. Some research is empirically driven such as the "Big 5" personality model whereas other research emphasizes theory development such as psychodynamics. There is also a substantial emphasis on the applied field of personality testing.

Philosophical Assumptions

Many of the ideas developed by historical and modern personality theorists stem from the basic philosophical assumptions they hold. The study of personality is not a purely empirical discipline, as it brings in elements of art, science, and philosophy to draw general conclusions. The following five categories are some of the most fundamental philosophical assumptions on which theorists disagree:

1. **Freedom versus Determinism**
This is the debate over whether we have control over our own behavior and understand the motives behind it (Freedom), or if our behavior is causally determined by forces beyond our control (Determinism). Determinism has been considered unconscious, environmental, or biological by various theories.

2. **Heredity versus Environment**
Personality is thought to be determined largely by either genetics and heredity, by environment and experiences, or by some combination of the two. There is evidence for all possibilities. Contemporary research suggests that most personality traits are based on the joint influence of genetics and environment.

3. **Uniqueness versus Universality**
The argument over whether we are all unique individuals (Uniqueness) or if humans are basically similar in their nature (Universality). Gordon Allport, Abraham Maslow, and Carl Rogers were all advocates of the uniqueness of individuals. Behaviorists and cognitive theorists, in contrast, emphasized the importance of universal principles such as reinforcement and self-efficacy.

4. **Active versus Reactive**
Do we primarily act through our own initiative (Active), or react to outside stimuli (Reactive)? Behavioral theorists typically believe that humans are passively shaped by their environments, whereas humanistic and cognitive theorists believe that humans are more active.

5. **Optimistic VS Pessimistic**
Personality theories differ on whether people can change their personalities (Optimism), or if they are doomed to remain the same throughout their lives (Pessimism). Theories that place a great deal of emphasis on learning are often, but not always, more optimistic than theories that do not emphasize learning.

Personality theories
Critics of personality theory claim personality is "plastic" across time, places, moods, and situations. Changes in personality may indeed result from diet (or lack thereof), medical effects, significant events, or learning. However, most personality theories emphasize stability over fluctuation.

Trait theories
According to the *Diagnostic and Statistical Manual* of the American Psychiatric Association, personality traits are "enduring patterns of perceiving, relating to, and thinking about the environment and oneself that are exhibited in a wide range of social and personal contexts." Theorists generally assume a) traits are relatively stable over time, b) traits differ among individuals (e.g. some people are outgoing while others are reserved), and c) traits influence behavior.
The most common models of traits incorporate three to five broad dimensions or factors. The least controversial dimension, observed as far back as the ancient Greeks, is simply extraversion vs. introversion (outgoing and physical-stimulation-oriented vs. quiet and physical-stimulation-averse).

- **Gordon Allport** delineated different kinds of traits, which he also called dispositions. *Central traits* are basic to an individual's personality, while *secondary traits* are more peripheral. *Common traits* are those recognized within a culture and thus may vary from culture to culture. *Cardinal traits* are those by which an individual may be strongly recognized.
- **Raymond Cattell's** research propagated a two-tiered personality structure with sixteen "primary factors" (16 Personality Factors) and five "secondary factors."
- **Hans Eysenck** believed just three traits—extraversion, neuroticism and psychoticism—were sufficient to describe human personality. Differences between Cattell and Eysenck emerged due to preferences for different forms of factor analysis, with Cattell using oblique, Eysenck orthogonal, rotation to analyse the factors that emerged when personality questionnaires were subjected to statistical analysis. Today, the Big Five factors have the weight of a considerable amount of empirical research behind them, building on the work of Cattell and others.
- **Lewis Goldberg** proposed a five-dimension personality model, nicknamed the "Big Five":

1. **Openness to Experience**: the tendency to be imaginative, independent, and interested in variety vs.

practical, conforming, and interested in routine.

2. **Conscientiousness**: the tendency to be organized, careful, and disciplined vs. disorganized, careless, and impulsive.
3. **Extraversion**: the tendency to be sociable, fun-loving, and affectionate vs. retiring, somber, and reserved.
4. **Agreeableness**: the tendency to be softhearted, trusting, and helpful vs. ruthless, suspicious, and uncooperative.
5. **Neuroticism**: the tendency to be calm, secure, and self-satisfied vs. anxious, insecure, and self-pitying

The Big Five contain important dimensions of personality. However, some personality researchers argue that this list of major traits is not exhaustive. Some support has been found for two additional factors: excellent/ordinary and evil/decent. However, no definitive conclusions have been established.

- **John L. Holland's** *RIASEC* vocational model, commonly referred to as the **Holland Codes**, stipulates that six personality traits lead people to choose their career paths. In this circumplex model, the six types are represented as a hexagon, with adjacent types more closely related than those more distant. The model is widely used in vocational counseling.

Trait models have been criticized as being purely descriptive and offering little explanation of the underlying causes of personality. Eysenck's theory, however, does propose biological mechanisms as driving traits, and modern behavior genetics researchers have shown a clear genetic substrate to them. Another potential weakness of trait theories is that they lead people to accept oversimplified classifications, or worse offer advice, based on a superficial analysis of their personality. Finally, trait models often underestimate the effect of specific situations on people's behavior. It is important to remember that traits are statistical generalizations that do not always correspond to an individual's behavior.

Lesson 20

MURRAY'S THEORY OF PERSONALITY DEVELOPMENT AND INTERACTIONIST PERSPECTIVE

In this section we shall explore important standpoints of the Interactionist perspective in psychology. Following have been the important standpoints in the Interactionists' perspective on personality:

Henry Murray and Psychogenic Needs

American psychologist Henry Murray (1893-1988) developed a theory of personality that was organized in terms of motives, presses, and needs. Murray described a needs as a, "potentiality or readiness to respond in a certain way under certain given circumstances" (1938)

Theories of personality based upon needs and motives suggest that our personalities are a reflection of behaviors controlled by needs. While some needs are temporary and changing, other needs are more deeply seated in our nature. According to Murray, these psychogenic needs function mostly on the unconscious level, but play a major role in our personality.

Murray's Types of Needs

Murray identified needs as one of two types:

1. **Primary Needs** Primary needs are based upon biological demands, such as the need for oxygen, food, and water.
2. **Secondary Needs** Secondary needs are generally psychological, such as the need for nurturing, independence, and achievement.

List of Psychogenic Needs

The following is a partial list of 24 needs identified by Murray and his colleagues. According to Murray, all people have these needs, but each individual tends to have a certain level of each need.

1. Ambition Needs

- **Achievement:** Success, accomplishment, and overcoming obstacles.
- **Exhibition:** Shocking or thrilling other people.
- **Recognition:** Displaying achievements and gaining social status.

2. Materialistic Needs

- **Acquisition:** Obtaining things.
- **Construction:** Creating things.
- **Order:** Making things neat and organized.
- **Retention:** Keeping things.

3. Power Needs

- **Abasement:** Confessing and apologizing.
- **Autonomy:** Independence and resistance.
- **Aggression:** Attacking or ridiculing others.
- **Blame Avoidance:** Following the rules and avoiding blame.
- **Deference:** Obeying and cooperating with others.
- **Dominance:** Controlling others.

4. Affection Needs

- **Affiliation:** Spending time with other people.
- **Nurturance:** Taking care of another person.
- **Play:** Having fun with others.
- **Rejection:** Rejecting other people.
- **Succorance:** Being helped or protected by others.

5. Information Needs

- **Cognizance:** Seeking knowledge and asking questions.
- **Exposition:** Education others.

Influences on Psychogenic Needs

Each need is important in and of itself, but Murray also believed that needs can be interrelated, can support

other needs, and can conflict with other needs. For example, the need for dominance may conflict with the need for affiliation when overly controlling behavior drives away friends, family, and romantic partners. Murray also believed that environmental factors play a role in how these psychogenic needs are displayed in behavior. Murray called these environmental forces "presses."

Research on Psychogenic Needs

Other psychologists have subjected Murray's psychogenic needs to considerable research. For example, research on the need for achievement has revealed that people with a high need for achievement tend to select more challenging tasks. Studies on the need for affiliation have found that people who rate high on affiliation needs tend to have larger social groups, spend more time in social interaction, and more likely to suffer loneliness when faced with little social contact.

Interactionist Perspective

- Is people's behavior best explained by the circumstances and situation they find themselves in, or by their personality, which guides behavior no matter what the situtation is?
- Does the personality of an individual transcend the immediate situation and moment to provide a consistent guide to his or her actions or is what a person does completely dependent upon the situation he or she is in at the time?

For example, if you were placed on the sport field or in militiary combat, you would probably behave more aggressively than normal. In fact, even quite passive and submissive people become aggressive given sufficient provocation. This suggests that behavior may be explained by understanding not only the personality, but how also how we react to the environment and circumstances. We term this emphasis on the role of situation circumstances, a "situational" view of personality.

The dispositional approach to personality, by definition, tries to identify those psychological characteristics which remain relatively stable for a person over time and across situations. This may have blinded personality theorists and researchers to the role that changing situational circumstances plays.

The question provoked by the situation vs. person debate is to what extent to which behavior can be predicted by personality vs. the extent to which behavior arises from the dynamics of the situation and to what extent from the inherent characteristics of the person themselves.

The person vs. situation debate has been hotly contested topic since the late 1960's. Perhaps not suprisingly, the answer is that behavior is best understood and both situation and person. Thus, as with the nature versus nurture debate, we may be better off studying the interaction more closely, to better understand the phenonmena of human behavior and experience.

Mischel (1968) sparks personality vs. situation debate

In 1968, Walter Mischel challenged the assumption that personality determined behavior, and instead claimed that people's behavior from situation to situation was variable and depended on the situational circumstances. In other words, the "situation" view is that behavior depends on the situation itself, whereas the personality view is that behavior depends on long-held characteristic personality styles and is consistently displayed no matter the situation.

Mischel reviewed the research literature and concluded that the correlation between personality and behavior was .20 to .40 - overall .30, which is small. This was used to argue that since there was only a small correlation between personality and behavior, then the role of personality was not all that important and the variability of behavior must be due to the situational demands (and to error).

Another prominent situationist, Richard Nisbett (1980, cited in Funder, 2001) revised the personality-behaviour correlation upwards to .40, but this is still a small relationship. If you use the common squared correlation method there is an upper limit of only 16% i.e. only 16% of a person's behaviour can be explained by personality. Using the Binomial effect size it's 20%, so the implication is that personality doesn't explain much of behavior.

However, those on the side of personality argue that:

- The low personality-behavior correlations do not prove value of situational variables (the cause may be an unmeasured personality variable; i.e. stronger proof would be a high correlation between situational variable and behaviour).

- the real relationship between personality and behavior is higher than .40; i.e., .4 is a lower-bound estimate due to error in research instruments, etc.,
- .40 is not small; this can be translated (using effect sizes) to saying that knowing someone's personality characteristics allows prediction of behavior about 70% of the time (assuming we could predict behavior 50% of the time by chance) (Funder, 2001)
- that personality is a strong predictor of behavior across all situations (i.e., of someone's overall trends), but is not a strong predictor of an individual's behavior at a specific time in a specific situation; e.g., personality more accurately predicts how happy you will be over the next year than it will predict how happy you are today
- people choose their situations, and these choices reflect personality; e.g., an introvert may choose to work in a library
- there are no other psychological variables which predict behavior more strongly that personality traits; so even though the correlations may seem low, personality traits are still the most useful psychological tools
- Personality research has improved considerably since the research reviewed by Mischel; this helped Nisbett to upwardly revise the relationship to .40. That was over 20 years ago, and quite possibly the figure could be revised upwards further based on more recent research; however this view can be contrasted by the publication bias in research journals towards results which show significant relationships!

Interactionism: The interactionist perspective on the situation vs. person debate

Traits and Situations interact to influence behaviour - how else could it be?. Its like the genetics vs. environment issue, one cannot exist without the other). So, the trait and situationist perspectives are too simplistic: reality is more complex. In reality, different situations affect different people in different ways. Some situations allow expression of personality, other situations provoke a narrower range of behaviour. Thus,

Behaviour = personality x interpretation of the situation

It is vital to appreciate that there are individual differences in the personality-situation relationship. High self-monitors display less consistency across situations in their behaviour because they try to adapt more to the situation. Low self-monitors display more consistency in their behavior across situations because they less to adapt to situations.

Research (Kenrid et al, 1990) has shown that a trait will show up only in a situation where it is relevant. So anxiety may show up as a predictor of behavior some situations, and not others. Also, some situations allow expression of personality, others provoke narrower range of behaviour.

In summary:

- Some individuals show more consistent behavior
- Traits may only emerge in some situations; traits do not have a constant influence on behavior, their influence waxes and wanes
- Some situations allow expression of personal, whilst others provoke a narrow range of behavior (e.g., situation is strongly predictive of behavior of people hostage during a hijacking of a plane, whereas personality is strongly predictive of behavior during an exploratory art therapy session)
- People display their traits by all that they do, including choice of situations, e.g., choice of career, choice of relationship, choice of lifestyle, etc.

In conclusion, the person-situation debate has lead to more dynamic approach to understanding how personality traits and situations interact to produce a person's behaviour.

Behavior Contingency Units

Behavior Contingency Units are the close association between a person's behavior and the stimulus or cue properties of the setting in which it occurs. Substantial proportion of behavioral variance is accounted for by situational variables.

Bowers, Bem and Allen's Viewpoint

Situations are as much a product of the person as the person's behavior is function of the situation. The

individual's capacity to shape the environment is evidenced quite clearly through behavioral processes such as art, architecture and community planning Cognitive processes also play significant role in structuring the environment.

Metron's Self Fulfilling Prophecy

Self Fulfilling Prophecy is a person's expectations about other people that lead him to act in a way that brings out the traits that he expects them to have.

This is where interactionsit view of the environment and behavior assumes a dynamic interchange between man and the environment in which people affect, and are affected by their settings.

Lesson 21

ENVIRONMENTAL CHANGES AND STRESS

Humans are incredibly adaptable; when not satisfied with their lot, they have the intelligence and ingenuity to create new things, to adapt to what is available, and even to adjust or alter their living environment to make it more congenial. But this flexibility is daily being challenged.

Forces from within the species (e.g., violent crimes, war, acts of terrorism, and genocide), widespread natural catastrophes (e.g., famines, floods, droughts, earthquakes, and volcanic eruptions), and ever-increasing and dangerous technological developments (e.g., faster automobiles, increasing numbers of aircraft attempting to occupy the same air corridors, escalating numbers of chemicals, and the proliferation of nuclear devices) are coalescing to test the limits of human adaptability. Additionally, interpersonal forces demanding more material goods and greater and more efficient provision of services are increasingly straining limited physical and human resources.

In the process of developing technology and modifying the environment to make it serve the goals of comfort and luxury, a world has been created that is itself potentially lethal. Air, water, and noise pollution, accelerating energy consumption, pressures toward excessive work and an increased tempo of life are but a few manifestations of these forces.

Thus, over and over again in the course of daily living, we witness threats to human adaptability, feel pressure for increased ingenuity to provide protection from external forces, and struggle to reconcile material possessions with individual desires. The operation of these forces is inextricably tied to what has commonly come to be labeled ***stress.***

But what exactly is stress?

Personal accounts of stress, scales for measuring it, instructions for coping with it, and personality tests to see how well one can endure it have found their way into print and are supplemented by TV and radio accounts featuring self-proclaimed "experts" in its early detection and management. Hardly a week goes by when we are not reminded by some talk show host and "enlightened guest" that we are living in a stressful world. Often we are told that if we would only follow the exercise program, the dietetic regime, or the religious practices of the "guest of the day" our stress would dissipate and we could live normal, happy lives.

Although these claims have dubious value, a potentially robust way to understand the interrelationships between environment and behavior might be to consider the role of stress on human functioning. In this regard, the concept of stress has been helpful in specifying environmental characteristics that interfere with human functioning, that create physiological or psychological discomfort, and that lead to ill health (Evans & Cohen, 1987).

Defining Stress: Theoretical Perspectives

Stress has been defined as a state that occurs when people are faced with demands from the environment that require them to change in some way. Most researchers agree with this definition. What they do not agree on is whether stress is the demand itself or the person's response to that demand.

Response Based Definition of Stress

Some theorists have argued for a response-based definition of the term. Stress, they argue, should be defined in terms of some change from base rate in the number or intensity of some specified response. Response candidates have included psychophysiological measures like galvanic skin response, heart rate, blood pressure, and such corresponding psychological manifestations as anxiety, loss of individual control, and lowered self-esteem. In this sense stress can be defined in terms of "blood pressure above some threshold," or "change in heart rate greater than some specified minimum," or "anxiety scores exceeding some predetermined cut-off."

Objections to Response Based Definition

A major problem with this approach is that these same responses occur as a result of very different stimuli (e.g.,

heart rate may increase as a result of physical exercise, viewing a horror movie, riding a roller coaster, or waiting for a blind date). Likewise the psychological manifestations of anxiety, loss of felt control, and lowered self-esteem have myriad antecedents. But, while the immediate responses may be similar, the enduring effects resulting from these various sources are likely to be highly variable (e.g., the anxiety felt as a result of going on a blind date is not likely to have the same long-term repercussions as the anxiety resulting from impending layoffs at one's place of employment).

A definition of stress featuring only the "immediate" response component of the *stimulus-organism-response* system will, therefore, inevitably prove inadequate.

Stimulus-Based Definitions of Stress

Other theorists have argued for a stimulus-based definition of stress. They argue for taxonomy of environmental events based on their covariation with systemic, psychological, and/or social disturbance, and include such events as noise, air, and water pollution, population density, odors, loss of loved ones, and changes in life style. The emphasis here is on environmental events that impact on any of several response systems either immediately or as a result of prolonged exposure.

A stressful environment, for example, is one where noise level exceeds some specified decibel (dB) level, or where the carbon dioxide concentration equals or exceeds some agreed-upon value, or where environmental occupants exceed some number.

Problems with Stimulus Based Definition

It can be seen that a major problem with this view is that any stimulus may or may not be disturbing (stressful) depending on the personality of the individuals involved, the situation in which the event occurs, other competing behaviors, and the rewards and costs involved in dealing with the event. For example, a loud stereo can be enjoyable at a party, but very disturbing (stressful) if you are preparing for final exams; likewise, both high population density and isolation can be stressful or enjoyable depending on the amount of contact desired. Thus, it can be seen that nomothetic approaches to defining stress only in terms of the stressor also run into difficulty.

Lesson 22

STRESS AS CAUSE AND EFFECT

It is possible to think of stress as both something that is happening to a person and the person's response to what's happening. It involves environmental and psychological events, the interpretation of these events, and behavioral as well as physiological responding. Noisy environments, for example, may be related to physiological, psychological, and behavioral changes in those exposed to the noise. These responses, in turn, may change the nature and interpretation of the noise itself (i.e., noise changes neural activity in the reticular activating system, which subsequently changes the organism's perception of the noise; this altered perception, in turn, influences reticular activating system activity, and so on). Stress, therefore, is neither the stimulus nor the response; it is a process involving both, and, as a process, it influences the ways in which environmental events are attended to, interpreted, responded to, and changed. It is also the process within which the responder also is likely to be changed.

While the specification of just what stress is has yet to be fully articulated, it is clear that such a thing actually exists, and it appears to involve physiological, psychological, and behavioral responding. It is also clear that at times it may even play a broader role by affecting human social systems. Confronted by environmental events which pose threat, challenge or danger, organisms respond physiologically, psychologically, and behaviorally. These responses not only are helpful in meeting the demands of the changing environment, but may even alter that environment, making it more benign (not always without cost to the organism). Monat and Lazarus (1977) have defined stress as any event in which environmental demands and/or internal demands (physiological or psychological) tax or exceed the adaptive resources of the individual, his or her tissue system, or the social system of which one is a part. (cf. Cohen, Evans, Stokols, & Krantz, 1986; Singer, 1980). Within this definition, change becomes stressful only when it strains the coping capacities of the entire organism/environment system to adapt to the change. This definition encompasses aspects of both the stimulus and the response, and includes the organism as an active participant in the process. It is therefore consistent with definitions utilized by most current researchers and is the one that will be used when referring to stress throughout the remainder of this text.

It is very important to understand the role of perception in understanding the relationship of organism to environment. Most of the time the environment is perceived as falling within the organism's "window of adaptability" and therefore the influence of the environment can be characterized as steady-state. The above definition of stress presupposes that this is not always the case, that states of disequilibrium can occur, and that sometimes this disequilibrium "taxes or exceeds the adaptive resources" of the entire organism/environment system. Fundamental to dealing with this state of affairs is the ability to evaluate the environment in terms of the demands that are being made, and to assess the self with respect to the resources available to deal with these demands. This process is known as *appraisal* and will be turned to next.

Appraisal

One's perception of the environment as well as one's attitudes toward the source of stress will mediate the individual's response to it. If we believe that a stres-sor will cause us no permanent harm, our response will likely be less extreme than if it carries the threat of lasting harm. Also, if our attitudes are strongly in favor of something that is potentially harmful, we may appraise the threats as less alarming. Individuals who believe that nearby airports are an economic asset to the community are less concerned with the noise generated by planes taking off and landing than are people who do not perceive such benefits. There are three basic types of assessments made with regard to potential stressors. We can assess the environmental event as posing a challenge or constituting a threat, or we can assess it in terms of the damage it has already done. While we have separated these appraisals for the sake of exposition, it is likely that all three take place in response to most environmental stressors.

Harm or loss assessments typically involve analysis of damage that has already been done. The properties of a sudden event such as a tornado may predispose people toward such appraisal because damage is done very quickly and people are more concerned with the immediate consequences than the possibility of more. Bereavement is also likely to reflect a harm-loss evaluation in the wake of the loss of a loved one, although when a loved one has been chronically ill for an extended period of time, bereavement may also occur in anticipation

of loss. In addition to the actual loss of a loved one, we may be concerned with demands that will occur after death. Concern over these types of demands can be interpreted as challenges or as threats, that is, "Let's get on with life," or, "How will I get on with life?"

Threat appraisals are concerned with future dangers. If a tornado is sighted, it may initially be appraised as a threat and subsequently be appraised as something else. The stress of moving away to college, of learning to live with a roommate, and similar events is largely anticipatory as a student prepares to start school. Likewise, waiting to take an exam may be more stressful than taking it or even failing it. The ability to foresee problems and anticipate difficulties allows us to solve them or prevent their occurrence. At the same time, though, it may lead to the perception of threat and, thus, anticipatory stress.

Challenge appraisals focus not on the harm or potential harm of the event, but on the possibility of overcoming the stressor. Some stressors may be beyond our ability to cope, but we all have a range of events with which we are confident of our ability to cope successfully. Stressors that are evaluated as challenges fall within this hypothetical range. The event may be seen as potentially harmful, but we feel that we can prevent the harm from occurring. A person may have just lost his or her job because of a plant relocation. This stress can be seen as threatening (how are we going to make ends meet; how will we survive?) or as challenging (what else can I do to make a living; how can I make the best of a bad situation?). The magnitude of the stressor, our estimates of our coping resources, and our styles of coping with problems all determine whether an event is seen as challenging or threatening. Among the primary psychological variables that affect these appraisals are our attitudes toward the source of stress. These attitudes may act to moderate or intensify our reactions to stressors. In summary, if we perceive our immediate environment as challenging or threatening to equilibrium and, if the perceived demands of that environment tax or exceed our ability to satisfy or alter those demands, then stress occurs. Coping behaviors are selected to relieve that stress, and secondary appraisals are made to determine the efficacy of those selections. Before looking at the characteristics of environments and the predispositions of organisms that lead to stress, a brief description of the physiological and psychological processes involved is necessary. It is to these systems that we turn next.

PHYSIOLOGY OF STRESS

Although the causes of stress are many and varied and can be either pleasant (e.g., a passionate kiss) or unpleasant (e.g., an electric shock), they all demand adaptation. This adaptation invariably involves the activities of various hormones and numerous biological systems including the hypothalamus, cerebral cortex, reticular formation, limbic system, and autonomic nervous system. Regardless of its ultimate expression, the stress response is initially activated by alerting the organism to environmental change and readying it for action. This process is generally labelled ***arousal.***

Arousal

In the core of the hindbrain and extending upward to the midbrain and fore-brain is a network of neurons known as the ***reticular formation***. This network of nerve fibers, with cell bodies in the interior of the brain stem and axons projecting throughout the higher brain center, is referred to as the reticular activating system (RAS). The basic functions of these neural branches are twofold. First, they screen information on its way to the higher centers in the brain, blocking irrelevant information and allowing relevant information to pass upward where it can be processed and acted upon. Second, the RAS has the job of *alerting* the cerebral cortex. According to Beck (1983) the reticular system works "something like a fire alarm that gets people into action but does not really say where the fire is". Through this system the organism is made vigilant and aware of what is happening in the environment, and is made ready for action. Included in this readiness are "increased metabolism of carbohydrates to produce more glucose and the release of fatty acids for greater energy, higher heart rate and oxygen consumption, constriction of blood flow to peripheral areas of the body with greater supply to the skeletal muscles, kidneys and brain" (Evans & Cohen, 1987; p. 576). This increased readiness, coupled with appropriate information about bodily needs and environmental demands, plays an important role in determining the ultimate expression of behavior.

The capacity of sensory stimulation to guide behavior is poor, however, when arousal is either very high or very low. With very low arousal, the sensory message does not get through; with very high arousal it is likely that too many messages get through and prevent the organism from responding selectively to appropriate stimuli. The

latter presumably is what happens when people "lose their heads" in an emergency and to soldiers who panic under enemy fire. Thus, an intermediate level of arousal produces optimal functioning. What constitutes low, high, and intermediate arousal, however, varies as a function of a number of constitutional and psychological characteristics. For some people a ride on a double-loop roller coaster is not all that arousing, whereas for others the merry-go-round provides more than enough arousal.

When the RAS is damaged the organism becomes comatose and is unresponsive to stimulation. Additionally, drugs such as amphetamines increase RAS activity, whereas barbiturates depress it. Thus, arousal is partially neuro-chemical, and partially subjectively determined. What is becoming increasingly clear is that arousal is related to stress and is the mechanism by which the organism is alerted to changes in bodily needs and environmental demands. Ultimately, if one is to understand the role of the external environment in influencing human behavior, one needs to understand the arousal-producing properties of that environment. An understanding of how that arousal gets translated into goal-directed behaviors is also required.

Lesson 23

GENERAL ADAPTATION SYNDROME (GAS) & PSYCHOLOGY OF STRESS

Hans Selye (1976) has extensively studied the body's reaction during stress and has postulated that it occurs in three major phases:

1. Alarm reaction
2. Stage of resistance
3. Stage of exhaustion.

1. Alarm Reaction

In response to any stressor, either physical or psychological, the hypothalamus is activated, mediating the secretion of large amounts of ACTH by the pituitary. This ACTH, in turn, stimulates the adrenal cortex to secrete increased amounts of adrenal corticoids. In general, these hormones activate the organism (as discussed in the previous section) allowing it to deal more adequately with its environment. This phase is called the *alarm reaction.*

2. Stage of Resistance

In the second stage the organism recovers from the initial stress and begins to attempt to cope with the situation, mobilizing the body physically as well as psychologically to meet the demands of the environment. The organism, in a sense, is resisting the demands of the situation This stage was, therefore, labelled by Selye as the *stage of resistance.*

3. Stage of Exhaustion

If the organism is unsuccessful in its attempts to cope, or if the stress persists, the *stage of exhaustion* is reached. At this stage the adrenal gland can no longer respond to the stress by secreting adrenal corticoids and the organism has exhausted its ability to cope with the stressor.

Important issues for consideration in this area are: how the stress of overpopulation is related to increased adrenal activity and to adrenal hypertrophy; how this has an inhibiting effect on gonadal functioning resulting in a decline in reproductive fitness, and ultimately to a decline in population and population density.

Evans and Cohen (1987) suggest that chronic exposure to a variety of environmental and/or social psychological conditions can in and of themselves be stressful, that the process of coping with them can be stressful, and that the " energy available for dealing with these conditions is limited. Thus, like Selye, they suggest that prolonged stress will eventually deplete the individual's adaptive resources.

Both approaches imply that stress produces a physical "wear and tear" on the system, and when coping abilities are exhausted, the individual becomes vulnerable to a variety of physical and psychological disorders. For further discussion and a comparison of the psychological and physiological models of stress see Baum, Singer, & Baum (1981), Cohen, Evans, Stokols, & Krantz (1986), and Evans & Cohen (1987).

PSYCHOLOGY OF STRESS

There is growing awareness of the importance of psychological factors (i.e., cognitive and emotional processes) in response to the environment. Additionally, such factors as beliefs, attitudes, and perceptual sets may, themselves, act as .: threats For these reasons, researchers concerned with understanding stress are increasingly considering the impact of psychological variables and are incorporating them into stress theories as both mediators of physical stressors and as stressors in their own right (Frankenhaeuser, 1978; Kasl & Cobb, 1970; Lazarus, 1966).

Primary Appraisal: The Perception of Threat

Acknowledging the role of cognitive processes in stress suggests one reason for our susceptibility to it. We not only respond to dangers or threats that have materialized, but are influenced by our anticipation of them and by

symbols of dangers experienced previously (Wolfe & Goodell, 1968). Thus, a situation in which stress has been experienced (e.g., a dentist's office) may be symbolic of danger to us and we may experience stress in anticipation of danger when we are there (e.g., we may have increased blood pressure or perspiration simply while waiting for a friend at the dentist's office). Similarly, an event that has never occurred or may never occur may elicit stress. Living near a nuclear power plant or a toxic waste disposal site may engender stress in residents independent of whether either has ever precipitated imminent danger. In a study of the decontamination procedures at Three Mile Island, for example, stress levels were higher just before radioactive gases were released into the atmosphere than while the releases were actually occurring (Baum et al., 1980). Additionally, Veitch and colleagues (Stang & Veitch, 1985; Veitch, Stang, & Conley, 1985) have shown that merely living near a chemical waste disposal site can lead to levels of chronic stress nearing those that are experienced by individuals in the aftermath of actual technological and natural disasters.

Studies of anticipated crowding suggest that individuals experience stress when expecting to be crowded even if the crowding never actually materializes (Baum & Greenberg, 1975). Furthermore, Spacapan and Cohen (1983) have shown that subjects expecting to experience a cold stresssor exhibit as strong a stress response as subjects actually exposed to it. Psychological perspectives on stress, therefore, emphasize the role of interpretation or appraisal of potential stressors. When an event threatens harm or loss, or when internal demands challenge or surpass one's ability to adapt to them, the event or its demands are likely to result in an interpretation of stress.

Appraisal of potential stressors depend on a number of factors including attitudes toward the source of noxious stimulation, prior experience with it, knowledge of how to cope with it or knowledge of its consequences, and evaluation of its apparent costs. If, for example, residents of Onaga, Kansas, hear on the radio that a tornado watch has been issued for their area, the appraisal of this news will depend on their attitudes toward tornadoes, previous experience with them, the preparations they have made to cope with them, and the likely magnitude of the costs to be incurred should they actually be hit by one. When exposed to potentially stressful situations or events, we appraise the setting or the event and make judgments about how threatening it is.

After a situation is judged to be threatening and stressful (i.e., the environment possesses the possibility of potential loss, of danger, or merely represents a challenge), *secondary appraisals* are made. No longer concerned with assessment of danger, attention is turned to the dangers or benefits of different modes of coping with these threats. In a sense this is the psychological equivalent to the physiological "resistance stage" of the GAS. Later in this chapter we will look at specific moderators of the stress response.

Secondary Appraisal: Selecting Coping Behaviors and Evaluating Their Effectiveness

The perception of danger motivates a search for coping responses that will reduce this threat. Thus, one's response to a situation will depend on two kinds of appraisal. First, an interpretation of the situation and a consideration of its potential threat is made (i.e., primary appraisal); second, response choices to ameliorate the situation are considered (i.e., secondary appraisal).

By weighing the costs and benefits of these choices, a coping strategy is selected. Coping involves both action-oriented and intrapsychic efforts to manage environmental and internal demands, and conflicts among them, which tax or exceed a person's resources—that is, the individual masters, tolerates, or reduces the effects of environmental and internal demands. These actions are the end product of secondary appraisal, and if they are successful they bring the organism back into equilibrium with its environment.

An individual exposed to a stressor attempts to "prevent, avoid or con trol emotional stress" (Pearlin & Schooler, 1978, p. 3). This is indeed what coping is. It is a response to environmental or internal demands. Before such a response can be made, the individual must determine the resources available for making such a response, including social variables (i.e., the interpersonal network of which the individual is a part, including friends, relatives, fellow workers, neighbors, etc.), psychological resources (i.e., the personality characteristics that people draw upon to help them withstand the stressor), and constitutional resources (i.e., genetic strengths and vulnerabilities, state of health, etc.). Having assessed one's resources, a coping response is chosen, carried out, and its success evaluated.

Lesson 24

RESEARCHING STRESS: THE ENVIRONMENTAL CONTEXT

Organisms, including humans, undergo stress in the context of the greater environment of which they are a part. At any given moment the environment/ organism system can be in a state of equilibrium on some dimensions, but in disequilibrium with respect to others. It is therefore important to be able to identify potential sources of stress and to determine the levels of those sources likely to lead to disequilibrium.

Measuring Stressors: Qualitative Differences

Knowing the source of stress is important because a number of properties unique to the stressor can shape the appraisals made or the effects it may have. First, it is obvious that while some events are threatening to almost no one (a cool ocean breeze, for example) and some are threatening to almost everyone affected (a tornado), most events carry a range of potential problems, some or all of which will be appraised as stressful under some conditions, but not stressful under other conditions (a summer thunderstorm). Second, it is equally obvious that some sources of stress are ever-present and chronic (e.g., living near a toxic waste disposal site, or near a rail line or freeway) while others are recurring and acute (e.g., living on a floodplain, or an earthquake fault). Third, stressors can vary with respect to their predictability (the noise of the 3:15 a.m. freight train would be highly predictable, but the next nuclear power plant failure would not be), and controllability (while I might be able to control the ambient temperature of my office by a turn of the thermostat, I have no control over the path taken by a tornado).

FIGURE 5-3Some events are threatening to almost everyone affected and some are threatening to almost no one.

Evans and Cohen (1987) have compiled a typology of stressors. Their compilation is useful in that it allows distinctions to be drawn along several major dimensions, including how long the stressor persists, the magnitude of response required by the stressor, and the number of people affected.

Daily Hassles. The category that includes some of the most chronic environmental stressors has been labelled *daily hassles*. These are present during most of our daily lives and include such conditions as job dissatisfaction (Frankenheuser & Gardell, 1976; Kahn & French, 1970), neighborhood problems (Harburg, Erfrut, Chaperi, Hauenstein, Schull, & Schork, 1973), crowding (Langer & Saegert, 1977), and noise (Glass & Singer, 1972). We have all been confronted by automobiles that won't start on cold mornings, buses that run late, toasters that burn bread, bosses who demand too much in too little time, and neighbors who party too much or too late. Such is the stuff of life. These petty annoyances constitute the daily hassles and can be stressful. Individually they tax us little, but collectively and accumulatively they affect behavioral as well as psychological and physiological responding.

Cataclysmic Events. A second category represents those stressors whose sudden and powerful impact is more or less universal in eliciting a response, and which demand a great deal of effort for effective coping. These stressors, labeled *cataclysmic events,* were dealt with in greater detail in Chapter 13. Examples include war, natural disasters, and nuclear accidents. These events are unpredictable and powerful and generally affect all who are touched by them. The accident at Three Mile Island, the eruption of Mount St. Helen, a plane crash, the heat wave in the American Southwest, the flooding in Missouri, as well as more common events like tornadoes, hurricanes, and other natural disasters, can be considered in this category of stressors (Baum, et al., 1980; Pennebaker & Newtson, 1983).

Major personal life events. A third group of stressors include those events powerful enough to individually challenge our adaptive abilities. These events include illness, death, or significant loss (psychological or economic). The label attached to this type of stressor is *major personal life events*. See Table 5-1 for a partial listing of some common stressors. The distinction here is important because coping with cataclysmic events entails sharing loss with numerous others, whereas loss sustained by the latter involves only a few people. Further, McGrath (1970), Schacter (1959), and Cobb (1976) have identified affiliative and social comparative behavior as a reasonable means for coping with and understanding the effects of stress; hence, the number of people affected by the stressor may play a critical role in dealing with it. While the old adage that misery loves company may or may not be true, it is most often true that the greater numbers of people who share in the stress of personal life events, the easier they are to deal with.

Ambient stressors. A final class of stressors has been labeled *ambient stressors* and includes such environmental background conditions as work overload, poverty, family conflicts, and air pollution. They represent the relatively continuous, stable, and intractable conditions of the environment (Cambell, 1983).

TABLE 5-1 A Partial Listing of Some Common Stressors

Listed below are a number of events that sometimes bring change in the lives of those who experience them and that necessitate social readjustment.

Marriage
Death of spouse
Death of close family member
Foreclosure on mortgage or loan
Outstanding personal achievement
Female pregnancy wife/girlfriend pregnant
Changed work situation
Major change in living conditions
Trouble with employer
Change in residence
Major change in financial status
Gaining a new family member
Marital separation from mate
Marital reconciliation with mate
Major change in church activities
female having abortion
Detention in jail or comparable institution
Major change in sleeping habits
Major change in eating habits
Death of a close friend
Minor law violation
New job
Sexual difficulties
Trouble with in-laws
Major change in closeness of family
Being fired from job
Borrowing less than $10,000

Borrowing more than $10,000

Male: girlfriend having abortion

Major personal illness or injury
Divorce

Retirement from work

Ending of formal schooling
Leaving home for the first time

Major change in social activities

Son or daughter leaving home

separation from spouse
Breaking up with boy/girlfriend

Reconciliation with boy/girlfriend

Engagement

Source: Holmes, T. H., & Rahe, R. H. (1967) The Social Readjustment Rating Scale. *Journal of Psychosomatic Research, 11,* 213-218.

These stressors may go unnoticed until they interfere with some important goal or directly threaten one's health. People habituate to rather than actively attempt to confront these stressors. For example, it is often easier to live with family problems than to seek professional help or dissolve the relationship; it may be easier to breathe polluted air than to take measures to clean it up or to move.

Lesson 25

MEASURING STRESSORS

Quantitative Differences

Numbers of easily recognizable qualitative differences exist among these categories of stressors and these have been alluded to in the above paragraphs. However, there are also a number of quantifiable dimensions among and with in these categories that can be expected to lead to differential responding and therefore need to be considered. Consequently, we now turn our attention to such variables as intensity, duration, rate, and controllability. Furthermore, we will suggest some ways in which these variables might be measured as well as their possible relationships to behavior.

1. **Intensity.** Intensity of the stressor refers in some sense to the "power" of the stimulus. Intensity can be "measured," for example, in terms of the magnitude or frequency (loudness or pitch) of sound, the concentration (parts per million) of a pollutant, the velocity of the wind, or the temperature or relative humidity of the atmosphere. It can also be measured in terms of its physical effects; for example, the number of homes destroyed in *a* flood, the number of persons killed by a tornado, the number of victims hospitalized as a result of a nuclear accident, or the number of birth defects resulting from water contamination.

It is generally assumed that the greater the intensity of the stressor, the greater the resulting stress response. And while this may be a warranted assumption, much more research needs to be done to determine if the functional relationship between intensity of the stressor and magnitude of the stress response is exponential, linear, curvilinear, or perhaps even some form of step function. Throughout the remainder of this text we will, where the data allow, suggest the probable form of these functions.

2. **Duration**. Independent of the intensity of the stressor is its impact with regard to time. The immediate presence of a tornado, for example, is relatively short (perhaps only a few minutes), but its intensity is great. On the other hand, an airborne pollutant (such as asbestos) might have a low concentration, yet be ever-present. Duration and intensity, it can be seen, are independent dimensions. All other things being equal, we can expect stressors of long duration to have a greater effect on the stress response than stressors of short duration. However, the accumulative effect of low-level stressors over long periods of time may result in deceptively severe consequences. Any consideration of the potential effects of an identified stressor, therefore, has to take into account both the duration of the stressor and its intensity.

3. **Rate.** While some stressors occur but once, many are recurring. Their periodicity can be regular or irregular, predictable or unpredictable, and short-phased or long-phased. For example, residents of a floodplain may expect that flooding will occur, but only in the spring of the year (perhaps on average once in ten years). This stressor is thus irregular and therefore unpredictable, with a relatively long phase. By comparison, the 3:15 a.m. freight train that rumbles past your apartment, alerting cars at the nearby corner with its silence piercing whistle, is regular (3:15 every morning) and therefore predictable and has a short phase (every 24 hours).

While very little empirical data has accumulated with respect to the influence of phase length on the stress response, there is some evidence to suggest that both regularity and predictability lead to increases in the stress of anticipation, but can also lead to decreases in overall stress by allowing for the careful selection of coping strategies (e.g., adaptation or habituation).

4. **Controllability.** Stressors vary with respect to the degree of control humans have over them. It is possible to exert some control over the temperature of our indoor environments, over the noise level of our offices, and even over the traffic we have to drive in. We do this by turning the thermostat either up or down, by putting sound-damping or sound-absorbing equipment in our offices and by choosing the times of the day and the routes to take to avoid traffic. It is not possible to exert control over other stressors. We cannot stop a hurricane; we cannot prevent an earthquake. There are still other stressors where it is possible, theoretically, to exert control, but practically we are unable to (e.g., the loud stereo in the adjacent apartment, or the litter in the streets below). Researchers have shown that the lack of control over environmental stressors where it is possible to have it can exacerbate the stress response.

In our discussion of environmental stressors throughout this text we will again and again be looking at potential stressors in terms of their intensity, duration, rate, predictability, and controllability, and we will be calling for additional means of measuring these characteristics.

Measuring Stress: The Immediate Response

Physiological and Somatic Responses

The most common measures of stress allow inferences about emotional states by assessing physiological reactivity. This has been done directly by measuring levels of catecholamine (e.g., adrenaline, noradrenalin) and corticosteroids in the blood or urine (e.g., Franken-haeuser, 1978), and indirectly by measuring systematic reactions caused by increased levels of these hormones (e.g., Ax, 1953). Increased cardiovascular reactivity (i.e., faster heart rate, higher blood pressure), muscle potential changes, and skin conductance measures have also been used to show the effects of acute stress.

These somatic correlates of stress are important for a number of reasons. First, increased catecholamine and corticosteroid secretion is associated with a wide range of other physiological responses, such as the aforementioned changes in heart rate, blood pressure, breathing, muscle potential, and other autonomic functions. Prolonged or sudden elevation of circulating catecholamine may damage body tissue. Catecholamine also appear to affect cognitive and emotional functioning, and elevated levels of epinephrine or nor epinephrine in the blood may affect our mood and behavior.

Cannon (1929, 1931) suggested that adrenaline has a salutary effect on adaptation; by arousing the organism, adrenaline provides a biological advantage to the organism, enabling it to respond more rapidly to danger. When we are extremely frightened we experience an arousal that, although possibly uncomfortable, readies us to act against the thing that scares us. Thus, stress-related increases in catecholamine may facilitate adaptive behavior. In fact, studies have shown superior performance on tasks following epinephrine infusion (Frankenhaeuser, Jarpe, & Mattell, 1961). However, arousal has also been associated with impaired performance on complex tasks (cf. Evans, 1978). In any event, it is clear that arousal influences behavior.

Measuring Stress: The Long-Term Response

Stress and Illness

Studies of stress and illness provide additional evidence of the negative effects of stress. While illness traditionally has been viewed as a biological phenomenon, there seem to be diseases that do not fit within a strict biomedical model (i.e., they do not appear to be the result of specific physiological dysfunction or an invasion by some foreign substance). Diseases of *life style,* such as heart disease, seem to be related to patterns of coping that characterize behavior. Hypertension, heart disease, and the like are not contagious; they do not seem to be caused by germs, microbes, or other simple infection-causing mechanisms. Rather, they develop over a person's lifetime and are contributed to by a number of factors including responses to stress.

Model A:

Dohrenwend & Dohrenwend (1981) have conceptualized the possible processes whereby stress induces adverse health changes (see Figure 5-4). In this figure, Model A contains no intervening processes. Rather, it postulates a simple and direct effect of stressful events on health. It further suggests that the effects of stressful life events are cumulative, thus accounting for studies of extreme situations, such as combat or incarceration in concentration camps. Other severe stresses over which an individual has no control, such as the death of a loved one, are also accounted for by this model. This model is called the *victimization hypothesis.*

Model B:

Model B, the *stress-strain hypothesis,* postulates that psychophysiological strain mediates the impact of life events on subsequent health and illness. Evidence in support of this hypothesis comes from studies that show that if the effects of symptoms of psychophysiological straining are eliminated, correlations of stressful life events scores and measures of illness are significantly reduced (Bloom, 1985). This model is most closely related to the conceptualization of stress in this text.

Model C:

The *vulnerability hypothesis,* suggests that there are preexisting personal dispositions and social conditions which moderate the causal relation between stressful life events and health. It is this model that suggests to researchers a search for such mediating factors as the strength of social support systems, optimism, locus of control, etc.

Model D

By contrast, postulates that personal dispositions and social conditions make independent causal contributions to the occurrence of pathology. This model suggest that personality variables and/or social conditions are a potential source of added burden to the individual in the precipitation of illness and is thus called the *added burden hypothesis.*

Model E

Psroposes that transitory life events have no role in precipitating illness, but rather that stable personal characteristics and social conditions by themselves cause adverse health changes. This model is called the *chronic burden hypothesis.* Finally, Model F portrays stressful life events as exacerbating already existent health disorders. It is called the *event proneness hypothesis* because stressful life events are thought to characterize individuals who are already ill.

Research on the relationships between stress and illness has been conducted in several settings and at different levels. Early research, for example, considered the stress of the mass bombings of London during World War II, and the stress associated with the German concentration camps. Many survivors of these brutalities showed relatively permanent adjustment problems. Others showed elevated blood pressures during initial exposure, greater physical illness later, and a greater incidence of premature or sudden death than did people their age who did not undergo the stressful experience.

Other studies (Reynolds, 1974; Warheit, 1974) reveal dramatic examples of stress-related illness and death. Research conducted at the space center at Cape Kennedy during the last years of this country's moon program considered base employees who monitored moon missions from the ground. Increased rates of alcoholism and divorce were observed as pressure to complete the mission increased. More seriously, there was a spontaneous increase in sudden deaths among the relatively young workers. These deaths, presumably caused by heart failure, were nearly 50 percent more frequent than the average for that age group. The sudden deaths peaked as the space program was being phased out and, as Eliot and Buell (1979) note, "was most notable during the year when space employees were fired more often than rockets."

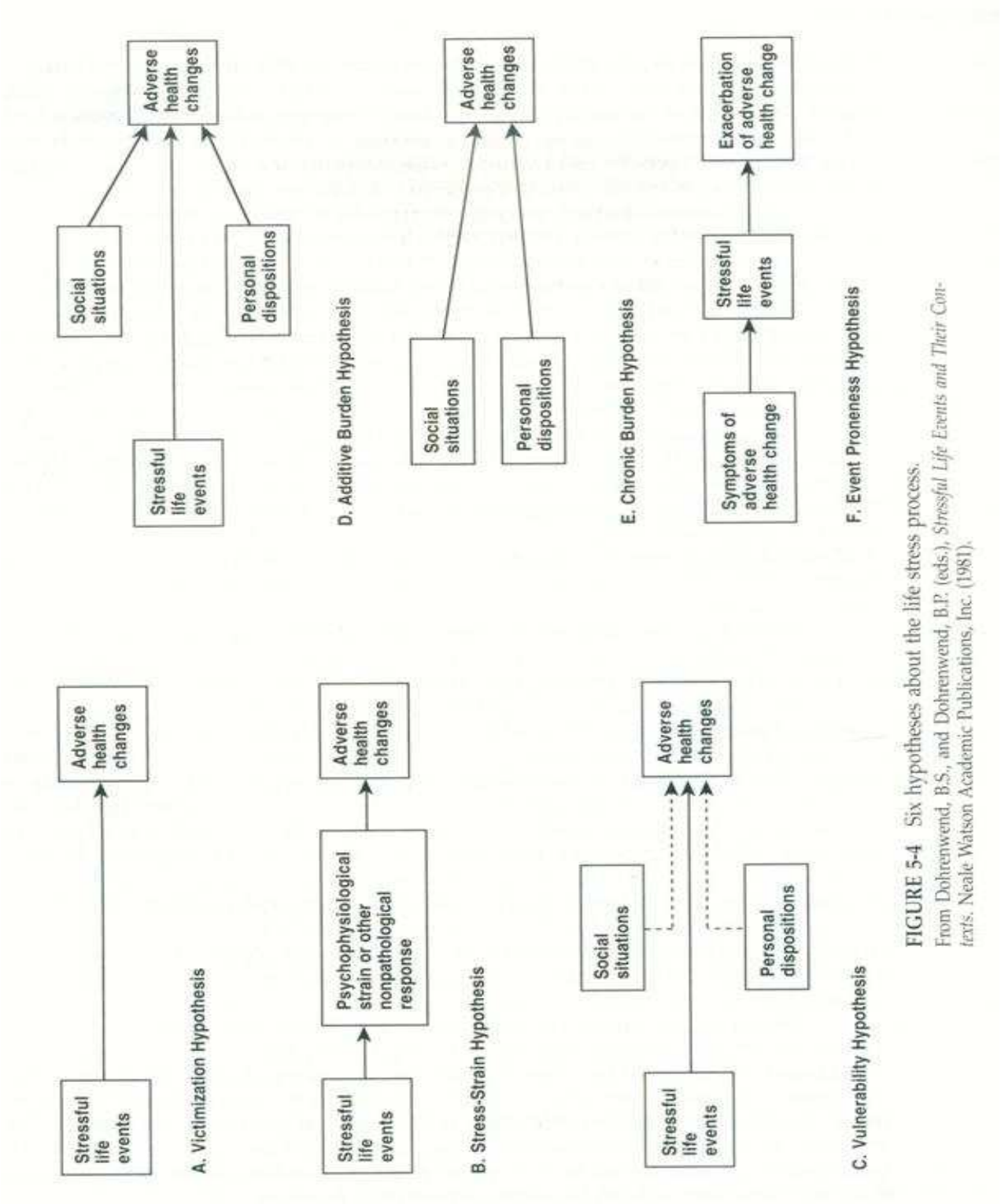


FIGURE 5-4 Six hypotheses about the life stress process.
From Dohrenwend, B.S., and Dohrenwend, B.P. (eds.), *Stressful Life Events and Their Contexts*. Neale Watson Academic Publications, Inc. (1981).

Research on stress and the human immune system has revealed some extremely interesting findings. The immune system manufactures antibodies to fight against invasions of bacteria, viruses, allergens, and even cancerous cells. Evidence suggests that functioning of the immune system is impaired while a person is experiencing stress, thus leaving the individual more vulnerable to disease (Jemmott & Locke, 1984). One study involving college students found that secretions of immunoglobulin (an antibody that fights against upper respiratory infections) were lower when the students were under stress (during midterm and final exams). Their rate of respiratory infection also was up during these same periods (Jemmott, Borysenko, McClelland, Chapman, Meyer, & Benson, 1983). Higher stress levels have also been shown to be related to low T-lym-phocyte

responsiveness (Zautra, Okun, Robinson, Lee, Roth, & Emmanual, 1989) and to a greater spread of cancer through the lymph nodes (Morris, Greer, Pet-tingale, & Watson, 1981).

Generally speaking, illness as a function of stress is a result of the stress response more than it is a part of it. If stress is sufficiently prolonged, repeated long enough or severe enough to resist adaptation, illnesses such as Selye's diseases of adaptation are more likely. To some extent, these are directly caused by the continuous high level of physiological responding characteristic of stress. This is analogous to a car's engine continuously racing at high RPMs. Eventually, this over activity will cause engine breakdown. Chronically elevated levels of catecholamine, blood pressure, or gastric acid can cause a number of diseases. Reduced efficacy of the immune system can cause or exacerbate others. The important point is that the stress process can predispose an organism to illness or death.

Lesson 26

MEASURING STRESS: PSYCHOLOGICAL ASSESSMENT

Psychological Measures

Psychological measurement of the stress response has focused on various psychiatric symptoms and has utilized a variety of standard psychiatric symptom inventories. The common denominator among the various scales seems to be the extent to which respondents perceive themselves to be in an intractable situation marked by negative affect and a degree of uncertainty. Among the more widely used psychological measures of stress are the Hopkins Symptom Checklist, a self-report measure incorporating the dimensions of obsessive-compulsiveness, hostility, depression, somatization, and anxiety (see, for example, Derogatis, Rickels, & Rock, 1976), the State-Trait Anxiety Inventory (see Spielberger, 1972), the Demoralization Scale (see Dohrewend, Dohrewend, Kasl, & Warheit, 1980), and the Life Experience Scale (see Sarason, Johnson, & Siegel, 1978).

These scales, collectively, reflect distress arising from perceptions of bodily dysfunction. Complaints focus on cardiovascular, gastrointestinal, and respiratory systems with such manifestations as headaches, pain and discomfort localized in gross musculature. They also tap such behaviors and feelings as restlessness, nervousness, free-floating anxiety, panic, aggression, rage, and resentment. Thoughts, impulses, and actions that are experienced as unremitting and irresistible but are simultaneously ego-alien and unwanted are also assessed. Finally, some attempt is made to have respondents identify the sources of their feelings and the impact that each of these sources may have.

Measures of Coping

The level of stress a person experiences and the extent to which deleterious effects occur as a result of exposure to a stressor will depend, in part, on how well the individual copes with the stressor. The theoretical literature (e.g., Lazarus & Folkman, 1984) as well as the practitioner literature (Switzer, 1979) acknowledge this. Empirical studies, however, are rare, owing in great part to a lack of scales with known psychometric properties or verified construct validity. At a conceptual level it is possible to think of coping as taking one or more of several forms, each focusing on some aspect of the stress situation. For example, individuals can engage in behaviors that attempt to alter the situation (in a cold environment the individual can change the thermostat setting, go to another room, put on another layer of clothing), they can attempt to manage or reduce the emotional distress (they can focus on the energy they are saving, they can convince themselves that colder environments are healthier), or they can attempt to manage the symptoms of stress by relaxation or diet or exercise. Scales that tap into these modes of dealing with stress are, at best, in the formative stage (see Latack, 1986).

Rather than focusing on scales that are intended to measure coping strategies, a second way of dealing with these issues is to consider the side effects of coping independent on the particular strategy being used. It is to these side effects that we turn next.

Behavioral Coping Responses

As already noted, stress can cause both cognitive deficits and improved performance. Cognitive deficits may in turn be caused by behavioral strategies that are used for coping—the person exposed to loud noise may "tune out" or narrow his or her field of attention (Cohen, 1978; Deutsch, 1964). But the same behavior may render us unable to concentrate or unwilling to put effort into a task (e.g., Glass & Singer, 1972). As exposure to stress increases, the adaptive reserves are depleted, causing aftereffects and reductions of subsequent coping ability. Evidence for the existence of poststres-sor effects comes from a number of sources, including research on the effects of noise (e.g., Glass & Singer, 1972; Rotton, Oszewski, Charleton, & Soler, 1978; Sherrod & Downs, 1974; Sherrod, Hage, Halpern, & Moore, 1977), crowding (Evans, 1979; Sherrod, 1974), and electric shock (Glass, Singer, Leonard, Krantz, Cohen, & Cummings, 1973).

Aftereffects that occur after exposure to a stressor include decreases in cognitive functioning and tolerance for frustration, increased aggressiveness, helplessness, decreased sensitivity to others, and withdrawal (Cohen, 1980). These postexposure consequences appear to be affected by perception of control during exposure to the stressor, with fewer aftereffects following experiences in which participants felt that they had control. One explanation for this is that aftereffects are related to the amount of effort expended in coping with a stressor. Because perceived control appears to ease the difficulties posed by a stressor, it should reduce the effort needed

to adapt, and therefore reduce aftereffects. Thus, costs of adaptation may be reflected by aftereffects, and we should be careful to look for them even when people seem to have successfully coped with a stressor.

MODERATORS OF THE STRESS RESPONSE

The extent to which a stressor produces adverse effects has been shown to be moderated by attitudes toward the stressor, perceived control over it, the general level of fitness of the individual, as well as by the support system that the individual has available. As these factors will increase or decrease a stressor's impact, we turn now to a discussion of them.

Attitudes Towards the Source of Stress

As mentioned earlier, responses to stressors are necessarily related to the way in which a stressor is perceived. Attitudes toward the source of the stress are important psychological factors and act as filtering devices that moderate perception of the stressor. For example, high levels of noise are generally recognized as potent environmental stressors (Glass & Singer, 1972). Although noise levels in areas surrounding airports are highly correlated with noise annoyance reported by residential groups in these areas, the relationship between noise exposure and individual ratings of annoyance is generally not strong (Wilson 1963). Tra-cor, Inc. (1971) found that individual annoyance ratings were more highly correlated with several attitudinal measures than they were with the various indices of physical exposure to noise. In a number of studies, attitudinal measures account for up to a third of the variance in response to noise, and that the addition of attitudinal measures increases the predictability of annoyance to between 58 percent and 65 percent (Leonard & Borsky, 1973; Tracor, Inc., 1971). There is even some evidence that manipulating attitudes changes people's evaluation of their environment (Cederlof, Honsson, & Sorenson, 1967). Fear of nearby airplane crashes seems to be the single most powerful predictor of individual annoyance in response to airport noise. Attitudes toward nuclear power are also related to its perceived costs and benefits. In a survey of residents in Truesdale County, Tennessee, where Tennessee Valley Authority officials planned to construct a nuclear power plant, it was found that supporters of the plant felt economic benefits would be more likely to result than did opponents of the plant. Opponents rated the disruptive effects of population growth and hazards to safety and environment as more likely than did supporters. The same process appears to have been active at Three Mile Island. Evaluation, thus, is a function of the balance between perceived benefit and cost. To the extent that cost is weighed heavily, attitudes may become more negative (see Chapters 4 and 14) and heightened stress is likely to occur.

Control

Perceived control is another powerful psychological mediator of stress, providing a sense of being able to cope effectively, to predict events, and to determine consequences before they happen. Glass and Singer (1972) considered the effects of perceived controllability and predictability in their studies of stress due to noise and found that predictable or controllable noise exacted smaller costs in adaptation. The perception that the noise might be accurately anticipated or even turned off, if desired, facilitated adaptation with minimal aftereffects. Subsequently, Sherrod (1974) found the same relationship for stress due to crowding, and Rodin, Solomon, and Metcalf (1978) found that providing control reduced crowding stress.

A study by Staub, Tursky, and Schwartz (1971) has some relevance here. Subjects who were given perceived control over shocks reported less discomfort than did subjects who did not control the intensity or administration of the shock. This was so even though all subjects actually received the same number and intensity of shocks and the "control" subjects did not actually exercise their control. The perception of control seemed to affect perception of the stressor used in this study. Similarly, Veitch (1976) found that residents of northwest Ohio who had individual control over the thermostat settings in their homes and apartments reported fewer ill effects of reduced residential temperatures in the winter months than those who did not have such control. Finally, evidence from Phifer (1990) suggests that such symptomology as gastrointestinal disorders, headaches, and susceptibility to infectious diseases is enhanced, if not caused by, inability to control environmental stressors.

Somewhat more direct evidence of control influencing appraisal of stressors comes from the growing literature on cognitive control. By providing subjects with information about a stressor prior to their exposure to it,

researchers have been able to reduce the threat appraisal made when the stressor is experienced. Some studies have considered medical settings and have found that the stress of surgery or of unusual medical procedures can be reduced by providing patients with accurate expectations of what they will feel (e.g., Johnson, 1973, 1984; Johnson & Leventhal, 1974; Taylor & Clark, 1986). By giving normative information about sensations to patients, researchers have provided them with "road maps" telling them what they may expect. As a result, when these sensations are experienced they will not be appraised as abnormal or frightening. Other studies have found that accurate expectations also reduce crowding stress (Baum, Fisher, & Solomon, 1981; Langer & Saegert, 1977). Inaccurate or violated expectations of crowding result in some negative responses (Greenberg & Baum, 1979).

Patient well-being and the effectiveness of medical treatment can also be improved by giving patients some choice in their treatment program (Miller & Mangan, 1983; Mendonca & Brehm, 1983). It would appear that providing patients with preparatory information or with some choice about the treatment they will receive can increase their feelings of control, self-confidence, and motivation and thus improve the effectiveness with which they deal with certain types of stressors. There is evidence, however, that shows that sometimes distraction and emotional disengagement may be more adequate coping strategies than the attention, involvement, and sense of personal responsibility provided by increased control. Carey and Burish (1988) have shown that distraction helps cancer patients undergoing chemotherapy from focusing on a variety of psychological side effects. Ludwick-Rosenthal and Neufeld (1988) suggest that the benefits of control must be balanced against its potential costs, and Ward, Lev-enthal, and Love (1988) caution that the short-term benefits of avoidance and denial must be weighed against their potential for long-term damage. Obviously, there is no universally beneficial treatment approach.

As a general rule, though, it can be said that to the extent that people have either real or perceived control over environmental stressors or are provided with accurate expectations (real or perceived) regarding those environmental events, the resultant stress will be reduced either in the appraisal stage of the stress process or in the coping stage. Any condition of the environment or information with respect to it that increases the person's sense of personal control should have a salutary effect on the stress response and should be sought after and developed where possible.

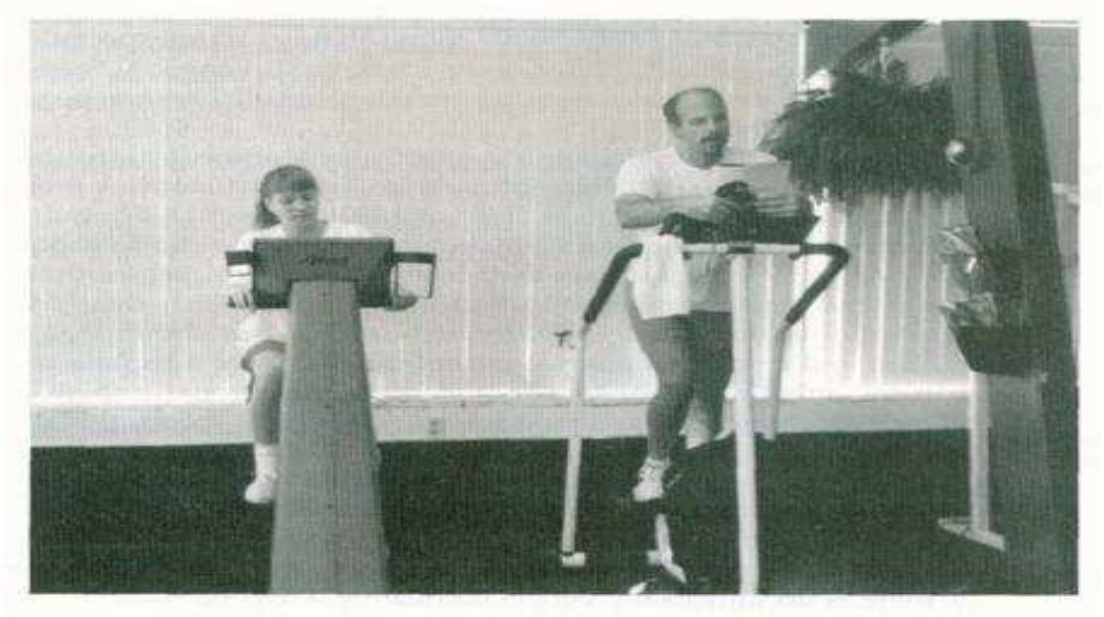
Lesson 27

ORGANISM ENVIRONMENT RELATIONSHIP

The Hardy Personality

Two additional factors that moderate the effects of stressors are the general level of fitness and the personality of the individual involved. Generally, the more one exercises, the greater one's physical fitness (endurance, strength, and maintenance of good physical condition), the less the chances for illness (Roth, Wiebe, Fillingim, & Shay, 1989). In addition to the physiological system being in "better shape" to with stand stress, it has been suggested that those individuals who are fit experience less cognitive and physiological arousal when confronting stress (McGilley & Holmes, 1988).

Often coupled with good physical fitness is a psychological factor involving a sense of commitment, the perception of difficult situations as challenges and opportunities, and the belief that one has control over one's life?



This factor has been labeled ***hardiness*** (Kobasa, 1979), and is related to what Zim-merman (1990) has called ***learned hopefulness:*** knowing how to solve problems paired with a sense of control. Contradic (1989) has shown that persons fitting the description of being "hardy" tend not to be overwhelmed by difficult situations; rather, they are spurred on to seek solutions, to be constructive. As a result, they experience less stress, contract fewer illnesses, and have lower blood pressure. Less hardy, more pessimistic individuals, on the other hand, report more symptoms of illness after experiencing stressful events (Scheier & Carver, 1987) and die at earlier ages (Peterson, Seligman, & Vaillant, 1988).

Social Support

Social support networks might be expected to ameliorate the effects of stressful events. The most obvious way in which a social support network operates is that "many hands make light the work."

Clearly, it there are more people working on "cleaning up" the effects of a tornado, each individual person has less of the burden on his or her shoulders. Cohen and Ashbey-Wills (1985) suggest that social networks operate in two ways. First, people who have social support are generally healthier to begin with, and second, when confronted by a stressful event, others in the network can act as a buffer providing comfort and encouragement and, if necessary, food and money (Pilisuk, Boylan, & Acredolo, 1987). Additionally, others in an interpersonal network provide opportunities for self-disclosure (Pennebaker, Hughes, & O'Heron, 1987), expressing emotion (Pen-nebaker & Beall, 1986), and problem solving (Costanza, Derlaga, & Winstead, 1988), all of which allow individuals to more effectively cope with stress.

The Relaxation Response

Just as stress can be thought of as a nonspecific response by the body to any demand that is made upon it, there is growing evidence that there is an anti-stress response, a relaxation response (Benson, 1975). Benson finds that in this response muscle tension decreases, cortical activity decreases, heart rate and blood pressure decrease, and breathing slows. The stimuli needed to produce this response, according to Benson, include a quiet environment, closed eyes, a comfortable body position, and a repetitive mental device. The first three factors lower afferent input to the nervous system, while the fourth lowers the internal stimulation to the nervous system. These conditions allow the body to reach a low level of arousal and to recuperate from stress. Benson suggests that these four conditions are met by most traditional and religious techniques of meditation and prayer, and further asserts that in addition to whatever spiritual function they may serve, such techniques directly promote recuperation from stress. Transcendental meditation, biofeedback techniques, some forms of verbal self feedback, and certain group experiences also appear to share these qualities and may account, in part, for their success in dealing with stress.

THE ROLE OF STRESS IN UNDERSTANDING ORGANISM-ENVIRONMENT RELATIONSHIPS

Stress is characterized as a process that unfolds as we encounter a stressor, become aware of its danger, mobilize our efforts to cope with it, engage in confronting it, and succeed or fail in adapting to it. This process follows a logical sequence (see Figure 5-6). The danger posed by a stressor is evaluated; strategies are selected to cope with it; the body mobilizes itself psychologically as well as physiologically to combat the stressor; and the coping is put into action. If coping behavior is successful, adaptation is achieved, and the effects of the stress diminish. If coping is unsuccessful, stress persists, physiological arousal and psychological arousal are not reduced, and pathological end states (gastrointestinal disorders, cardiac malfunction, psychological disorders, etc.) are made increasingly likely.

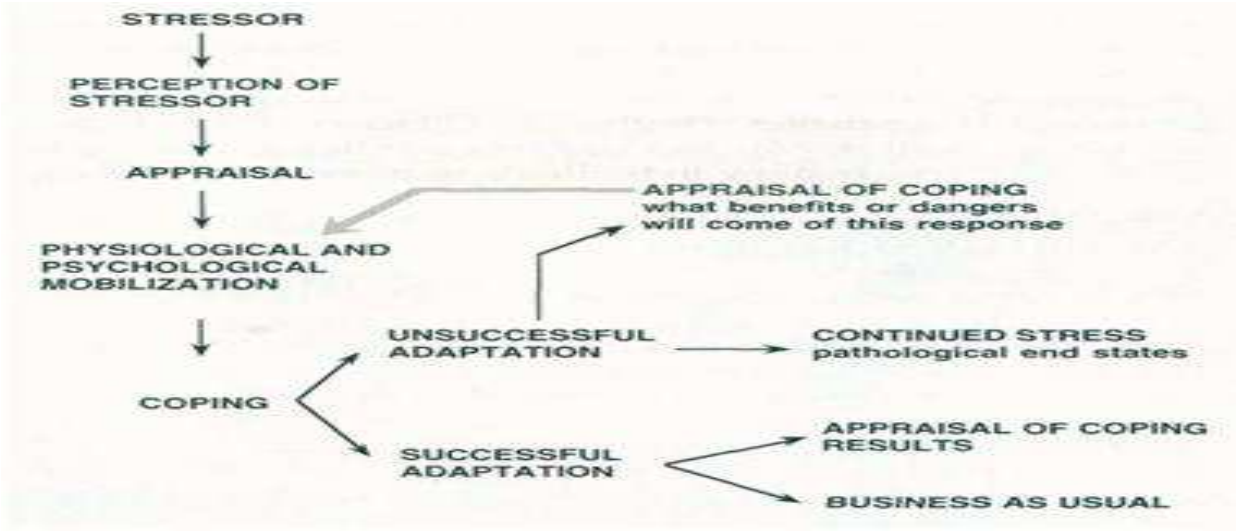


FIGURE 5-6 The stress response including secondary appraisal processes (fashioned after Monat & Lazarus, 1977)

There are times when the relationship is stressed. Indeed, stress can be thought of as "disequilibrium." There are times when either the environment presents too great a challenge or the organism has depleted its coping capabilities, or both. It is at these times when the relationship is in disequilibrium. Whether or not this disequilibrium occurs depends on a number of physical, psychological, and physiological processes, not the least of which is the process of perception as described in Chapter 4 and the affective processes as described in the present chapter.

Throughout the remainder of this text we will be looking at elements of the environment that, other things being equal can influence these processes to create disequilibrium or promote equilibrium in the organism/environment relationship. We will see, for example, how sound under certain conditions can be perceived as noise and how this perception in turn influences psychological and physiological responding to the source of that noise. Similarly, we will look at other environmental elements including atmospheric conditions,

population density, architectural design, and technological developments. In short, there are many aspects of the environment that may act to produce stress. We will attempt to elucidate the conditions when this is likely to occur and to discern those individuals who are most likely to be affected. Finally, we will attempt to suggest ways of preventing either stress or its adverse effects, assuming it cannot be avoided.

Lesson 28

CONFORMITY

Conformity is the process by which an individual's attitudes, beliefs, and behaviors are influenced by other people. This influence occurs in both small groups and society as a whole, and it may be the result of subtle unconscious influences, or direct and overt social pressure. People often conform from a desire to achieve a sense of security within a group typically a group that is of a similar age, culture, religion, or educational status. Any unwillingness to conform carries with it the very real risk of social rejection. In this respect, conformity can be seen as a safe means of avoiding bullying or deflecting criticism from peers. Conformity is often associated with adolescence and youth culture, but it affects humans of all ages Although peer pressure may be viewed as a negative trait, conformity can have either good or bad effects depending on the situation. Peer pressure leading to drug or alcohol abuse is harmful, but driving safely on the correct side of the road is a beneficial example of conformity. Conformity influences the formation and maintenance of social norms and allows society to function smoothly and predictably Because conformity is a group phenomenon, such factors as group size, unanimity, cohesion, status, prior commitment and public opinion all help to determine the level of conformity an individual will display.

Varieties of conformity
Harvard psychologist, Herbert Kelman identified three major types of social influence.

Compliance is public conformity, while keeping one's own private beliefs
Identification is conforming to someone who is liked and respected, such as a celebrity or a favorite uncle
Internalization is acceptance of the belief or behavior and conforming both publicly and privately

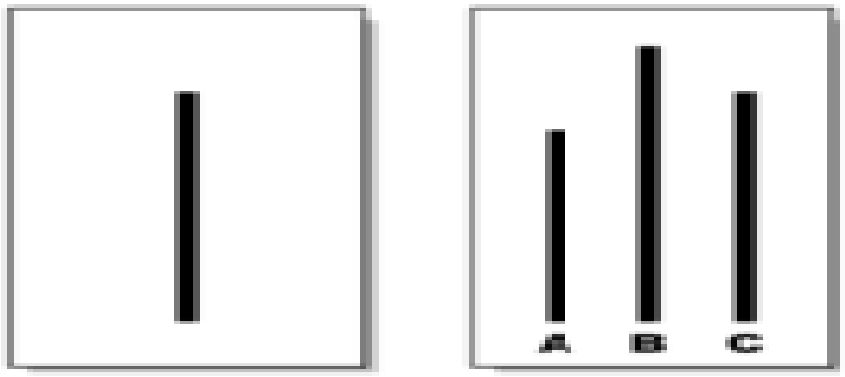
Although Kelman's distinction has been very influential, research in social psychology has focused primarily on two main varieties of conformity.

These are ***informational*** conformity, or informational social influence, and *normative* conformity, otherwise known as normative social influence. Using Kelman's terminology, these correspond to internalization and compliance, respectively. There are naturally more than two or three variables
in the social environment influential on human psychology and conformity; the notion of "varieties" of conformity based upon "social influence" is ambiguous and indefinable in this context.

Informational influence
Informational social influence occurs when one turns to the members of one's group to obtain accurate information. A person is most likely to use informational social influence in three situations: When a situation is ambiguous, people become uncertain about what to do. They are more likely to depend on others for the answer. During a crisis immediate action is necessary, in spite of panic. Looking to other people can helpease fears, but unfortunately they are not always right. The more knowledgeable a person is, the more valuable they are as a resource. Thus people often turn to experts for help. But once again people must be careful as experts can make mistakes too. Informational social influence often results in ***internalization*** or ***private acceptance***, where a person genuinely believes that the information is right.

Informational social influence was first documented in Muzafer Sherif's autokinetic experiment. He was interested in how many people change their opinions to bring them in line with the opinion of a group. Participants were placed in a dark room and asked to stare at a small dot of light 15 feet away They were then asked to estimate the amount it moved. The trick was there was no movement; it was caused by a visual illusion known as the auto kinetic effect. Every person perceived different amounts of movement. Over time, the same estimate was agreed on and others conformed to it. Sherif suggested that this was a simulation for how social norms develop in a society, providing a common frame of reference for people.

Subsequent experiments were based on more realistic situations. In an eyewitness identification task, participants were shown a suspect individually and then in a lineup of other suspects. They were given one second to identify him, making it a difficult task. One group was told that their input was very important and would be used by the legal community. To the other it was simply a trial. Being more motivated to get the right answer increased the



tendency to conform. Those who wanted to be most accurate conformed 51% of the time as opposed to 35% in the other group.

Which line matches the first line, A, B, or C? In the **Asch conformity experiments**, people frequently followed the majority judgment, even when the majority was wrong Economists have suggested that fads and trends in society form as the result of individuals making rational choices based on information received from others. These informational cascades form quickly as people decide to ignore their internal signals and go along with what other people are doing
Cascades are also presumed to be fragile because people are aware that they are based on limited information. This is why fads often end as quickly as they begin:

Normative Influence
Normative social influence occurs when one conforms to be liked or accepted by the members of the group. It usually results in *public compliance*, doing or saying something without believing in it. Solomon E. Asch was the first psychologist to study this phenomenon in the laboratory. He conducted a modification of Sherif's study, assuming that when the situation was very clear, conformity would be drastically reduced. He exposed people in a group to a series of lines, and the participants were asked to match one line with a standard line. All participants except one were secretly told to give the wrong answer in 12 of the 18 trials. The results showed a surprisingly high degree of conformity. 76% of the participants conformed on at least one trial. On average people conformed one third of the time

Normative influence is a function of social impact theory which has three components. The *number of people* in the group has a surprising effect. As the number increases, each person has less of an impact. A group's *strength* is how important the group is to a person. Groups we value generally have more social influence. *Immediacy* is how close the group is in time and space when the influence is taking place. Psychologists have constructed a mathematical model using these three factors and are able to predict the amount of conformity that occurs with some degree of accuracy
Baron and his colleagues conducted a second "eyewitness study", this time focusing on normative influence. In this version, the task was made easier. Each participant was given five seconds to look at a slide, instead of just one second. Once again there were both high and low motives to be accurate, but the results were the reverse of the first study. The low motivation group conformed 33% of the time (similar to Asch's findings). The high motivation group conformed less at 16%. These results show that when accuracy is not very important, it is better to get the wrong answer than to risk social disapproval
An experiment using procedures similar to Asch's found that there was significantly less conformity in six-person groups of friends as compared to six-person groups of strangers. Because friends already know and accept each other, there may be less normative pressure to conform in some situations. Field studies on cigarette and alcohol abuse, however, generally demonstrate evidence of friends exerting normative social influence on each other.

Minority influence

Although conformity generally leads individuals to think and act more like groups, individuals are occasionally able to reverse this tendency and change the people around them. This is known as *minority influence*, a special case of informational influence. Minority influence is most likely when people are able to make a clear and consistent case for their point of view. If the minority fluctuates and shows uncertainty, the chance of influence is small. However, if the minority makes a strong, convincing case, it will increase the probability of changing the beliefs and behavior of the majority. Minority members who are perceived as experts, are high in status, or have benefited the group in the past are also more likely to succeed

Another form of minority influence can sometimes override conformity effects and lead to unhealthy group dynamics. A recent review of two dozen studies found that a single "bad apple" (a lazy or inconsiderate group member) can substantially increase conflicts and reduce performance in work groups. Bad apples often create a negative emotional climate that interferes with healthy group functioning. They can be avoided by careful selection procedures and managed by reassigning them to positions that require less social interaction.

Gender

There are differences in the way men and women conform to social influence. Social psychologists, Alice Eagly and Linda Carli performed a meta-analysis of 148 studies of influence ability. They found that women are more perusable and more conforming than men in group pressure situations that involve observation by others. In situations not involving observation, women are less likely to conform. Furthermore, estimates showed that the sex difference is relatively small. Eagly has proposed that this sex difference may be due to different sex roles in society. Women are generally taught to be more agreeable whereas men are taught to be more independent

Normative social influence explains women's attempt to create the ideal body through dieting, and also by eating disorders such as anorexia nervosa and bulimia. Men, in contrast, are likely to pursue their ideal body image through dieting, steroids, and overworking their bodies, rather than developing eating disorders. Both men and women probably learn what kind of body is considered attractive by their culture through the process of informational social influence.

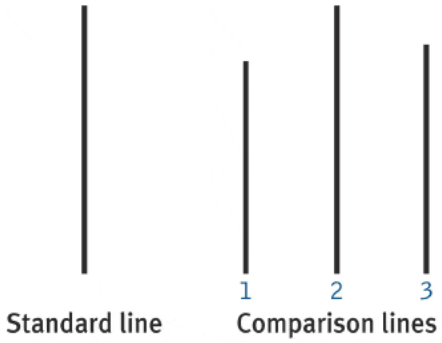
The **Asch conformity experiments** were a series of studies published in the 1950s that demonstrated the power of conformity in groups. These are also known as the "**Asch Paradigm.**

Lesson 29

ATTRIBUTING BEHAVIOR TO PERSONS AND SITUATIONS

Asch's Experiment on Conformity

Subjects were asked to judge line lengths while working in a group.
7 subjects; the 6th was real, rest were confederates.
Confederates consistently gave obviously wrong answers
The subject often conformed and gave the same wrong answer
On average, 37% of participants conformed.



Attribution Theory

The theory is concerned with the ways in which people explain (or attribute) the behavior of others or themselves (self-attribution) with something else. It explores how individuals "attribute" causes to events and how this cognitive perception affects their usefulness in an organization. *Attribution theory* has been developed to explain how we judge people differently depending on the meaning we attribute to a given behavior. By observing behavior, we attempt to determine whether the behavior is internally or externally caused.

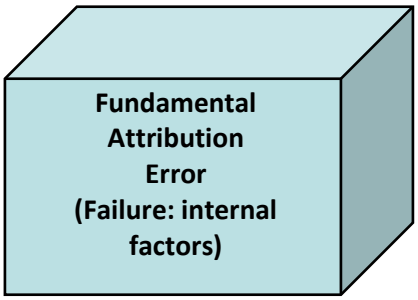
- When we observe people, we attempt to develop explanations of why people behave in certain ways.
- Our perceptions and judgments will be significantly influenced by the assumptions we make about the person's internal state. This is the field of attribution theory.

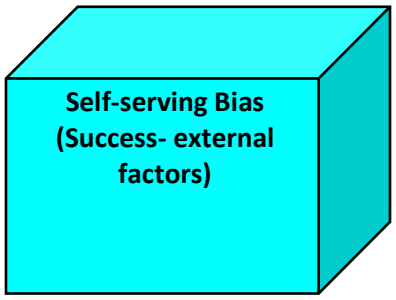
Fundamental Attribution Error

- Underestimating the influence of external factors and overestimating the influence of internal factors.
- For example, assuming that the person is late all the time because she or he isn't interested in the work rather than finding out that the shift starts when the parking is totally full.

Self Serving Bias

- Attributing success to internal factors and failure to external factors is called *self-serving bias*.





Internally VS Externally Caused Behaviors

- We believe that internally caused behaviors are under an individual's control; externally caused behaviors are motivated by external forces.

How we determine the source of behavior:

It is determined by three factors:

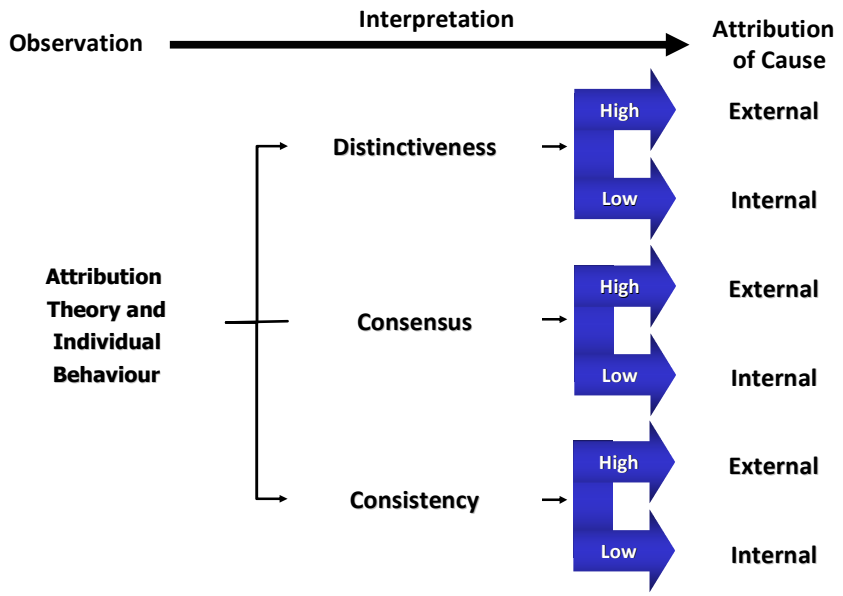
- Distinctiveness
- Consensus

– Consistency

Distinctiveness*:* refers to whether an individual displays different behaviors in different situations.

Consensus: If everyone who is faced with a similar situation responds in the same way, we can say the behavior shows ***consensus.***

Consistency: Finally, an observer looks for *consistency* in a person's actions.



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Lesson 30

The Study of Culture

The study of culture is a challenging undertaking because its primary focus is the broadest component of social behavior – an entire society

What is Culture?

Culture is broad and pervasive and given its very nature It, generally requires detailed examination of the character of the total society. This includes factors that give a society its distinct flavor such as language, Knowledge, Laws religions, Foods, Customs, Music, Art, Technology, Work patterns, Products, Artifacts, Culture is a society's personality.

Culture may be understood in terms of three defining areas:

1. Beliefs Component
2. Values Component
3. Customs Component

1. The Belief Component

Beliefs consist of a very large number of verbal and mental statements. Beliefs reflect a person's particular: knowledge or assessment of something, another person (people who come from the mountains are tough), Men are mathematical, Women are creative.

2. Values Component

Values are also beliefs, Values meet the following criteria: (Telling the truth), Relatively few in number , Serve as guide for culturally appropriate behavior, Enduring and difficult to change, Not tied to specific objects or situations, Widely accepted by the members of society. In broad sense, Values and beliefs are mental images that affect a wide range of specific attitudes that in turn influence the way a person is likely to respond in a specific situation

Example: the criteria a person uses to evaluate alternative brands in a particular product category: Preference for one of these brands influenced by both a person's general values (what constitutes quality, the meaning of a country of origin) Specific beliefs – perceptions about the quality of Chinese made products and the quality of American products

3. Customs Component

Customs are overt modes of behavior that constitute culturally approved or acceptable ways of behaving in specific situations. Customs consist of everyday routine behavior of the consumer. Diet sweetener for coffee, putting ketchup in a burger, Eating sweet after the main course. Where beliefs and Values are guides for behavior, customs are usual and acceptable ways of behaving

Culture is learnt

Unlike innate biological characteristics (e.g. sex, skin, hair color, intelligence) culture is learnt

At an early age we begin to acquire from our social environment a set of beliefs, values and customs that make up our culture. As children we come to learn certain behavior patterns for example, having an egg in the breakfast, drinking milk every day, and brushing teeth twice a day, washing hands before eating food, Drink water in the middle of the meal.

How is Culture Learnt?

Culture is learned by making use of two processes:

1. Enculturation
2. Acculturation

Enculturation

Learning of one's own culture is called Enculturation

Acculturation

The learning of new or foreign culture is called **Acculturation**, too many marketers contemplating international expansion make the strategic error of believing that if their products are liked by the local consumers then every one will like them, To overcome such a narrow view marketers must go through an acculturation process, they must learn everything that is relevant about the usage or potential usage of their products and product categories in the foreign countries in which they plan to operate.

Language Symbols

To acquire a common culture the members of a society must be able to communicate with each other through a common

language

Symbols
A symbol is anything that stands for something else, Any word is a symbol, Marketers must use appropriate symbols to convey desired product images and/or characteristics, Symbols can be verbal or non-verbal, Verbal symbols may include a TV announcement or an advertisement in the magazine, Non-Verbal communication involves the use of such symbols as figures, colors, shapes and even textures, Human mind can process symbols. It is possible for a person to experience cognitively visualization for a product

Contradictory Meanings of Symbols
Trademark depicting an old craftsman may depict careful craftsmanship. It may also show an image of outdated methods and lack of style

Using the Slang Language
An advertiser using slang in the advertisements to attract teenage audience must do so with great care**.** Slang that is misused or outdated will symbolically date the marketer's firm and product

Rituals
Ritual is a type of symbolic activity consisting of a series of steps (multiple behaviors) occurring in fixed sequence and repeated over time

Ritualized Behavior
In addition to language and symbols culture includes ritualized experiences and behaviors. Rituals extend over the human life cycle from birth to death including a host of intermediate experiences (confirmations, graduation and marriage). Ritualized behavior is rather formal and often scripted behavior

The Dynamic Culture
Culture plays the need gratifying role for the society.

The Need Gratifying Role of Culture
To fulfill its need gratifying role culture evolves continually to function in the best interest of society

Factors Responsible for Culture Change
These may include: New technologies, Population shift, Resource Shortages, Wars, Accidents, Natural Disasters, Changing Values, and Customs borrowed from other cultures.

Lesson 31

POPULATION AND ENVIRONMENT

Current trends in world population point out that by 2030 the world population is likely to be10 billion and by the end 21st Century the numbers may rise to 30 billion. Populations in Sub-Saharan Africa and in The Himalayan regions of Asia have already exceeded the immediate capacity of the area to sustain life.

The impacts of population growth may be understood in the following areas.

1. Resource Depletion and Environmental Deterioration

Resource Depletion is erosion of agricultural soil, Stalinization of highly productive irrigated farmland, deforestation and Lake Acidification (more prevalent in USA). This includes extensive loss of tropical forest, permanent soil degradation (Amazon Rive Basin) regional water shortages and deteriorating water quality.

Increase of 200-300 percent in the world water withdrawals in the next twenty years is predicted. Of 200 major river basins of the world, 148 are shared by two countries and 52 are shared by chemical waste being produced at rates faster than we can safely dispose them. Non renewable resources are being consumed at increasing rates.

2. Public Policy and the Environment

Preserving the carrying capacity of earth, major policy changes coupled with government business and individual actions can do much to alleviate these problems. Important measures need to be taken such as mandating reforestation after cutting, detoxification of chemical by-products before disposal, judicious soil management, energy and material conservation, industrial and household recycling.

This must be combined with introduction of high yield hybrids and methods of farming the seas.

The reliable data upon which to base public policy has given a sense of urgency to the development of Environmental Psychology and has contributed to its growth as discipline.

Important facts about Pakistan need to be taken under consideration:

1. Pakistan's urban population to equal rural by 2030: UNFPA

Pakistan's urban population is likely to equal its rural population by 2030, according to a report titled 'Life in the City: Pakistan in Focus', released by the United Nations Population Fund (UNFPA) here on Wednesday.

2. Rural – Urban Migration (females)

According to the report on Pakistan, the proportion of females is lowest in rural to urban migration and highest in rural to rural migration. The same pattern has been observed in India. In the rural-urban stream, the share of females is 51 percent in Pakistan. A relatively large fraction of rural-urban migrants crosses provincial boundaries. The perception that "the urban migrant is invariably a male" is incorrect; females make up a considerable proportion of migrants.

3. Slum Population

At least one in every three city dwellers in Pakistan lives in a slum. Many migrants, who move to cities in order to find jobs and have a better life, may not find jobs in the formal sector or any kind of decent shelter with a minimum of basic amenities. The informal sector provides employment to most migrants and they gravitate to squatter colonies where they build some kind of shelter for themselves. As a result, slum and marginal human settlements have spread in most urban localities, particularly in urban agglomerations.

4. Increase in Urban Population

The report also shows the share of the urban population increased from 17.4 percent in 1951 to 32.5 percent in 1998. The estimated data for 2005 shows the level of urbanization as 35 per cent. The level of urbanization in Pakistan is the highest in South Asia. More than 60 percent of the population of urban Sindh lives in Karachi and this concentration has increased over time. Approximately three-quarters of the total urban population of Sindh are concentrated in just three urban centers: Karachi, Hyderabad and Sukkur.

In Punjab, 22 percent of the urban population lives in Lahore, and half of the total provincial urban population lives in five large cities. Peshawar has a population of approximately one million without counting the Afghan refugees, which is 33 percent of the

urban provincial population. The share of Quetta in the total urban Balochistan population was 37 percent.

More than half of the total urban population of Pakistan lived in 2005 in eight urban agglomerations: Karachi, Lahore, Faisalabad, Rawalpindi, Multan, Hyderabad, Gujranwala and Peshawar. Between 2000 and 2005, these cities grew at the rate of around 3 percent per annum, and it's projected that this growth rate will continue for the next eight to nine years.

By 2015 it is estimated that the population of Karachi will exceed 15 million, while Lahore and Faisalabad will cross eight million and three million-respectively. According to the UNFPA global report, more than half of the world population, around 3.3 billion will be living in urban areas by 2008 and the number will swell to around five billion by 2030.

Lesson 32

IMPACT OF ENVIRONMENT IN ITS INCUMBENTS

Human Population Growth and Environment

The human population of 6000 B.C. is estimated to have been about 5 million people. By A.D 1650 our numbers reached 500 million and in the succeeding two hundred years we had doubled our numbers to 1 billion. In 80 years, by 1930, we had doubled them again. The current rate of population doubling is approximately 35 years (Ehrlich, 1968); that is, at current growth rates, we can expect the number of human beings inhabiting the earth to double every 35 years and to quadruple within the expected life span of any given individual. Put differently, the world's population of human is currently growing (total births minus total deaths) by an average of over 100,000 people per day (that's approximately one new city of Chicago each month). By the year 2030, barring unforeseen catastrophe, the number of humans vying for space on our planet will exceed 10 billion. Thus, humans are remarkably prolific procreators, and it could be argued that reproducing is one of the things they do best! Carried to the absurd, Isaac Asimov tells us that, at present rates of increase, in 6700 years all the matter in the universe will have been converted to human flesh by unchecked fecundity. Such a geometric explosion of population (Asimov's preposterous projections aside) elicits rather frightening, and highly probable, scenarios with respect to the quality of life in the future. Obviously there are limits to population growth, and the rate of acceleration has begun to slow down, but whether this acceleration can be halted or perhaps even reversed in time for our planet to remain habitable is a much debated question.

At the same time that our absolute numbers are growing, there has been a trend toward urbanization. Rather than spreading ourselves evenly over the surface of the earth we have tended to concentrate our numbers into limited geographical areas. The number of cities with populations in excess of 100,000 has quadrupled in the last 20 years and is expected to quadruple again in the next 20 years. In the United States alone, 70 percent of our citizens live on only 2 percent of the habitable land. These two trends (increasing numbers and increasing urbanization) combine to bring about dramatic rises in population concentration. The effects of these increases are only beginning to be considered worthy of investigation. Furthermore, these trends are magnified in the developing countries (i.e., third world countries show not only faster rates of population increase but also accelerated rates of urbanization). In light of the fact that third-world countries do not have a highly sophisticated agri-economy upon which to build up an urban population, these figures are especially disconcerting.

This unmistakable, worldwide, positively accelerating trend toward urbanization has led a number of scholars to claim that in today's world the major problems of society are urban ones, and that coping with urbanization constitutes the major behaviors of modern humans. Personal anonymity, lack of privacy, crowding, feelings of powerlessness, a pull between monotony and over stimulation, traffic, pollution, and other problems that are either created or aggravated by increasing population concentrations are twentieth-century problems with which the inhabitants of Planet Earth may not be ready to cope. Those who have looked to the future predict a world in flux and one quite different from the world we now inhabit. Increases in starvation, pollution, communicable diseases, physical malfunctions, and slums are but a few of the physical effects predicted to be influenced *by* increased population concentrations. Poorer physical and mental health facilities and an increase in crimes and civil disturbances are listed among the social problems, and such psychological effects as increases in drug and alcohol abuse, greater family disorganization, with drawl, aggression, and decreased quality of life are also foreseen.

Clearly, this is a rather alarming and dismal picture of the future brought on by unchecked population growth. But is this mere speculation, the ratings of dooms dyers, or do these projections have some basis in fact? Predicting the effects of population growth is perhaps one of the most central and fundamental issues in the field of environmental psychology, and in this chapter we will attempt to provide some tentative conclusions from the research on this issue. We will first review some of the research on the effects of urbanization, and then we will consider the related question of how humans respond to high levels of population density (i.e., the study of "crowding").

URBANIZATION

As noted in the chapter's introduction, the majority of our population lives in or near large cities. Thus, it is not surprising that considerable effort has been expended toward describing and understanding the experience of urban life. In this section we will discuss the physical, social, and psychological effects of urbanization.

Pakistan Situation

Pakistan's urban population is likely to equal its rural population by 2030.

Life in the City: Pakistan in Focus', United Nations Population Fund (UNFPA)

Urbanization in Pakistan

Sindh: Share of the urban population increased from 17.4 percent in 1951 to 32.5 percent in 1998.The estimated data for 2005 shows the level of urbanization as 35 percent. The level of urbanization in Pakistan is the highest in South Asia.

Most & Least Urbanized Provinces

Sindh is the most urbanized province with 49 percent of the population living in urban areas. NWFP is the least urbanized province with only 17 percent of its population living in urban areas.

Urbanization Punjab & Baluchistan

Urban population in Punjab and Baluchistan in 1998 was 31 and 23 percent respectively. Urban population in Baluchistan and Islamabad has been increasing at higher rates of 5.1 and 5.8 percent respectively.

Urban Centers of Pakistan

More than 60 percent of the population of urban Sindh lives in Karachi and this concentration has increased over time. Approximately three-quarters of the total urban population of Sindh are concentrated in just three urban centers: Karachi, Sukkur and Hyderabad. In Punjab, 22 percent of the urban population lives in Lahore, and half of the total provincial urban population lives in five large cities.

Urban Centers of Pakistan

Peshawar has a population of approximately one million without counting the Afghan refugees, which is 33 percent of the urban provincial population. The share of Quetta in the total urban Balochistan population was 37 percent.

Urban Population Concentration

More than half of the total urban population of Pakistan lived in 2005 in eight urban agglomerations: Karachi, Lahore, Faisalabad, Rawalpindi, Multan and Hyderabad. Gujranwala and Peshawar between 2000 and 2005, these cities grew at the rate of around 3 percent per annum, and it's projected that this growth rate will continue for the next eight to nine years.

Urbanization Growth Rate

By 2015 it is estimated that the population of Karachi will exceed 15 million, while Lahore and Faisalabad will cross eight million and three million-respectively. According to the UNFPA global report, more than half of the world population, around 3.3 billion, will be living in urban areas by 2008 and the number will swell to around five billion by 2030.

Country representative of UNFPA, Dr France Donnay said that the growth of cities would be the single largest influence on development in the 21st century. But little was being done to maximize the benefits of urban growth or reduce its harmful consequences. "Between 2000 and 2030, Asia's urban population is to increase from 1.36 billion to 2.64 billion and Africa's from 294 million to 742 million".

"Katchi Abaadi" Statistics

In Pakistan, the urban population living in "*katchi abadis"* varies between 35 and 50 percent. The growth of these informal settlements in the two mega cities, Karachi and Lahore, has particularly been massive. In Karachi, these settlements increased from 212 in 1958 to more than 500. In Lahore, there are more than 300 katchi abadis Faisalabad, at least 40 percent of the population lives in these abadis.

Lesson 33

EFFECTS OF URBANIZATION

Physical Effects

The unchecked physical expansion of cities has created what some have called *urban sprawl*. This term refers to a random, and sometimes unseemly, spreading out of the city-proper in all directions. This often results in business and industrial areas bordering or surrounding residential and recreational areas of the city. One consequence of such random growth is the difficulty in maintaining an efficient and effective public transportation system, with the paths of industrial, business, and residential traffic criss-crossing.

Apart from the bewilderment created for "out-of-towners" trying to find their way around the city, the noise and traffic can disrupt the daily lives of inner-city residents (see Chapter 8 regarding the effects of noise on apartment dwellers near freeways). Those who can afford it relocate and move to the suburbs on the outskirts of the cities. The inner-city neighborhoods tend to deteriorate and become overcrowded—creating slums, or ghettoes. Problems of disease, crime, and race relations become inevitable results of inner-city life. The flight of the wealthy to the suburbs, together with the growth of *super malls* and shopping centers in the suburbs, leads to the economic decline of the inner city. Finally, the dramatic population increase in the suburbs creates the same problems that the suburbanites were originally attempting to avoid. Little wonder, given such a vicious circle of events, that so many cities today are in a state of crisis!

In addition to the effects of urban sprawl on the life and vitality of the city-proper, a number of broader environmental problems have been created by increased urbanization. Many of these were discussed earlier in the chapters on climate and pollution, and more will be dealt with in later chapters on energy use and environmental attitudes, clearly, problems such as garbage, sewage, and industrial waste disposal, energy shortages, air and noise pollution have their seeds in urbanization, and they are growing every day. While the roots of environmental problems rapidly extend to the rural areas of our country (and; others), they remain firmly planted in the urban centers. Fortunately, public concern for these problems has grown in the last decade, and steps are being taken to improve them. Nonetheless, steady increases in population concentrations in urban areas continue to aggravate the problems and impede efforts to eliminate them. Finally, while researchers have only recently begun to investigate the causes and solutions of physical environmental problems resulting from urbanization, they have been even slower to study the effects of urban life on human beings. Some research has been done, however, and it is to this that we turn

Theories of Urban Effects

The large number of variables potentially affecting the city-dweller makes it difficult to achieve a simple conceptualization of the effects of urban life on individual and social behavior. Some possible negative effects of living in a city have been determined and accounted for by a variety of theoretical constructs, many of which were discussed in Chapter 2. For example, Glass and Singer (1972) have studied the influence of particular physical *stressors* (e.g., noise) on performance and mental health. Wohlwill's *adaptation-level* theory (1976) proposes that humans function best at intermediate levels of arousal. This latter approach accounts for negative effects of city life by asserting that the excessive stimulation level in the urban environment produces over-arousal.

A related approach suggested by Mil-gram (1970) is that the quantity and rate of stimulation that urbanites are exposed to exceeds their systems' capacity, resulting in ***information overload*** *by Proshansky*, Ittleson, and Rivlin (1970) suggest that the demands of city life limit an individual's freedom, leading to *behavioral constraints* that can produce the feeling of loss of control over one's life. Finally, Barker (1968) argues that cities are *overmanned* environments, where the number of inhabitants exceeds the system's capacity to provide meaningful roles for its denizens. This lack of well-defined roles, in fact, produces feelings of marginality and alienation.

While the various theoretical positions outlined above highlight slightly different aspects of the urban experience, each can be integrated in the model presented in Chapter 2. To the extent that the configurations of physical and social variables present in the urban environment are perceived by the individual as being

outside an optimal range, displeasure, heightened arousal, and loss of control are experienced. This then leads to coping behaviors designed to return the individual to an optimal range of pleasure, arousal, and dominance. If these efforts are successful, the individual functions without behavioral disturbance. Unsuccessful coping leads to the various negative effects discussed above. But while most of the research on urban life has dealt with these negative effects, some theorists have proposed beneficial results of city life.

Urban-Rural Comparisons

A number of studies have compared differences in the incidence of physical and psychological disorders in urban and rural environments. Interestingly, the results of these studies do not reveal uniformly worse physical and/or mental health in cities in comparison with rural areas. It is perhaps not surprising that there is a higher rate of respiratory diseases in cities, since these ailments are closely linked to air pollution. Although common depictions of city life suggest a greater presence of stress, Hay and Wantman (1969) report only minimal differences in the incidence of stress-related illnesses such as heart disease and hypertension, and some researchers have even reported a lower incidence of other physical ailments in urban areas in comparison with rural areas (Srole, 1972). Similarly, while alcoholism and drug addiction have been reported to be more common in urban than rural areas (Trice, 1966), Dohrenwend and Dohrenwend (1972) have reported that the incidence of psychoses is higher in rural areas than in cities. Thus, the city does not seem to be a consistently *pathological* environment when compared with rural areas.

Social-Behavioral Effects

Differences between urban and rural settings have been reported in the occurrence of *affiliation, prosocial,* and *antisocial* behavior. Studies have indicated that urbanites are less affiliative toward strangers than are people in rural areas (e.g., McCauley, Coleman, & DeFusco, 1977; Milgram, 1977; Newman & McCauley, 1977). Urbanites tend to avoid eye contact with strangers and are less likely to reciprocate friendly gestures than are rural-dwellers. While studying prosocial behavior, several researchers have reported that urbanites are less likely to help a stranger (Gelfand, Hartman, Walder, & Page, 1973; Korte & Kerr, 1975; Mil-gram, 1970, 1977). However, it does not follow that urbanites are inherently less friendly and helpful than people in rural areas. These differences could be explained simply in terms of the urbanites paying less attention to other people, perhaps as a means of coping with excessive stimulation (see Moser, 1988),

Finally, regarding antisocial behavior, clear differences have been reported between urban and rural areas in the incidence of crime (Carlstam & Levy, 1971; Fischer, 1976; Zimbardo, 1969), with rural areas definitely being safer than cities. While this may seem obvious, the reasons for greater crime rates in cities are not wholly understood. Zimbardo (1969) proposed the concept of *deindivid-uation* to explain the high crime rate in cities. The inhibitions against antisocial behavior, such as the fear of getting caught and being humiliated before the community, are less effective in a city than in a small town. Owing to the large number of people in the city, individuals may feel more anonymous and thus less concerned about what other people in the community think about them. Theories of over manning could also account for high crime rates in cities. Given that there are many more people than there are jobs, unemployment is higher in cities, leading the unemployed to resort to crime to "make a living."

Beneficial Effects

As mentioned earlier, much of the research comparing urban and rural life has sought to identify the negative effects of urbanization on the city-dweller. This negative image of the city was underscored in a study by Melton and Hargrove (1987) in which rural scenes were substantially more likely than urban scenes to be described in pleasant terms. Rural inhabitants were more likely to be perceived as friendly, and purposeless activity was commonly attributed to urban populations. While there certainly seems to be some ill effects of city life, some theorists (e.g., Freedman, 1975) have argued that much of this research starts with a biased and pessimistic assumption that cities are bad. That this assumption may not be valid is suggested by a Gallup survey *(Gallup Opinion Index,* 1973) in which the majority of the respondents indicated that they preferred to live near a city. Thus, although it is common for people to extol the joys of life "in the country," cities still have an attraction to most people. Among the obvious advantages of the city are greater entertainment and cultural opportunities, in addition to specialized medical facilities. Furthermore, the results of some studies show that rural areas are not necessarily perceived as *Utopias* (e.g., Kru-pat, Guild, & Miller, 1977). Finally, some theorists (e.g., Proshansky, 1976) have suggested that life in the city makes an individual more versatile

and adaptable and gives a broader perspective on life than is afforded by a rural existence.

Lesson 34

PROBLEMS RELATED TO CROWDING

Animal Studies of Crowding

Two major lines of research exist with respect to animal studies. The first involves *naturally occurring* population cycles and the second involves *experimentally controlled* population concentrations. Two notable examples of the study of naturally occurring cycles are the lemmings' "march to the sea" (Dubos, 1965) and the (Sika) deer die-off on James Island (ChrTstian, Flyger, & Davis, 1960). The Norwegian lemmings are small rodents resembling the field mouse but having short tails and fur-covered feet. They live primarily in the Scandinavian mountain regions. About every three or four years they appear to migrate (march) to the sea, with many of them drowning as an end result. Scandinavian mythology contends that the lemming ritual begins with the search for a home and ends in a deliberate attempt to commit suicide, explaining the phenomenon as a biologically pre-programmed and orderly way to limit their numbers. Closer inspection of the "march," however, has revealed that the movement is not orderly at all, but rather a wild frenzy. This helter-skelter activity quite accidentally results in large numbers of the lemmings reaching the sea and thus drowning. It now appears that these prolific reproducers reach considerable numbers every three to four years and that this increased population (and thus population density) acts to influence brain and adrenal functioning, which in turn is overtly manifested in non directed activity.

Christian, Flyger, and Da vis (1960) have observed similar abnormal adrenal functioning in a herd of deer and have suggested the stress resulting from increased population density as a causal agent. In 1916 four or five deer were released on James Island in the Chesapeake Bay off the coast of Maryland. By 1955 this small herd had grown to 280 to 300 deer (approximately one per acre). In 1958 over half of the herd died, and by 1960 it had been reduced to 80 members. The herd stabilized at the threshold of 80 members. During this time, Christian's group was performing detailed histological examinations of the deer's adrenal glands, thymus, spleen, thyroid, gonads, kidney, liver, heart, lungs, and other tissue. The carcasses were found to be in excellent shape throughout. All had shiny coats, well-developed muscles, healthy fat deposits between the muscles, and other indicators of good health. The only abnormal finding was an increase in the size of the adrenal glands. In the most severe case the adrenal glands were found to be 10 times the size of base rate samples. From these and other data, infection, starvation, and illness were ruled out as causes for the dramatic two year die-off. Overactive adrenal functioning was inferred on the basis of the enlargement, and increased stress due to crowding was proclaimed as the cause of this increased endocrine activity.

Perhaps the most dramatic and well-known of the animal studies involving *experimentally* controlled population concentrations is the research conducted by Calhoun (1962). Calhoun provided his animals (in this case, Norway rats) with a luxurious environment. Food and water were provided *ad lib* and nesting materials were always available. In fact, the only limitation on the environment was space. The rat populations were free to grow, but the space that housed them remained the same. As time passed the rats segregated themselves, with the more dominant animals laying claim to the more spacious areas while simultaneously limiting their members. The remaining members had to eat, sleep, and raise their young in more highly concentrated areas of this finite human-made universe. Calhoun called this area a ***behavioral sink.***

Those animals that inhabited the behavioral sink began to exhibit behavioral as well as physiological pathologies. For example, nest building among females was incomplete or poorly managed: Pups were left on their own, and unguarded; nursing behavior was disrupted. Among the juvenile males, pan-sexualism was practiced and incidents of cannibalism were detected; aggressive behavior was heightened among some and withdrawal behavior among others. Infant mortality increased, as did the number of aborted pregnancies. Among the physiological pathologies discovered were tumors of the mammary and sex glands in females and abnormal kidneys, livers, and adrenal glands in both sexes. The search for association between rates of pathology and population density in humans was no doubt guided by the work of Calhoun. Indeed, the pathologies suggested by Calhoun (i.e., morbidity, mortality, fertility, ineffectual parenting, and psychiatric disturbance) or their manifestations (i.e., incidence of infectious diseases, juvenile delinquency, adult crime, and others) have all been linked, though not always successfully, to increasing human population concentrations.

Additional effects of increased population concentrations have been reported subsequent to Calhoun's seminal work. For example, it has been shown that population density leads to the production of fewer sperm by males, to later onset of estrus, less frequent and shorter duration estrus, and consequently less frequent births and smaller litters (Crow & Mirsikowa, 1931; Snyder, 1966; 1968) among females. There is also evidence for an increase in alcohol consumption and performance decrements on complex tasks (Goeckner, Greenough, & Maier, 1974) for rats raised under high-density conditions.

Effects similar to these have been found for such diverse animals as swine, chickens, cattle, and elephants in addition to other rodents (Greenburg, 1969; Hafez, 1962; Marsden, 1972; Theissen, 1966). However, caution must be exercised in generalizing these results to humans. First, it is quite likely that the behavior of animals other than humans is more biologically determined and less dependent on learning and cultural inputs (Swanson, 1973). Second, humans usually find respites, if only briefly, from high-density situations, whereas in the animal studies no escapes were possible (Evans, 1979). Finally, humans have shown themselves to be more capable of adaptation and adjustment than any other animals.

Despite the fact that it is always difficult and often misleading to generalize the findings of animal research to humans, the animal research is of extreme value in our attempts to understand human behavior. Indeed, the use of animals as a source of hypotheses about human behavior is the only way some questions can be logically and ethically addressed. For example, if we are concerned with the effects of increased population concentrations over several generations, it is more sensible to use animals that bear young more quickly than humans. Second, if the effects are thought to be even remotely hazardous, it would be unethical to subject humans to those conditions. Third, with modern telemetry equipment and the miniaturization of sensing devices it is quite easy to study behavioral and physiological responses without disturbing the processes that are being monitored. Aside from the ethical issues involved, the greater cognitive capacities of humans do not allow for such clean monitoring. Work with humans has been done, however, and it is to this research that we now turn.

Lesson 35

IMPACT OF POPULATION CONCENTRATIONS AMONG HUMANS

Most early work on the influence of population concentration among humans centered on its relationship to crime, mental illness, and other indices of social upheaval and disorganization. Crime statistics show that a disproportionate number of violent crimes are committed in our most densely populated cities and that indicators of mental illness worsen as people move from rural areas, to urban areas, to the inner city of large metropolitan areas. The prospect of increased population concentration acting as the cause of these and other effects is both pessimistic and alluring: pessimistic because of the two undeniable trends stated at the beginning of this chapter, alluring because human effects! could then be accounted for by the same mechanisms that account for effects on; other animals. Because of this lure, a number of investigators have turned to demographic, often archival, studies to explore the effect of increased population concentrations on human behavior.

Defining Density

Investigators have utilized various measures of population concentration, and for the most part have been indiscriminate in using the terms *crowding* and *density* to refer to these measures. Where the distinction has been made, there remains no consensus as to the *appropriate* measure of density. Schmitt (1957), for example, assessed the relationship between five semi-independent measures of density and adult crime and juvenile delinquency.

They used the following five measures

1. average household size
2. proportion of married couples without their own home
3. proportion of dwelling units in structures with four or more living units
4. population per acre
5. Percentage of occupied dwellings with 1.51 or more persons per room—only the last two showed strong positive relationships with delinquency and adult crime.

In subsequent work Schmitt (1966) has distinguished between *inside density* and *outside density*. That is, Schmitt noted the difference between the number of people per unit of living space and the number of people in the larger community (e.g., persons per acre). Others have made similar distinctions (see, for example, Galle, Gove, & McPherson, 1972; Jacobs, 1961; Zlutnick & Altman, 1972). The importance of these contrasts becomes apparent when the following possibilities are considered: low inside-low outside (suburbs); high inside-high outside (urban ghettoes, barrios, and others); low inside-high outside (luxury inner city apartments and condominiums); high inside-low outside (rural farm areas). Using only inside density as a predictor one would have to presume the effects of density to be the same in the urban ghettoes as in the rural farm areas, whereas using outside density would lead to predictions of luxury apartment dwellers and ghetto residents showing similar effects. These predictions are, of course, surd and underscore the need for careful delineation of the term *density*.

A second difficulty that the preceding possibilities illuminate is the differences in socioeconomic, ethnic, and social structure variables that are likely to exist among the four areas. It is possible that these variables may be related to degenerative or pathological effects independent of population concentration, but owing to their naturally occurring co-variation with density, the cause gets misplaced. More recent studies have therefore been somewhat more explicit in the density measures being utilized and have cant toiled for the possible confounds of social structure variables, For example, in a study by Galle, Gove, and McPherson (1972) persons per acre was shown to be positively related to public assistance rate, juvenile delinquency, and the rate of admission to mental hospitals. However, when the authors controlled for social class and ethnicity these correlations disappeared. Thus, density appeared to be unrelated to social disorganization when social class and ethnic variables were considered, Galie's group, not content with such a simple conclusion, reanalyzed their data. In the subsequent analysis, density was defined differentially as:

(1) The number of res idential structures per acre
(2) The number of living units per structure
(3) The number of residents per living unit

(4) The number of persons per room.

Utilizing multiple correlation techniques, they showed that the combined effects of the four measures of density correlated significantly with each pathology with class and ethnicity being controlled. The most important contribution to the various pathologies was the number of persons per room, with the exception of admissions to mental hospitals. The percentage of people living alone and the number of persons per living unit were the best predictors of this last pathology. However, Kellett (1989) has recently argued that density is' an inadequate concept to investigate the relationship between health and housing.

The Density/Crowding Distinction

A major conceptual breakthrough resulting from these and other data is that most theorists now agree that the physical state of high density is not the same as the psychological experience of crowding (Altman, 1975; Loo, 1973; Proshansky et. al, 1970; Stokols, 1972a, 1972b, 1976) an<T that these two must be differentially defined. Daniel Stokols (1972a) noted the confusion regarding the terms *density* and *crowding,* especially as their use is reflected in research concerning humans. He states that as a result of this confusion many writers use the two terms interchangeably and tend to view crowding in terms of spatial considerations alone, deplete of social and personal dimensions, which may interact with those spatial factors to mediate the experience of crowding. Density is a *physical* condition involving space limitations, whereas crowding is an *experiential state* determined by perceptions of restrictiveness when exposed to spatial limitations. Thus, Stokols proposes that density is a *necessary* but not *sufficient* condition for crowding. As Stokols views it, the potential inconveniences of limited space such as the restriction of movement, the preclusion of privacy, and other disadvantages of space limitation must reach some degree of saliency and be viewed as aversive before people experience crowding.

For example, Desor (1972) has defined crowding in terms of excessive stimulation from social sources; Zlutnick and Altman (1972) have defined crowding in terms of an individual's inability to adequately control interactions with others; Van Staden (1984) emphasized perception of large numbers of people, spatial restriction, and an aversive experience of the situation as relevant components of the crowding construct. In this regard crowding may be thought of as a psychological concept referring to a subjective experience, which may or may not be adequately reflected by population density measures such as the amount of physical space per person or number of people per unit of living space. In short, there seems to be general agreement that high density is seldom a sufficient and probably never a necessary condition for the experience of crowding.

As important as this conceptual breakthrough is, a complete understanding will elude researchers unless the physical state of density is carefully elucidated and the psychological state of crowding is properly operationalized. For example, population per unit of land (areal density) is a composite of several levels of land use: net residential average, structures per residential area, dwellings per structure, rooms per dwelling, and persons per room (Carnahan, Gove, & Galle, 1974). Density is therefore highly complex, and its components are likely to vary independently of each other. With this realization it is obvious that neighborhoods may have the same population density and yet be quite different from one another. For example, one neighborhood may have large portions of its land being used for industrial or commercial purposes rather than residential purpose, and thus have low population density, whereas a second neighborhood may have equally low density because its residential area is comprised of detached single family dwellings located on spacious suburban lots. Obviously, density does not mean the same thing in these two instances.

Operationalizing the psychological construct *crowding* has proven to be difficult, and the present state of development of the correlational/survey approach appears to rest on finding associations between one or more measures of density and one or more archival measures of pathology. The inability to control for a host of important extraneous social/situational variables has also limited definitive conclusions about the effects of density.

For these reasons many environmental psychologists turned to the laboratory to achieve greater control over antecedent physical and social parameters of crowding, as well as more valid measurement of the construct. For example, Arkkelin, Veitch, Kruempel, & Christensen (1982) developed a simulation technique that permitted the manipulation of the two physical components of density (the number of people present and interpersonal distance) independently of one another. They concluded that the interaction of interpersonal distance with a

social/situational variables (e.g., gender, acquaintance, activity) was a more important determinant of subjective discomfort than was the absolute number of people present in a setting. They further determined that the aversive experience of *crowding* could be characterized as an affective state of displeasure, heightened arousal, and lack of control. In the following section we will review other studies that have systematically manipulated density and measured affective and social-behavioral responses.

Lesson 36

CROWDING & DENSITY HUMAN EXPERIMENTAL STUDIES

Conducting carefully controlled experimental studies of the effects of population density on human behavior involves many difficulties. Nonetheless, a number of studies have been conducted and reported. Some research has utilized rather interesting, but naturally occurring, high-density situations like prisons, commuter trains, playgrounds, and shopping centers. Others have purposely manipulated either numbers of persons within a setting while holding setting size constant (i.e., manipulated social density) or have maintained the same number of respondents while manipulating the setting size available to them (i.e., manipulated spatial density; see, for example, Loo, 1972; McGrew, 1970; Pedersen, 1983; Saegert, 1973, 1974). In keeping with the previous chapters, we will look at what is known about the effects of density on physiological processes, on task performance, and on such social affective behaviors as attraction, altruism, and aggression.

Physiological Reactions

One of the first researchers to report on the physiological effects of density was D'Atri (1975). He observed the blood pressure levels of inmates in a prison who were confined to either single or double occupancy cells and found those inmates in the latter cells to exhibit higher levels. Paulus, McCain, and Cox (1978) have also found blood pressure to be positively related to increased density, and McCain, Cox, and Paulus (1976) have reported that inmates in high-occupancy dormitory settings complain more of illness than do those in lower-density cell blocks. This finding may occur as a result of real illness brought on by physiological disturbances or by a desire on the part of the inmate to be taken from the high-density dormitory to the lower-density infirmary. In either case, the differential density seems to be the reason for the discrepancy in the number of complaints. Aiello, DeRisi, Epstein, and Karlin (1977) have shown density to be related to increased skin conductance; Fleming, Baum, and Weiss (1987) reported elevations in urinary catecholamines under conditions of high social density; and Heshka and Pylypuk (1975) have reported increased adrenocortical activity in males as a result of high social density.

Other indirect evidence that density may influence physiological processes is reported by Baron, Mandel, Adams, and Griffen (1976) and by Dean, Pugh, and Gunderson (1978). The former researchers found that students who lived in dormitories of high social density frequented the Student Health Center more often than those in low social density dormitories, and Dean and his colleagues found that illnesses among enlisted navy personnel were positively correlated with both social and spatial density. Based on these and other data, most researchers in the field have concluded that the physiological and health effects of increasing density are strongly influenced by the individual and by social coping mechanisms that people have learned to use in dealing with these situations.

Task Performance

Early research on the effects of density on task performance utilized relatively simple tasks like psychomotor tasks, problem solving, or anagram solving in laboratory contexts where subjects either knew or could easily discern the interests and hypotheses of the experimenter. These studies failed to demonstrate any consistently reliable effects, positive or deleterious, of density on performance (Freedman, Klevansky & Ehrlich, 1971; Freedman, Levy, Buchanan, & Price, 1972; Rawls, Trego, McGaffey, & Rawls, 1972; Stokols, Rail, Pinner, & Schopler, 1973). More recent laboratory studies, as well as some small-scale field experiments, however, have shown that under some circumstances density can adversely affect task performance. Performance decrements as a result of increases in either spatial or social density have been reported for tasks that are sufficiently complex or require a high rate of information processing (Bray, Kerr, & Atkin, 1978; Evans, 1979; Paulus, Annis, Seta, Schkade, & Matthews, 1976; Paulus & Matthews, 1980). Additionally, performance impairments are, as might be expected, reported for situations in which people must interact with one another in the process of carrying out their task (Heller, Groff, & Solomon, 1977), particularly if the presence of others impedes required locomotion.

Saegert, Mackintosh, and West (1975) found support in an interesting and provocative field study for the notion of increased density leading to performance decrements. Saegert and her colleagues tested subjects in a socially dense department store and in a busy railway terminal. Among the tasks subjects were asked to perform was to provide a cognitive map (see Chapter 4) of their environment. The researchers concluded that tasks which involved knowledge and/or manipulation of their environments were impeded by increased density. The fact

that increasing density is accompanied by a corresponding decrease in the clarity of one's mental image and knowledge of the immediate environment may also explain the findings of Glassman, Burkhart, Grant, and Vallery (1978) and Karlin, Rosen, and Epstein (1979). These researchers showed that social density was related to grades attained in two separate university settings. Additionally, Karlin et al. (1979) showed that once conditions of high social density were removed (i.e., students were reassigned to less crowded quarters) grades improved significantly. Thus, increased density may overload one's information-processing ability, resulting in impaired performance on tasks that require higher-level cognitive skills.

Social-Affective Responses

It is not difficult for any of us to recall situations of high density that have made us feel uncomfortable. Crowded elevators, bargain basement sales, the first day of classes in a large lecture hall, bus depots and airport terminals where we are hurrying to make connections are but a few. Without much difficulty we could probably also recall occasions when this discomfort has led to feelings of tenseness, anxiety, or even anger. On the other hand, parties, rock concerts, and crowds at athletic contests also represent situations of high density that may have evoked very different, perhaps even very positive, feelings. Hence, our feelings are obviously related not only to density but to the circumstances under which density occurs.

Freedman (1975) proposed a density-intensity model to account for these seemingly contradictory responses to high density. Freedman argues that increases in density serve to intensify the prevailing affective state induced by social/situational variables. More recently, Duckitt (1983) obtained measures of both positive and negative affect in relation to different degrees of household crowding. He reported an association between increased density and elevations of negative affect, but no reduction in positive affect. Thus, perhaps instead of asking simply whether or not people respond aversively to high density, it would be better to ask under what conditions high density is likely to elicit negative affect.

Support for this fairly straightforward conclusion comes from a number of studies including those by Griffitt and Veitch (1971), Baxter and Deanovich (1970), Smith and Haythorn (1972), Stokols et al. (1973), Evans (1975), Sundstrom (1975), and McClelland and Auslander (1978). What may not be so evident at first (unless the findings are being carefully considered in light of the model presented in Chapter 2) is that these differential feeling states are likely to lead to quite diverse social behaviors. Hence, a number of studies have looked at the effects of density on such social behaviors as attraction, altruism, and aggression.

Attraction

The first laboratory study to show that interpersonal attraction (liking) is reduced under conditions of high social density was conducted by William Griffitt and Russell Veitch (1971) at Kansas State University. Subjects in that experiment were exposed to one of two conditions of social density and one of two levels of ambient temperature. After being given time to become inured to these conditions, participants were asked to make evaluations of strangers and to indicate their degree of probable liking for them. Subjects who were exposed to the high-density conditions gave significantly more negative evaluations and expressed a lower degree of probable liking than did those exposed to low-density conditions. Similar results have been obtained by numerous researchers, with some finding these effects for males but not for female respondents (see, for example, Epstein & Karlin, 1975).

Additionally, a number of laboratory and field setting studies have shown a relationship between density and such attraction-related responses as eye contact, sociableness, visiting behavior, talkativeness, and intimacy. For example, early research by Hutt and Vaizey (1966) revealed that as the number of children in an experimental play setting increased, the amount of interaction among them decreased. Simultaneously, they exhibited greater social withdrawal. Baum and his associates (Baum, Harpin, & Valins, 1975; Baum & Valins, 1977; Valins & Baum, 1973) have found similar results with dormitory-housed students. Those students living in more socially dense dormitories were discovered to be less talkative, less sociable, and less group oriented than those from more sparsely populated settings.

Eye contact, often an indicator of positive interpersonal relations, was found to decrease as a function of density in a quasi-laboratory study (Baum & Greenberg, 1975). This finding, incidentally, has been confirmed in a very different setting by McCauley, Coleman, and DeFusco (1977), and by Newman and McCauley (1977). Finally, if

it is assumed that liking is related to one's willingness to discuss intimate topics, then Sundstrom (1975) has produced additional evidence for an inverse relationship between density and liking. He found a decrease in the willingness to discuss intimate topics as the number of others in an interview situation increased. The evidence is fairly clear, then, that increases in density stand a very good chance of leading to decreases in liking. But before leaping to overwhelming conclusions, recall the positive feelings you may have had at your last socially dense party.

Altruism

If density is inversely related to liking, one might also expect it to be inversely related to our willingness to lend a hand, to provide assistance, or to be charitable to our fellow humans. This proposition presumes that liking does indeed increase the likelihood of persons engaging in helping behavior. Studies attempting to test this notion increased dramatically after the murder of a young woman in New York City occurred in a densely populated area in full view of many witnesses and after repeated pleas for help (for a detailed account see Rosenthal, 1964). Social scientists began questioning the generality of this kind of occurrence and speculated as to the reasons why it might happen. One plausible explanation was that the high-density neighborhood somehow led to a social callousness that would not be engendered in low-density areas.

The laboratory and field studies conducted on altruism in the last 20 years are too numerous to detail here. However, the results, contrary to speculation, indicate generally that density is not directly related to helping behavior. Rather, density conditions act indirectly, depending on other factors, to increase or decrease helping. Wohlwill (1976) has shown that the environment is an important source of affect, and Holahan (1977) suggests that decreased helping behavior in densely populated areas is based on the fear for personal safety engendered in some socially dense areas. If there were no reason for fearing personal safety, presumably no decreases in helping would be apparent. This explanation is consistent with the findings of Alice Isen and her associates (Isen, 1970; Isen, Clark, & Schwartz, 1976; Isen & Levin, 1972) and by Veitch, DeWood, and Bosko (1977), who have shown helping behavior to be positively related to positive mood states. Finally, rural and urban differences in helping behavior (Gelfand et al., 1973; Korte & Kerr, 1975; Milgram, 1970) and the equally often reported lack of differences (Forbes & Gromoll, 1971; Korte, Ypma, & Toppen, 1975; Weiner, 1976) may be explained in terms of attentional processes associated with differences in density or by differential time available to provide help given the variable pace of the respective life styles.

Aggression

It might be expected that if differential density leads to diverse emotional responses, then to the extent that aggression is related to mood, aggression might be expected to vary as a function of density. Research to date indicated that this causal chain of events is either not entirely accurate or not fully articulated or appreciated. Most studies, however, have not independently and simultaneously considered all three variables; hence, this inferential chain is difficult to realize. For example, early research in the relationship between density and aggression utilized school children in a play setting (Ginsburg, Tollman, Wanson, & Hope, 1977; Hutt & Vaizey, 1966) and found the two to be related; however, no measure of affect was taken. Two other studies with children showed no effects (Loo, 1972; Price, 1971), but again no measures of affect were taken. It is likely that the critical variable (i.e., differential affect) may not have been present in any of these studies. This conclusion is strengthened by the finding that autistically withdrawn children (emotional stabiles) showed no effect for changes in density in the Hutt and Vaizey (1966) study.

As noted earlier, density does not automatically lead to a specific emotional response. For this reason, and following the above logic, aggressive responses would be expected only to the extent that density elicits negatively toned affective responses. This elicitation results not only from the density of the environment but by the personal and social conditions of the setting. For example, Rohe and Patterson (1974) have found that high density leads to aggression in children when the play situation does not provide ample toys for each. As long as there are plenty of toys to go around, increases in density did not affect children's aggressive behavior. Thus, it is likely that density, like temperature, acts only to moderate aggressive responses and is not the direct cause of them.

Lesson 37

CROWDING IN EVERYDAY SETTINGS

Researchers have increasingly moved out of the laboratory to study crowding in commonly experienced settings such as the residence, neighborhoods, and recreational areas. In the following section we will review some of this research, and will conclude with a comparison of these studies with those discussed in the previous sections.

The Residence

Sweaney, Inman, Wallinga, and Dias (1986) reported a significant relationship between increasing household density and feelings of crowding in children. As noted earlier, Duckitt (1983) reported an association between increased household density and negative affect. However, he reported that the relationship was nonlinear, with increasing density associated with a sharp initial rise, followed by a flattening out of the curve. Further, Gabe and Williams (1986) reported that residential dissatisfaction was associated with both high and low density. These inconsistent findings have also been reported examining the ubiquitous residence hall on university campuses. For example, Hughey (1983) reported that occupants of rooms accommodating three students in space designed for only two people had lower self-esteem than did occupants of two-person rooms. However, Ronchi and Sparacino (1982) compared residents of triple vs. single occupancy rooms, and reported no differences in either judged pleasantness or arousal level. Measures of blood pressure indicated a tendency for higher blood pressure levels in residents of single rooms.

These contradictory results could be due to differences in methodologies and in definitions of density and crowding, or they could simply mean that there is no consistent relationship between residential density and crowding. It is possible, however, that the differential results are mediated by social variables. An illustrative study in this regard was conducted by Wenz (1984). Data were obtained on household density, loneliness, and suicide ideation. Wenz reported that both loneliness and density were associated with suicide ideation. He argued that density bears only a distal relationship to suicide ideation (i.e., it is not density level per se, but the quality and quantity of social interaction and the nature of separation between people that may be "pathological"). Wenz concluded that household density may simply aggravate or accelerate not cause or motivate preexisting suicidal tendencies. Also, Neil and Jones (1988) studied the impact of environmental stressors on psychological health in remote "boom" communities in Australia and reported that most of the variance could be explained by loneliness. Thus, it is possible that either high or low density produces adverse effects, a point to which we will return in Chapter 10 regarding territoriality and privacy.

Many people have questioned whether responses to density are culture-specific. For example, there are clear differences in objective population density in the United States compared to China. Could it be that individuals in these countries differ in their responses to density? Gillis, Richard, and Hagan (1986) did report cross-cultural differences, with Asians being more tolerant of high density and British respondents being less adaptable, with Southern Europeans somewhere in between these two. Churchman and Ginsberg (1984) reported that the negative image and experience of "high-rise" housing prevalent in our culture did not emerge in responses of such residents in Israel.

These differences could be due to varying adaptation levels across cultures developed by lifelong exposure to different population densities. However, we must be careful of overgeneralization. Chalsa Loo and her colleagues (Loo, 1986; Loo & Ong, 1984) have challenged the belief that the Chinese hold different attitudes toward crowding than the larger U.S. population. In surveys of residents of San Francisco's Chinatown area, these researchers reported a relationship between high population density/commercial development and lowered neighborhood satisfaction and between increased building density and lesser feelings of safety. Their respondents generally evaluated crowding as undesirable, and their results indicate that prolonged exposure to high density breeds dislike for crowding in a primary environment (i.e., the home) more than in a secondary environment (i.e., the neighborhood). Similarly, Homma (1990) reported that the Japanese also view crowding as a negative experience.

Recreational Areas:

An increasing number of Americans are visiting our country's national parks each year. Ironically, many people visit such parks in order to appreciate the natural environment away from the "rush of the crowd." This trend

has led some to suggest that limitations should be placed on the number of visitors to recreational areas. Because of this concern, researchers have recently begun to examine perceptions of and reactions to density in these settings. Westover and Collins (1987) interviewed urban park visitors and reported that the most important predictor of perceived crowding was, indeed, the actual number of visitors on a daily basis. Burrus-Bammel and Bammel (1986) reported a negative correlation between the daily number of users at a visitors' center and the average duration of visit. Thus, these studies suggest that perception of density is related to feeling crowded, and people spend less time in recreational areas as the number of users increase.

However, other researchers have argued that the relationship between density and the wilderness experience is complex, and decisions to limit capacities should not be made simply on perceived crowding. For example, Bultena, Field, Womble, and Albrecht (1981) interviewed hikers at Mount McKinley National Park about their expectations and preferences for sights of other parties, number of parties seen daily, and trip satisfaction. Reported crowding was a function of preferences and frequency of contacts, but perceived crowding was unrelated to overall trip satisfaction. Similarly, Shelby, Heberlein, Vaske, and Alfano (1983) reported that people engaged in three different recreational activities felt more crowded when the number of encounters exceeded expectations or preferences, which were better predictors of crowding than was the absolute number of encounters. These authors suggest that crowding could be reduced by providing information that makes expectations realistic and allows visitors to select densities.

Absher and Lee (1981) challenged the commonsense notion that crowding in backcountry settings is dependent on the sheer number of people. They reported that when personal and experiential motives were statistically controlled, the effect of social density on perceived crowding was non significant. They argued for a complex formulation of crowding that incorporates normative, motivational, and social organizational aspects. Manning (1985) has also argued for a normative conceptualization of crowding in outdoor recreation, suggesting that crowding norms are influenced by visitor characteristics, characteristics of those encountered, and situational variables. Support for this assertion was provided by Gramann and Burdge (1984). They reported that objective density was unrelated to crowding perception, but perceived crowding was positively related both to the probability that physical movement was restrained and the probability of exposure to threatening behavior of others. West (1981) reported only a weak relationship between perceived crowding in backcountry campers and the desire to further limit established carrying capacities. Westover (1989) demonstrated that perceived crowding resulted from a dynamic process influenced by site image, subjective interpretation of objective reality, and constant reassessment of site conditions' salience to individual goals.

Thus, just as we saw in correlational research on pathologies associated with high density, and laboratory research on social, affective, and behavioral effects of density, research in naturalistic environments such as the home, neighborhood, and parks has also yielded inconsistent results. Hence, the answer to the question of whether or not humans respond aversively to high density must be a qualified one. Yes, high density can have detrimental effects given the presence of certain social conditions. In their absence, however, it is unlikely that density will have any significant direct effect on human responses.

Lesson 38

THE BUILT ENVIRONMENT AND HUMAN ADJUSTMENT

The line one of the authors gets in at the grocery store is always the slowest moving. The couple ahead of me can't find their checkbook; the clerk has to run a price check on the stewed prunes; a worm is discovered in the tomatoes necessitating another five minutes of squeezing and choosing; the roll of tape in the cash register is used up; or the cashier decides to take a break just as it's my turn to be checked out. My luck is no better at the bank, automobile registry, travel agent's counter, or fast-food restaurant. Someone nearly always spots a friend who just happens to be ahead of me, they exchange pleasantries, engage in conversation, and they both are served before I am. I am also a sucker for the "I'll only be a second and I've left my motor running would you mind if I go ahead of you?" ploy.

Although these situations are presented from a first-person perspective, I'm sure that you could have written in a similar vein about *your* experiences with waiting in lines. Lines are a fact of life. We assume that there is nothing that can be done about them and that the time we spend in them will inevitably increase. In fact, John Hershey (1974) wrote a futuristic novel, *My Petition for More Space,* in which the entire story is carried out in a waiting line.

When I'm not waiting in line, I often seem to be just waiting at the bus depot for my predictably late bus, waiting in the reception area to see my dentist, waiting in the baggage claim section hoping that my luggage took the same plane I did. I seem to spend far too much time doing far too little in public places where I'd rather not be. I am not alone in this feeling. Fairfield (1977) claims that most public waiting spaces are "drab, cramped, unimaginative, anxiety provoking and dehumanizing" (p.43), and suggests that life is too short to cumulatively waste weeks, months, or years just waiting. I agree. But must waiting be a fact of life, and need it be so annoying? Is it possible it is merely the result of poor planning or oversights in design? Could these waiting annoyances be designed out of grocery stores, banks, fast-food restaurants, baggage claim areas, and similar situations?

Upon reflection it becomes obvious that the arrangement of our immediate surroundings create both opportunities and limitations. Supermarkets afford us the opportunity to purchase all of our food needs in one location, but they also place limits on our ability to get in and get out quickly. The realization that physical design limits human capabilities comes easily when we observe someone confined to a wheelchair attempting to negotiate a street curb, or someone who is visually impaired trying to read street signs. But, while these may be extraordinary yet poignant examples, it is nonetheless true that all of us are affected in varying degrees by the built environment. It is also true that while we are likely to blame the designer of curbs for the difficulty we perceive the person in the wheelchair as having, we are *not* likely to blame the designer of grocery stores for our own long wait, or the designer of street signs for the difficulty exhibited by the visually impaired. But is it possible the designer is equally blameworthy in all these instances? In the remainder of this chapter we will be examining a number of aspects of the designed environment and the impact of that design on our behaviors, and we will be returning to the question of who is to blame.
C.M. Deasey (1974) quotes a leading architect as saying "good architecture is impossible until there is a change in the public attitude about architecture." A restatement in the context of the opening paragraphs is "Nothing will be done about the design of supermarkets, fast-food restaurants, airports, parks, and similar situations until the public demands that something be done." Deasey further claims that his colleague's comment is irrelevant and draws an analogy to the medical profession. The remark, he says, is something like a doctor saying that it is impossible to practice medicine well until the human physique is radically revised. No doubt surgery would be greatly simplified if we had a zipper in our sides so that internal inspections and rearrangements could be made more efficiently, but no doctor who still maintained touch with reality could argue that this was essential to proper treatment. The doctor works with the human body as he finds it; the designer must work with human nature as he finds it.

No doubt a sensible position is somewhere between these two extremes. The doctor need not require a zipper, but he (or she) certainly has to ask the patient where it hurts if the doctor is to remedy any ailments. The public need not change its attitudes about architecture, but must certainly let designers know what's wrong if they expect designers to serve them better.

When creating space, designers should to be aware of the needs of its intended users. For a supermarket designer, a valuable source of information is the shopper; when designing an airport terminal, architects should talk to travellers; for hospital design, patients (among others) may provide valuable input. Normative data (telling us what other shopping centers are like, how most airports are designed, or the standard way of utilizing space in hospitals) does littie to minimize the hassle and maximize the potential of the users of that space. The best way to find out the influence of design is to ask those that are influenced by it. The best indicator of a designer's success is the comments of users, rather than a comparison with other (perhaps equally aberrant) designs.

At first this seems an elegantly simple way to evaluate the fit between the user of the designed environment and the environment itself. Users can tell designers what they don't like, what they do like, and how to get from the former to the latter. I, as a user of supermarkets, dislike waiting in checkout lines. More than that, however, I dislike the fact that others, by serendipitously choosing some other line, are able to queue up later and get out earlier than I. I want checkout lines to be equitable" first ready, first out." Now design me a store that will provide for this.

Unfortunately for me, I am not the only user of grocery stores, and my exchanging of money for goods in the least amount of time is only one of the goals that the checkout space has to fulfill. For example, the needs of the cashiers, as well as the security guard, the baggers, the person who returns the carts to the cart stalls, the shelf-stockers, and the multitude of vendors who daily make drop-offs at the store, must be considered. Any prudent designer should incorporate the needs of all of these users in the design. Of course, in doing so, the solution is no longer "elegantly simple," and often the needs of one group of individuals are at odds with the needs of another group.

Further, as discussed in Chapter 4, self-reports of attitudes, perceptions, feelings, and even needs are subject to a number of biasing influences. So even if designers did ask users about their design needs, the user responses may or may not be reliable or valid. Furthermore, this assumes a willingness on the part of designers to gather information from potential users and then design space based on that information. Architects, however, have been reluctant to do this. In fact, Lang (1988) suggests that architectural theory, and thus architectural practice, consists primarily of normative positions espoused either by individual architects or by schools of architectural thought. And, Spreckelmeyer, Domer, and Carswell (1985) conclude, on the basis of questionnaire information obtained from nearly 600 practicing architects, that consistent differences in perception exist among graduates of different schools, that these differences are manifested in their designs, and are a direct reflection of their respective schools. Thus, architects tend to rely predominantly on their own experiences, feelings, and ideas and tend to feel justified in doing so (Tzamir & Churchman, 1989), despite the fact that only the very wealthy seek environments that reflect the tastes of architects (Newman, 1980). Hence, our elegantly simple solution is fraught with difficulties in getting reliable and valid information regarding user needs, difficulties in reconciling the varying needs of the various users, and difficulties in getting designers to use this information once it has been obtained.

Before attempting to develop a system of user-designer interaction that might alleviate some of these difficulties, it may be helpful to examine some aspects of the designed environment and note the impact on inhabitants. Thus, we will now turn to the effects of institutional design and, because they in many ways represent prototypical institutions and because more empirical work has been done with them, we will look specifically at hospital, prison, and school designs.

INSTITUTIONAL SPACE IN GENERAL

In an early but important paper, M. Powell Lawton (1974) reviewed a number of variables that influence the fit between individuals and their environments. To build environments that are in harmony with their users, each of these factors must be considered. Various aspects of the environment (e.g., site location, building type, design layout) as well as of the user (e.g., patient type, gender, owner/user) need to be carefully assessed and a match between them sought. As we look specifically at hospitals, prisons, and schools we will consider such factors as the inhabitants' adaptation to the institution, the location of the institution, the within-institution dispersion of space, the building type, each individual's personal (private) space, the individual's social space (e.g., lobbies, halls, cafeterias), the outdoor spaces surrounding the institution, the instrumental activity space, and staff space. We will also attempt to determine how the designs of these various spaces influence other environmental factors

such as noise and illumination contribute to such psychological factors as privacy and control. We will also attempt to identify, where possible, the genesis of various design models.

HOSPITALS

The hospital is easily recognized as an institution in its own right. So firmly established is its image that the mere mention of one conjures up thoughts of long sterile hallways, stainless steel utensils, banks of life-monitoring equipment, people in white uniforms rushing to and fro, specialized rooms for specialized functions, wheelchairs lined up at elevators, and the smell of rubbing alcohol and disinfectant. The design of hospitals is so uniform that if you were blindfolded, taken inside of one, and then given back your sight, you would recognize immediately where you were. Indeed, by paying attention to changes in sounds and smells, you might even know before the blindfold was removed.

Given this uniformity in design, a paradoxical aspect of hospitals is the variety of people there. In a broad sense, they can be categorized as patients, medical staff, administrators, support personnel, and visitors, but within each of these a variety of subcategories could be enumerated. For example, the medical staff includes doctors, nurses, radiologists, X-ray technicians, and others, each of whom could be further classified with respect to his and her sundry specialties. Patients vary in terms of their age, gender, diagnosed ailment, therapeutic regimen, and thus in terms of their environmental needs. The environmental requirements of these various subgroups are not always the same and are occasionally in conflict. Visitors are occasionally "put off" by housekeepers, floor nurses by administrators, doctors by candy stripers, etc.

In fact, in some instances the needs of the patient and those of the staff are in direct conflict. For example, during surgery the patient requires a warm and moist atmosphere, whereas the surgical staff, who are under a great deal of stress, would ideally be submerged in dry, cool air. However, because the stress of the staff is of relatively short duration, and any added strain to the patient's system could be disastrous, the thermo-atmospheric environment of the operating room is usually designed in favor of the patient. The staff momentarily suffers and recovers later.

Although the case cited above demonstrates a decision in favor of the patient, all too often the patient's psychological well-being suffers in favor of enhanced staff efficiency. In fact, if there has been an over-riding philosophy in hospital design, it has been to attempt to maximize medical personnel efficiency by manipulating the environment with the implication that by increasing efficiency of the medical staff the patients' well-being will also be enhanced. This is not always the case, however. Increased efficiency is sometimes obtained at the cost of depersonalization.

Robert Sommer (1969) describes a mental hospital that had decided to spend some pension funds on amenities for the elderly. New furniture, air conditioners and a TV were purchased for their ward. These purchases were to have a salutary effect on patients; however, Sommer described them thusly: "They were like strangers in a train station waiting for a train that never came" (p. 79). After some time on the ward, Sommer made a number of observations: (1) The patients had never been consulted prior to or even after the installation of the new furnishings; (2) the straight row, back-to-the-wall chair arrangement was *enjoyed* by the nurses because it made surveillance easier, by cafeteria help because it provided a wider corridor for their food carts, and by custodians because it left the appearance of orderliness; (3) the straight line arrangement was maintained by the patients themselves; (4) no attempt had been made to arrange the furnishings in any other fashion; (5) this arrangement was highly detrimental to promoting social interaction among the patients and, in fact, led to a greater degree of disengagement. Here is a good example of the physical design of the environment being created to satisfy the needs of the staff in deference to the needs of the patients. Incidentally, many of these physical design barriers to communication and effective functioning were later rectified, but not without some foot-dragging by the staff.

More recent documentation of the relationship between mental hospital design and psychiatric theory and practice (e.g., Cooksey, 1989; Luchins, 1988; St. Clair, 1987) suggests that experimentation in design and correlative experimentation in the treatment of mental illness has been going on for some time. Further, when the needs of the patients as well as the staff are considered, profound positive effects can be found on staff mood, staff absenteeism, patient self-image, and also decreases in patient violence (Christenfeld, Wagner, Pastva, & Acrish, 1989). Data from Devlin (1992), however, suggest that only staff who have initially high morale, and

those who have to serve a less difficult patient population, tend to rate environmental variables higher after renovation than before.

Returning to Lawton's (1974) classification of design concerns we find that the institutional design of hospitals requires: "(1) permanent behavior-maintaining structures; (2) structures that will exercise latent healthy behavior that may be learned for permanent use (rehabilitation); and (3) structures that will allow for freedom of operation and expansion in scope of healthy aspects of the individual (self-realization)" p. 62. The hospital environment necessarily has to be designed to compensate for failures in individual performance (Lindsley, 1964) and where possible to raise the level of individual performance to the point where prosthesis is either unnecessary or minimized. The patient is in the hospital because the body was unable to fight off infection, because various anatomical or physiological structures or processes succumbed to environmental stressors, or because mental or psychological mechanisms have placed the individual at risk in the non institutional environment. The hospital environment must be designed to compensate for these individual failures. Not only do different people need different environmental solutions but even the same individual's differing and changing competencies may require, at different stages of confinement, prosthetic, therapeutic, and/or self-realizing environments.

Hospital Design and Its Effects

Most of what we know about the effect of hospital design on user behavior comes from descriptive, non investigative reports. Much of the literature is comprised of anecdotal accounts of patients or members of the medical profession who have been content to observe behavior (often their own) within a single setting and without attempting to validate their observations. This, of course, does not mean that their observations are wrong or that their accounts are without value. Rather, it means that additional, systematic research is required before any theory-based generalizations can be developed and before designers will be amenable to making changes in the standard floor plan of hospitals. A second difficulty with the information we have associated with hospital design and its effects is that a great deal of it is derived from patients in psychiatric hospitals. Clearly, this population should not be considered prototypical of all patients and their needs. Despite these caveats there are a number of interesting findings which are more or less generalizable to all hospitals and all patients independent of the particular reasons for being hospitalized.

One obvious reason for evaluating hospital design is the efficiency with which staff are able to provide medical care for patients. Lippert (1971) suggested the possibility that the location of nurses' stations relative to patients' rooms may be related to the efficiency of patient care. Using patient care stops as a measure of efficiency, Lippert was unable to report that design layout was a factor in nurse efficiency. Trites, Galbraith, Sturdavent, and Leckwart (1970), on the other hand, found evidence for greater efficiency and greater satisfaction in hospitals with radial ward design in comparison with both single and double corridor design. One solution to the problem of efficiency is to place the nurses in as close proximity to the patients as possible. Unfortunately, the outcome of this type of design is not always benign. Pill (1967) discusses the loss of privacy experienced by the nursing staff as a result of this arrangement. Clearly there are times when the discussion of patients and their needs require at least minimal privacy for the nurses; equally clear is the need for nurses simply to "get away" from their patients for short periods of time. Proximity in deference to privacy is probably not the design answer to efficiency.

Just as it is probably wise to design hospitals to ensure the privacy of nurses when needed, it is equally wise to design for the necessary privacy of the patient. Beckman (1974) suggests that appropriate hospital design encourages patients to leave their rooms and seek out others for social interaction. This interaction is seen as having therapeutic value. Your authors suggest that social interaction will be sought and be therapeutic only to the extent that it can be managed by the patient. Without some degree of privacy social interaction is likely to be thwarted and withdrawal behaviors are more likely to be exhibited. Finally, the issue of privacy for patients is directly related to the degree of control patients feel they have over their environment and perhaps over their own personal care, and as we saw in Chapter 5, the perception of control is very important to the way in which we deal with stressful situations.

People confined to hospitals for more than a few hours are apt to remark on, if not complain about, the number of rules and regulations they are asked to comply with and the regimentation that rapidly pervades their day and night. Patients are given very little control over the limited space that is available to them. Often the placement of flowers, or other gifts, the temperature of the room, whether the windows or drapes can be opened, the volume

of the television set, the number and frequency of visitors, and the time of the day for both ingestion and egestion are controlled by hospital staff. This *low control* aspect of hospital designs has drawn the attention of researchers, leading Olsen (1978) to conclude that hospital design and its accompanying regimentation communicate the message that all patients are sick and dependent and should behave in a passive manner. Low control and expected passivity may contribute to patients becoming over dependent, and for some withdrawal from normal, healthful, rehabilitative activities, thus slowing the healing process and further delaying release.

Indirect evidence in support of this speculation comes from Wilson (1972), who has reported higher incidences of postoperative problems (physiological as well as psychological) among patients housed in windowless intensive care units compared to those in units with windows. Minckley (1968) has shown that surgical patients exposed to uncontrollable noise experienced greater post operative pain and made greater use of painkillers than did those who were not exposed to the noise. Finally, Reizenstein (1976) has reported that patients' disclosures to physicians are more frequent in certain types of design settings than in others. All told, it can be safely said that providing patients with privacy as needed and control as desired within the hospital setting will lead, all other things being equal, to reductions in hospital confinement times. Incidentally, nurses are not immune to the effects of lack of control. Top (1989) has shown that the inability to control noise produced by heart monitors, respirators, and other hospital equipment can influence the performance of nurses in critical care units. However, nurses who are less sensitive to noise, or who report a greater commitment to their work, experience less stress as a result of this lack of control than do those who are more sensitive to noise or less committed to their work. Several studies, while acknowledging the rehabilitative qualities of social interaction, have nonetheless shown social and spatial density (see Chapter 10) to be negatively related to behavioral diversity within the room, to room utilization by the patient, and to overall satisfaction of the patient with the facility (Ittle-son, Proshansky & Rivlin, 1970; Rivlin, Wolfe, & Beyda, 1972; Wolfe, 1975). Too much opportunity for social interaction it would seem can be as bad as too little.

Lesson 39

PRISONS

Robert Sommer (1976) succinctly draws attention to the conflicting goals of imprisonment by noting the words of a prominent corrections official: "We are trying to operate the prison to be both a junkyard and a salvage yard" (p. 17). In this light he remarks that corrections employees, judges, police, legislators, and inmates all have diverse, vague, and often conflicting ideas of what prisons are supposed to accomplish. It is perhaps because of these conflicting views that we see great sentencing disparity among judges, differential parole criteria, varying opportunities for vocational training and psychological counseling, and differences in time actually served by individuals imprisoned for the same offenses. Siegler and Osmond (1974) refer to this state of affairs as a "model muddle." What should be taken as the model for prisons? What should they attempt to accomplish? What is the best way to achieve those goals? What features of institutional design should be put into place to help reach those goals?

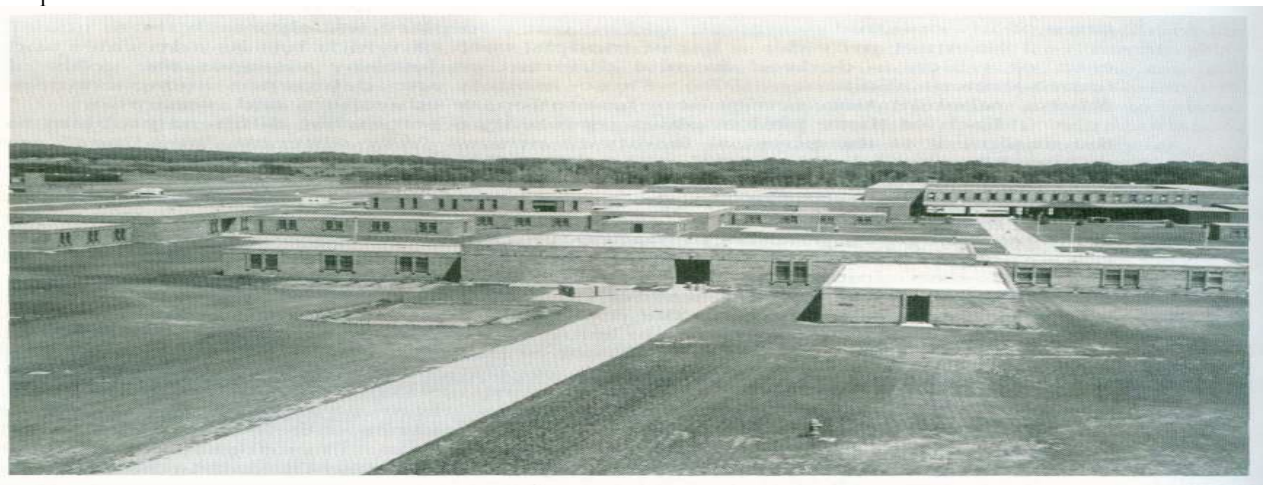
Sommer provides a list of models, each of which has its advocates and each of which is derived from a different philosophy vis-a-vis the goals of imprisonment (Sommer, 1976). These models are: deterrence, incapacitation, reform, rehabilitation, retribution, restitution, re-education, and integration.

Each of these philosophies represents a somewhat different problem to the designers of the physical facility of prisons. Very different "buildings" are required if a model of integration is being followed than if, for example, a model of incapacitation is being adhered to. The former, which aims at integrating the offender back into society, might include libraries, auto repair shops, truck-driving academies, food preparation laboratories, work cottages, facilities for conjugal visits, etc., whereas the latter, which requires only that the offender be physically removed from society, requires little more than cages. In the case of deportation or capital punishment even this minimum in design is not needed. We will now turn to empirical work on prison design features and will, where possible, link these features to the philosophy which spawned them.

The life of a prisoner is in many ways similar to the life of a hospital patient. Prisoners are subjected to control by others, to highly ritualized routines, and to a great many rules and regulations. They also have very little mobility, very little space, and virtually no privacy. The physical design of a hospital as we have seen is the symbolic representation of an "aseptic" container, and the massive fortress-like structure of the prison, with its stone walls and guard towers, is the symbolic representation of an "impermeable" container. Also, as hospitals are designed primarily with the hospital staff in mind, prisons are built to suit the needs of prison administrators. Cell blocks are often multitiered as a matter of convenience and security. In fact, a publication of the United States Bureau of Prisons (1949) comments that "the bars used in such prisons are usually twice as large, and more than twice as strong, as those used in zoos to restrain lions or giant Kodiak bears." This degree of control is so oppressive for some that it has been argued that inmates engage in self-destructive behavior as a means of regaining some degree of control. Punitive measures it is suggested only serve to increase the likelihood of more serious self-destructive behaviors (Holley & Arboleda-Florez, 1988).

Historically, the architecture of prisons has been in concordance with the deterrence/incapacitation/retribution philosophies of criminology. Prisoners must be detained, must be kept from doing harm to the general public, and must be made to pay for their misdeeds. Indeed, the penitentiary is a place for stark penitence. The result of traditional design is that prison life becomes impersonal, anonymous, and without choice. Even in the area where prisoners can exert the greatest degree of control over their lives (the cell) the space is very limited and the ability to personalize is minimal. However, Gilbert (1972) has found that restriction of movement is more important than cell size. Prisoners apparently can content themselves with small sleeping quarters if they are able to engage in a variety of activities in more than one setting during the rest of the day. Sommer (1972) adds crowding, lack of privacy, and sensory deprivation to the list beginning with the factors of confinement and restriction.

FIGURE 11-4 The massive fortress-like structure of the prison is the symbolic representation of the "impermeable" container.



Sommer (1972) suggests that prison architecture should reflect the modern philosophies of re-education, reform, and integration. New Jersey's Leesburg prison has made an attempt in this respect by providing brightly decorated, larger, homelike cells that look out on a garden court and an attractive dining pavilion. Luxenberg (1977) has indicated that new prisons have attempted to avoid the unwanted consequences of designing for maximal security and have been successful in varying degrees.

Research by Paul Paulus and his associates has led to *a* number of very important conclusions regarding the effects of prison design on prisoners' behavior and health. For example, they have found, as might be expected, that single or double occupancy cells are judged as less crowded than are cells having larger numbers (Cox, Paulus, McCain, & Korlovac, 1982). Additionally, it has been shown that prisoners confined to cells of greater social density report more ailments and spend more time in the infirmary than do prisoners in single or double occupancy cells. Finally, Schaeffer, Baum, Paulus, and Gaes (1988) have shown that one form of expedient architectural intervention (cubicle partitioning) ameliorates one indicator of stress (urinary catecholamine level), even though Houston, Gibbons, and Jones (1988) have shown that physical attractiveness of institutional facilities has very little to do with prisoners' attitudes toward these places.

Wener and Keys (1988) have noted that perceived crowding, sick call rates, and isolated passive behavior all increase when the population density of prison cells increases. Given these findings, a number of corrections officials are now experimenting with designs that allow for more privacy, including conjugal visits, more mobility within the confines of the still-remaining fortress walls, and more personalizing of individual spaces by the prisoners themselves. Often in these prisons correctional officers remain in constant, direct contact with inmates (rather than in control booths), and communication and negotiation skills are fostered (Wener, Frazier, & Farbstein, 1987). However, Rutherford (1985) suggests that although architecture provides the context for these "new generation" prisons, the critical ingredient is staff commitment to run the prison as a cooperative venture.

Taking a very different perspective, Ekland (1986) provides data in support of the notion that the violence in prisons which has been linked with density is less a matter of cognitive confusion and tension (i.e., stress) as some have claimed than it is a matter of control. Adding support to this thinking, Goetting and Howsen (1986) provide data which show that rule-breaking behavior among inmates is associated with a number of parameters linked to low control including being young, black, male, having a relatively high number of prior convictions, having been unemployed prior to incarceration, and having been in prison a relatively long period of time. Only time and much needed research will tell us the impact of design changes on the behavior, attitudes, and values of the incarcerated (Ruback & Innes, 1988).

Lesson 40

EDUCATION ENVIRONMENTS

The Classroom

The image evoked by the term *educational environment* is one of students lined up in rows (perhaps in desks affixed to the floor) and facing an instructor (primarily a lecturer) at the front of the room. Not only does this image conform to the traditional classroom but it also represents the modal arrangement. There is probably a number of reasons why this arrangement is most typical, including ease of surveillance and attendance taking, ease of getting in and out of seats and in and out of classrooms, ease of maintaining control by the instructor, and others. Its genesis, however, is more likely the result of using outside light as the major source of illumination in lecture halls. Typically, classrooms are longer than they are wide, and on one of the long walls is usually a row of windows to let in light. Various investigators have studied the influence of this arrangement on the behaviors of individual students. Sommer (1969), for example, found that class participation was related to the student's placement in such a classroom, with those students seated in the front row participating more. Koneya (1976), however, found that while increases in participation as a function of seating in the front row was true for moderate verbalizers, low verbalizers tended not to participate in class discussion no matter where they sat. Along these same lines Schwebel and Cherlin (1972) found that students assigned front row seats are more attentive than those assigned anywhere else in the classroom, and Becker, Sommer, Bee, and Oxley (1973) have found that students who sit in the front and in the center of large lecture halls attain higher grades than those who sit in the back. This relationship between grades and seating position held in one study even when students were not allowed to choose their own seats (Stires, 1980). A review of this literature by Montello (1988) tends to support a consistent pattern for participation but fails to reveal any consistent relationship between seating arrangement and course achievement as measured by examinations.

Research in small classroom, seminar-type classes has also shown an effect for seating position. Sommer (1969), for example, has shown that students seated directly opposite the instructor participate the most, while those at the sides participate next most frequently. Those students directly adjacent to the instructor (shoulder to shoulder) tend not to participate at all. This finding is not unlike that of Steinzor (1950), who obtained the same results with groups arranged in circles. With this arrangement, interaction was greatest among those individuals who sat directly across from one another. Finally, in a free-choice seating situation, as well as when positions are assigned, those who sit at the ends of seminar tables are seen as participating more and as having more power. Such individuals more often emerge as leaders than do those sitting at any other location around the table. Is it any wonder that the Paris peace talks leading to a settlement of the Vietnam War were held up for months awaiting a decision on the shape of the table to be used and the positions of the delegates around it?

Before turning to recent design changes in classrooms, a number of other factors relating to design efficacy must be briefly mentioned. It should go without saying that classroom behavior, and thus performance, as well as learning will be influenced by such environmental conditions as temperature (see Chapter 6), noise (see Chapter 8), and crowding (see Chapters 9 and 10), and that the design of learning settings ought to take these variables into account. An additional factor (which has not as yet been dealt with) that may also affect learning is light. That is, both the intensity and the quality of the lighting provided in a classroom have an impact on students.

Obviously, minimal illumination is required to read a book or write a paper. And although it's entirely possible that Abraham Lincoln obtained much of his early education by the light of an open fireplace, recent evidence suggests that performance decrements can be expected if illumination is not sufficient or if it is greater than the general level to which we are adapted. Within the limits of these extremes, however, research reveals several facts: (1) As illumination increases, visual acuity increases; that is, with more light we are able to detect and recognize smaller visual details; (2) the effects of changes in illumination are more pronounced on difficult tasks than on easy tasks; (3) greater illumination allows for more accurate and quick discrimination; (4) at very high levels of illumination performance decrements are likely, because additional light can act to suppress some information cues, such as visual gradients (Boyce, 1975). If this additional light stems from a source closer to the direction in which we are looking and is sufficiently greater than the illumination to which our eyes have adapted, then we say there is visual glare. This glare can directly influence performance by rendering vision impossible (or at least less acute), and/or it can indirectly influence performance by creating discomfort or causing fatigue (Boyce, 1975; McCormick, 1976).

On the psychosocial side, illumination level has been shown to be directly related to conversational volume (Sanders, Gustanski, & Lawton, 1976), as well as to self-disclosure (Gifford, 1988). An exception to this latter finding occurs in situations involving sexual or romantic intimacy where both males and females prefer a lowered level of illumination (Biner, Butler, Fischer, & Wester-gren, 1989). A great deal more research is required to define proper illumination types and levels for learning and for socializing, for soothing and arousing, and for hurting, helping, and healing (see Chapter 6).

One final note regarding light involves not the light source (and thus its intensity) itself, but rather the reflecting surface and the lengths of light waves being absorbed and reflected. This, of course, relates to hue, commonly referred to as *color*. Speculation regarding the influence of color on psychological processes and psychomotor performance abounds, although very little empirical knowledge of the phenomenon is available. Despite this paucity of information, there is some evidence that color may affect people's moods and levels of arousal (Mehrabian & Russell, 1974) as well as their attitudes. Some colors are thought to induce feelings of security (blue), or to be stimulating or lead to excitement (red); others are thought to be soothing or comforting (Wexner, 1954). Acking and Kuller (1972) have shown that colors influence blood pressure and respiration rate, and Wilson (1966) has shown that color variations are related to galvanic skin response (GSR). The effect of color on physiological responding, on mood, and on attitudes may have some indirect effect on the way students view ' their classrooms, and thus on the amount and nature of learning that takes place.

Open-Space Classrooms. An open-space classroom is virtually a school without walls; that is, at least *a* school without permanent, inside, partitioning walls. The open classroom replaces the row-and-column seating arrangement of traditional classrooms. It is a large space broken only by portable partitions, desks, laboratory tables, bookshelves, plant dividers or the like. The central goal of the open classroom is to provide flexibility. Without permanent walls, space can be easily divided, arranged, and rearranged to meet the changing demands of the various classes housed in the area (Gump, 1975). It is felt that the open classroom encourages interaction between students and teachers and between teachers and other teachers. This increased interaction it is assumed has great educational value (EFL,
Research on the open classroom has resulted in a number of unsettling findings. Among these are that teachers and students alike are likely to report that this type of classroom is noisier and that the noise is more distracting (Brunetti, 1972; Burns, 1972; Rivlin & Rothenberg, 1976). Additionally, visual distractions are more common, and lack of privacy is likely to be seen as a problem by students and faculty alike. The effects of noise are more disruptive for those involved in study groups than those involved in laboratory experiences, and when the noise is conversational rather than study related (Brunetti, 1972). Thus, the open classroom has the potential to be more disorderly and for the students to be more disruptive than the traditional classroom.

In defense of the open classroom, it is cheaper to build and easier to maintain. Lighting and thermal conditions are better, and social interaction is increased. However, a number of design problems need to be dealt with before the open classroom will meet its economic and educational goals. In this regard,

Evans and Lovell (1979) offer the following design modifications: (1) Visual and auditory distractions should be reduced; (2) activity boundaries need to have definite demarcations; (3) classroom materials need to be more unobtrusively accessible; (4) privacy areas for teachers as well as students need to be provided; and (5) some areas to which territorial claim can be laid need to be provided so students can develop a sense of personal control and efficacy.

It is felt that much of this can be established by such design changes as using sound-absorbing partitions, carpeted floors, establishing traffic routes away from heavily used study areas, providing for and allowing personal markers in certain areas, and establishing privacy islands where one can escape the direct surveillance of others.

The Dormitory

Much of the educational life of college students is spent in the dormitory. While it is true that a great deal of information is imparted in straight-row lecture halls and variously designed seminar rooms, the organizing, encoding, and committing to memory of this material often takes place in the dormitory rooms. The design of dormitories should therefore be of great interest to those concerned with providing educational settings that act

to maximize learning potential. Research evidence from studies conducted by Baum and Valins and their associates (Baum, Aiello, & Calesnick, 1978; Baum, Harpin, & Valins, 1975; Baum & Valins, 1977; Valins & Baum, 1973) and by Holahan and Wilcox (Holahan & Wilcox, 1978; Wilcox & Holahan, 1976) indicates that high social density can have negative social and psychological effects on residents, particularly when the density leads to (as it often does) a lack of personal control. High-rise housing with rooms on either side of long corridors and small, common facilities (e.g., lounges, showers, bathrooms, laundries) are especially likely to lead to situations of social unmanageability and are therefore likely to be detrimental to learning and performance.

In addition to increasing loss of control, the socially dense environment may cause residents to experience louder noise levels that are intermittent, unpredictable, and often uncontrollable. This combination of characteristics is, of course, one shown to be most disruptive of performance and most likely to have residual aftereffects. Additionally, Lakey (1989) has reported that first-year students assigned to denser, corridor dormitories develop less social support by the end of their first term than do students living in less dense, suite dormitories. These findings argue against present dormitory design, which appears to be more the result of economic expedience than educational philosophy.

In a few instances college and university officials have been mindful of the possible consequences of these socially dense housing units and have allowed for some modifications such as giving students some control over their rooms (e.g. building lofts, changing floor patterns, rearranging furniture, and others) and by doing some remodeling to provide for shorter corridors and sound-absorbing partitions. Finally, at the University of California-Davis, students lived in dorms of polyurethane foam and fiberglass that housed two students apiece. The students (within limits) were able to design the interior of these dorms (Baum & Davis, 1980; Corbett, 1973). These innovative approaches to housing design have been shown to lead to greater feelings of control, less crowding, and greater group spirit than conventional design. No major effects on learning, however, have been reported.

In summary, the physical design of living and learning environments can affect the amount of learning that takes place. This influence can be the result of design features that allow for more or less illumination, more or less noise, differential ventilation, and of design features that preclude privacy or take away control. With careful planning, however, the deleterious effects of design can be minimized and the enhancing effects capitalized upon.

Lesson 41

STITUTIONAL DESIGN RECONSIDERED & QUEUING THEORY

We began this chapter with some reflections on institutional design in general and suggested that planners, architects, and other designers pay attention to the wants, needs, desires, and behaviors of the users of the space that they are designing. Mindful of the oversimplified "question-answer-solution" paradigm for design, it was suggested that a more complex depiction awaits the perusal of existing data on selected institutional environments. If our ultimate goal is to design our built environments to promote human welfare, there are several lessons to be learned from the brief excursion we have taken into the world of institutional design. Among these are that (1) the performance of a given built environment depends not only on its physical characteristics, but on the interaction of these characteristics with the needs and requirements of the users of that environment; (2) most designed environments have multiple users and often their design needs and requirements are not the same; and (3) evaluation of a design requires more than comparing it with a "model" or prototype for that type of environment. With our admittedly cursory glance at hospitals, prisons, and schools now completed we return to reconsider the design process.

Because of their training, architects and designers are primarily concerned with the technical, mechanical, structural, and economical aspects of their designs. Has the best use been made of the selected site? Has the maximum space been attained at the lowest practical price? Does the building fit with its context? Does the building perform the functions dictated by the client? Is the building structurally sound? Because designers' knowledge limit their work, they are no different from anyone else, and it is unlikely that they know very much about the cultural idiosyncrasies of the users or of their ecological inter-relatedness to the space that is being designed. It would be rare indeed if their knowledge encompassed an understanding of privacy needs, territoriality, habit, custom, interaction distances, adaptation levels, and other factors. Even if architects and planners were aware of these variables, it is unlikely that their understanding would extend to cross-cultural nuances among them which influence, and are influenced by, design and which interact with design characteristics to bring about social change (see, for example, Kent, 1991; Moghaddam, Taylor, & Lalonde, 1989, Soliman, 1991). Finally, even when individual and social needs are well understood, it is still possible that the inherent limitations of the design will preclude their fulfillment.

There are, however, a number of steps in the design process that, if followed systematically, could lead to a recognition of existing limitations and an amelioration of problems before they become incapacitating. In a very real sense, these steps are nothing more than the scientific method applied to problems of design. They are as follows:

1. Preparation (stating the problem).
2. Information (gathering relevant data).
3. Evaluation (defining desirable outcomes).
4. Creativity (determining cost-effective means of achieving desired outcomes).
5. Selection (deciding on one plan from the set of alternatives).
6. Implementation (transforming of the blueprint to a physical structure).
7. Reevaluation (determining how well the structure performs the desired function).

Wheeler (1967) has written:

There are clearly healthy and unhealthy buildings in the medical sense, in the psychological sense and in the sociological sense. Our ability to adapt is probably why bad elements of architecture are so widely tolerated. After a while they cease to be noticed by those who are continuously exposed to them. This does not mean, however, that adaptation is without cost to humans. It requires energy to move to a new level of adaptation and it requires energy to stay there. Environmental factors that do not conform to some modal value on each of the perceptual dimensions are expensive to live with; we pay for tuning them out by using more energy or by being less effective in our work or play. (p. 4)

On the physical level, there must be some congruence between the environment and the user. A glove must have five fingers on it, and shirts must have sleeves of certain and equal lengths. Eyeglasses must fit the wearer and, more importantly, the lenses should be ground to accommodate visual defects. In all such relationships certain

limits and ranges are set by humankind's physical and anatomical characteristics. The designed environment is no exception. The clearest examples, as we have seen, involve the use of prosthetic design by the disabled, but is no less true for those who are not disabled. Certain levels of illumination, certain intensities of sound, certain distances between machines, and others are prescriptions for design based on physical limitations of humans.

On the cultural level such prescriptions are not as easy to come by, and therefore the design process must proceed with greater caution. The realization that the "right answers" to design are very much dependent on the potential users of the design and on the functions to be served, as dictated by the paying clients of design, is crucial. Hall (1962) has specified a number of criteria utilized in setting performance standards for any system, including the interactive system of environment and environment inhabitant. These criteria and a brief description of each are outlined below.
Profit: This criterion involves getting the best product at the lowest price. Of course, running costs (maintenance, insurance, and others) as wellas start-up costs must be considered.
Quality: In terms of design characteristics, this criterion relates to the way in which the design is judged by the user.
Performance: This criterion relates to the design's ability to carry out its specified functions in a specified period of time. In a sense, we are talking about a system's reliability.
Competition: What are the other design characteristics that are developed to carry out the same or similar functions?

Compatibility: How well does this designed space fit into the space surrounding it? The concern here is with functional as well as physical proximity.

Flexibility: How easily can the design be modified or adjusted to account for expansion or changing use?

Elegance: Are the functions carried out in the simplest, least confusing fashion?

Safety: Is the design not only structurally but user safe?

Time: How long does it take to get from the preparation to the reevaluation stage in the planning process?
To meet these criteria the designer must be adept at crystal-ball gazing; not only must the present needs and desires of users and clients be ascertained but the changing role of the design in light of the changing composition of the users must be ascertained as well. Contini (1965) has remarked that much contemporary design is for a population of 50 to 75 years ago when people were shorter, several pounds lighter, and a few years younger. And as Kennedy and Highlands (1964) have agreed, we often become trapped by forms which were designed and constructed to care for the needs of previous generations. Finally, as Rapoport (1969) notes, immigrants moving to the United States have often brought with them the architecture of their homeland, which is often unsuitable for the region to which they have brought it.

So what crystal ball do we gaze into? How do we predict the future? How can we know what to build today that will be functional in a changed tomorrow? Bross (1953) has outlined a series of prediction techniques, each of which is no doubt somewhat more accurate than the crystal-ball method, but each with its own limitations. It is, according to Bross, possible to engage in *persistence, trajectory, cyclic, associative, analog,* and/or *hindsight* prediction.
The last of these, *hindsight* prediction, if the least well understood, is certainly the most accurate. It involves prediction after the fact, and requires only a generalized "I told you so" attitude and the ability to make ambiguous (or even contradictory) remarks with an exalted degree of self-righteousness. All too often designers of our environment engage in this kind of prediction either as a means of self-congratulation or to derogate the work of others.

Equally potent, however, is the tendency to engage in *persistence* prediction. This type of prediction is based on the premise that certain things never change; consistencies are looked for over a short period of time and then are presumed to be invariant over a long period of time. It is this kind of prediction that led to Contini's remark concerning the inadequacies of design. On behalf of persistence prediction, it is true that there are a number of invariants in the use of space, and that these invariants need to be accounted for in environmental design (see, for example, Barker, 1968). Bross (1953) notes that if one is interested in predicting the weather and merely

describes today's weather, approximately 75 percent accuracy will result. Persistence prediction in this instance, therefore, is relatively effective.

Trajectory prediction is a matter of observing trends and then extrapolating from those trends. Again, in predicting the weather, one might observe temperatures on three consecutive days and note that the temperatures were 76, 77, and 78 degrees, respectively. In the short run it might be a fairly good strategy to extrapolate from this data and predict that today's temperature would be 79 degrees. There are obvious disadvantages, however, for using this basis of prediction over longer periods of time. Certainly one wouldn't necessarily predict that in three weeks the temperature will reach 99 degrees. By the same token one might be able to make predictions regarding the use of the built environment over short periods of time based on present usage, but it would be much more difficult to extrapolate very far into the future using only present usage as a basis for determining trends.

Cyclic prediction depends on the lessons of history. It was first used in predicting astronomical events such as phases of the moon, eclipses of the sun, and others, and is highly practical today in, for example, the design of solar collectors, tidal turbines, expressways for inbound traffic during the morning hours and outbound traffic during the evening, etc.). Its application has not been as widespread in design as it might be, however—perhaps because natural human cycles have not been looked for as much as they could be.

Associative prediction is often used in science. It involves the observation that two events are related. Although this relatedness may certainly take the form of a causal relationship, it need not and often does not. Most predictions in ordinary life are also of the associative type, and are often oversimplified. That is, two events that occur simultaneously are often mistaken for cause and effect. All too often, however, the relationship is not causal. In fact, most events are multi-determined, so that a single association very often does not tell the whole story. Nonetheless, associative prediction is likely to be more accurate when applied to design problems than any of the others discussed, if for no other reason than the application of this method requires the careful observation and measurement of the events that are assumed to be related.

Analog prediction is based on the assumption that if two events are related with respect to certain properties, they are assumed to be alike on properties for which we know the values for one of the events but not for the others. Analog prediction depends on the richness and clarity of the particular metaphor being utilized. In design, if the aged are assumed to be like the physically ill, then the design for the elderly will be identical to the design for the physically ill. The advantage of this method, of course, relies on the veridicality of the analog, and the danger lies in its inexactitude.

Obviously, some methods of prediction are more useful and/or more efficient than others, depending on what is being predicted and the criticality of the fit between the environment and the user. Nonetheless, designers must engage in prognostication in the context of every stage of the design process. With this in mind, let us now return to the seven stages of the design process as outlined earlier in this section.

In the preparation stage of design, planners must determine exactly what they are to design. For example, in building for the elderly, are planners designing an intensive care unit, a general care hospital, a waiting room to death, small, individualized, but self-contained housing units, or what? The answer to this question will lead to additional questions about other users of the facility. In what capacity will others use the facility, and what are their special design needs? Having decided the specialties of the potential user, many facts must be gathered. Indeed, many of the empirical facts of the present chapter would be relevant to this stage of the design process. Having thus determined what designs lead to what behaviors, designers must engage in evaluation (what are the most desirable outcomes), and in creativity (what are the most cost-effective means of achieving the desired outcomes, and what are the necessary trade-offs that will have to be made). After consultation with clients, potential users, and contractors, the selection process begins, and the selected design is transformed into a physical structure. In all of the above stages the designer is engaged in prediction. In a sense, planners wager that the decision made will lead to the outcomes that were deemed desirable. Finally, in the reevaluation phase, the accuracy and the validity of the predictions are assessed. Is the structure carrying out the functions that it was designed to carry out, and is it doing so in a cost-effective and humane fashion? If flexibility was used as a design criterion, the planner will now be back at stage one and ready to proceed through the entire process once again, constantly refining the structure so that the best fit between the organism and environment can be obtained.

QUEUING THEORY

Queuing theory, as the name implies, is concerned with waiting. This might involve waiting to be "checked out" at the grocery, waiting to have one's car serviced, waiting to have a telephone installed, or waiting for the delivery of a home computer. Queuing is obviously related to transportation problems: We wait in line at the bus stop; cars proceed along a highway in single file, their speed dependent on and limited by the slowest driver; planes are provided "landing patterns," and must await their turn to land. Sometimes queues are irritating (e.g., in the grocer's line, or in the cashier's booth) and sometimes they can be very costly (e.g., if workers are queued to obtain tools, or to have necessary repairs completed, or if the production line queue breaks down). Queuing theory, therefore, has a great deal to offer the designer who is concerned with planning for efficiency.

Duckworth (1965) provides a model for understanding queuing based on the concept of traffic intensity. The model takes into account the rate at which people join a queue and the average time it takes for one of them to be served. As an example, let us suppose that over a span of 113 minutes, 21 customers have lined up to be checked out at a grocery. Further, let us suppose that the succession of arrival intervals reads 2,5,8,4,6,3,7,5,6,8,7,4,3,2,6,7,5,6,5,8,4. By adding the first two intervals (2,5) and dividing by two we find that the average interval for the first two customers is 3.5, by adding the first three arrival intervals and dividing by three (i.e., 15 divided by 3) we find the average interval for the first three customers to be 5. If similar calculations are made for all 21 customers it can be shown that the average interval between arrivals would be 4.68. Similarly, the average service time could also be calculated. We might find, for example, that the average time to tally the bill, bag the purchases, and send the customer out to be 3.5 minutes. Traffic intensity in this example would thus be 3.50 divided by 4.68, or 0.748, and the average waiting time per customer could be calculated and would be found to equal to 13.85 minutes. Thus, although people are being checked out at the rate of one every 3.5 minutes and are arriving at the rate of one every 4.68 minutes, the average waiting time per customer is 13.85 minutes.

If store managers kept track of the arrival intervals of their customers and knew the average time required to shop at different times throughout the day, then they could anticipate the arrival intervals at the checkout counter and could open more registers as required, or close some of them and have the cashiers carry out other duties during slack times. The prevalent method of waiting until long lines are formed and then deploying cashiers is both inefficient and frustrating. Utilizing queuing theory would minimize the waiting time of customers and maximize the efficiency of the cashiers and, best of all, the animosity your author expressed at the beginning of this chapter would be minimized.

Incidentally, as noted earlier, queuing theory would also have application in other areas of concern to environmental psychologists, including the anticipation of fluctuating power demands and the more efficient use of electrical generators and the more effective use of public transportation. Indeed, queuing theory has utility in any situation where all potential users of a facility cannot utilize the facility simultaneously, but rather must await their turn as specified by some procedure where service times, and arrival intervals, can be ascertained.

Obviously, queuing theory is not the only solution to waiting. Some places have adopted a "pick-a-number" system wherein the customer obtains from a consecutively numbered mechanism (ticket, token, etc.) a place in the queue and then obtains service based on that placement. Other establishments have one queue that feeds into a number of "service stations." Once you reach the head of the line, you know that you are the next to be served independent of which station is next to open up. Either of these solutions is more acceptable than the situation described in the opening paragraphs of this chapter.

Lesson 42

ENERGY USE IN HOMES AND COMMERCIAL BUILDINGS

As stated earlier, approximately 42 percent of all energy consumption in the United Stales is accounted for by the industrial sector. Almost two-thirds of this amount is required for processes within six major industries. Much of the industrial energy consumption takes place in the metals, chemicals, and, energy industries themselves. In fact, these three groups account for over half of all the energy consumed by the industrial sector of our economy. To provide the reader with some idea of the costs in terms of energy for various basic materials, comparisons show that the production of steel requires about one-sixth the amount of energy as does the production of aluminum, and that the production of glass is less energy-intensive than the production of steel. Two major consumer lessons can be deduced from such comparisons: (1) If .it all possible one should choose less energy- intensive materials over more energy-intensive materials; (2) because the energy costs of manufacture and transport are so high, materials should be used as long as possible and reused or recycled where appropriate.

Energy Use in Homes

Over the centuries one of the greatest tributes to human ingenuity has been the ability to develop housing that was minimally dependent on outside energy. Bernard Rudofsky (1964) provides an excellent pictorial account of what he calls anonymous architecture, or "architecture without architects." In this book humans' incredible capacity for construction of homes which mesh not only with the geography and topography but also with the prevailing climates of their sites is revealed. And in a rather ingenious book entitled *Tents: Architecture of the hjim/ids,* Torvald Faegre (1979) shows how the nomads have adapted the use of (he tent to such diverse climates as the Sahara Desert and the Himalayan Mountains. Clark (1975) laments the Loss of this ingenuity as he claims that with each passing year the American home becomes not only more uniform but now bears no relationship to the geography or to climate in which it is sited. The same home built in exactly the same way can be found on any street in Atlanta, Georgia; Bangor, Maine; Houston, Texas; or Bimidji, Minnesota. As we will see, this uniformity in design is true not only of homes but also of commercial buildings, and it leads to buildings that are energy-wasteful.

One of the three major determinants of how energy is likely to be consumed by residential homes is the type of heating/cooling system installed. In determining the energy costs of heating and cooling, consideration should be given to the number of energy conversions required to get the job done. In this respect heating with a natural gas furnace is more energy efficient than electrical baseboard heating because energy is lost in the conversion of the primary energy source (e.g. coal, fuel oil, or natural gas) to the secondary source: electricity. Electric homes use almost twice as much energy even though they are built with better insulation. The same is true of heating water: It is cheaper to heat water for home use with natural gas than it is with electricity.

Other than the choice of heating and cooling equipment, the next major determinant of energy utilization is the life style of the inhabitants. The extent to which a home is filled with electrical appliances and the extent to which these appliances are used will determine the amount of energy utilized. Color TVs are more energy intensive than are black-and-white ones, self-cleaning ovens use more energy than do conventional methods of cleaning, frost-free refrigerators consume more energy than do conventional refrigerators, air conditioners consume more power than window fans, and incandescent lights require more electricity than do fluorescent lights.

The real savings to consumers who purchase and use more energy-efficient appliances are substantial. For example, Clark (1975) reports on a study done by Neely (1972) in which he extrapolates from the sale of 6.6 million refrigerators/freezers in 1970. If all purchasers had chosen the more efficient units, he contends that the economic savings (based on one dollar per month reduction in monthly use costs) would equal $80 million at the end of the first year, and by the time 100 million new refrigerator-freezers were sold the economic savings would equal $1.2 billion dollars annually. He goes on to assume that the fuel burned to create the electricity to

operate the refrigerators was coal, and that it was burned at a modern electric power plant. Given the assumption that the savings in electricity would equal 40 billion kilowatt hours, the savings in coal would be 17 million tons. Additionally, buying the more efficient appliance would prevent the introduction into the atmosphere 690,000 tons of sulfur dioxide, 25,000 tons of particulate, and 147,500 tons of nitrogen oxides. Finally, the more judicious purchase would result in saving 26,000 acres from being strip-mined and 10,000 acres from being claimed for the use of power plants and transmission lines. All these savings accrue by merely choosing a more efficient over a less efficient refrigerator; think of the savings if the same choices were made over a variety of energy-consuming goods.

As alluded to earlier, perhaps the most important determinant of I he amount of energy a household will consume is the construction of the home itself; the major factor in construction is the wise use of insulation coupled with shading in the summer and utilizing the sun's rays in the winter. The National Mineral Wool Insulation Association (1972) claims that if 75 percent of all new construction used good insulation techniques, if 25 percent of all older homes were upgraded with better insulation, and if 12 percent of all older homes were equipped with storm doors and windows, then the nation's energy bill would be reduced by $3.1 billion each year". Incidentally, the costs of insulating are minimal compared with the costs of heating un insulated or poorly insulated spaces. Using wool as an insulator, for example, results in a 15 Btu savings for each Btu required in processing. In summary, anything that will capture the heat indoors in the winter and keep the heal out in the summer will result in substantial savings with no reduction in comfort.

Energy Use in Commercial Buildings

If the energy waste in homes can be considered obscene, then the energy waste in commercial buildings should be considered outright criminal. Our affinity for using glass and our love affair with tallness contribute to this waste. The Scars Tower in Chicago, for example, requires more electricity than the city of Rock-ford, Illinois, with its population of 147,000 people. This same building, incidentally, has 80 miles of elevator cables hidden somewhere in its viscera and enough concrete for 78 football fields *(Time,* 1973).

It has been estimated that commercial buildings use up to one-fourth of the nation's electricity just in lighting and over 50 percent of all the electricity produced (Clark, 1975). Because a great deal of the material used in modern commercial building is glass, expenditures of energy are required for heating and cooling.

Enough has been said about residential and commercial energy usage to conclude that the structures themselves are not built with energy conservation in mind, and that the users of these spaces are not particularly energy conscious. With slight modifications in design and in appliance usage, substantial savings in the amount of energy consumed could be realized. But energy use and abuse is not the whole story. One must also consider such by-products of energy use as air pollution, water pollution, and other forms of environmental degradation. It is to these effects that we now turn.

Environmental costs of Energy and Materials Usage

The use of energy and materials influences environmental quality throughout the extracting, processing, transporting, and usage stages. For example, it was once common for blow-outs to occur at drilling sites. These uncontrolled bursts of crude oil ascending the well shaft under great pressure and eventually being ejected into the surrounding area were particularly consequential when they occurred at offshore drilling sites. Before the use of more modern techniques was instituted, these uncontrolled bursts of oil dumped' thousands of barrels of crude oil into the environment before the well could be capped.

The resulting oil slick killed much marine life and endangered the lives of many more. But blow-outs aren't the only kind of environmental disaster that can occur at drilling sites. The drilling platform can ignite, as occurred in the Gulf of Mexico in 1970. Chevron Oil lost over a thousand barrels of oil a day to the sea, eventually destroying $100 million in shrimp and oyster beds. In the prior year a spill near Santa Barbara, California, destroyed a number of shore birds, shellfish, and an unknown quantity of other marine life. Because many

effects of an oil slick (no matter what the cause) are not fully determined for years after the initial event, the environmental costs of an oil slick are difficult to calculate. And the story continues. The massive Exxon oil spill in Prince William Sound in Alaska serves as a constant reminder of the ongoing environmental degradation resulting from our never-ending appetite for energy.

Although blow-outs, blow-ups, undersea pipeline breaks, and tanker accidents are dramatic and well-publicized, the amount of oil released into the sea by such incidents represents less than one-fifth of the total spillage (SCEP, 1970). By far the largest spillage of oil into the sea occurs as a result of normal operations—cleaning the tanks and ballasting of oil tankers, bilge pumping and cleaning of non-tankers, exhaust from ship's engines, and normal offshore production procedures. Baldwin (1971) estimates that as much as 4 million metric tons of oil per year spill into the world's waterways. Refining operations not only pollute the seas through spillage and seepage of oil but also through the release of other chemical effluents. For example, the National Wildlife Federation (1970) reports that one refinery dumped up to two and one-half tons of toxic lead per day into the Mississippi River in Louisiana. Other waste products of the refining industry include heat, phenols, hydrogen sulfide, heavy metals, etc. (Dewling, 1970).

Without doubt the use of fossil fuels as a major source of energy is not without problems, and these problems need to be addressed immediately. This is brought home not only as a result of concern over the detrimental side effects produced by the use of fossil fuels but also by looking at the reserves of these resources and other high energy minerals that are known to be available. Several conclusions have recently become apparent in this regard:

(1) The world's supply of natural resources is in serious jeopardy (mercury, gold, and tin are likely to be depleted very soon);
(2) The United States will become increasingly dependent on other nations not only for its energy but also for other natural resources;
(3) The United States is the prime consumer of a number of nonrenewable resources; and
(4) The United States with only 514 percent of the world's population accounts for from 14 percent (manganese) to 65 percent (natural gas) of the world's consumption of various resources (Makhijani & Lichtenberg, 1971). The carrying capacity of current American civilization is precariously perched on an enormous subsidy of fossil fuel and on resources which are likely to be more difficult to attain.

Strategies for Saving Energy

Arthur Purcell (1980) in a very provocative and informative book, *The Waste Watchers,* provides us with some very simple strategies for saving energy and materials and for reducing environmental degradation. Rule or strategy number one is simply to use and produce less. For every pound of aluminum, paper, steel, or other product that is not made we will save energy and avoid polluting. What Purcell says we can do with out.

Lesson 43

ALTERNATE ENERGY RESOURCES

Solar Energy

In the broadest sense, nearly all fuel systems in use today are based on solar energy. Fossil fuels store solar energy over millions of years. Natural gas, coal, and petroleum are stored reserves that cannot be renewed in our planet's lifetime. Wood fuels store solar energy for hundreds of years and can be a renewable energy resource if used with careful reforestation. Solar energy is also stored in plants and crop residue and can be released into biomass energy generation systems and renewed in periods as short as months or years. Systems which make direct use of solar radiation are using energy that is renewed daily, hourly, or instantaneously. The term *renewable energy system* generally refers to the use of these last energy alternatives, and it is to these systems that we now turn.

Renewable energy systems can take many forms. Wind energy conversion systems use airflow patterns generated by solar radiation. This energy is usually used to perform mechanical work or is converted into electricity. Systems which use the sun's rays directly for heat are usually referred to as either active or passive solar systems. These systems can be used either to heat or cool a home, to heat domestic hot water, or to maintain comfortable swimming pool temperatures. The sun's energy is well suited to these relatively low temperature tasks.

Passive solar systems. These systems have no solar panels; instead, part of the building collects, stores, and distributes solar energy. Passive solar buildings or additions are designed and built with materials that enable the structure to perform these functions. South-facing windows, doorways, greenhouses or skylights serve as solar collectors, while floors or walls contain the thermal storage mass necessary to store excess heat until it is needed. A variety of energy-conserving techniques are incorporated into the building to help keep heat in. These systems rely on natural processes of heat transfer (i.e. radiation, convection, and conduction) to distribute collected heat.

Active solar systems. Active solar systems use solar panels for heat collection and electrically driven pumps or fans to transport the heat to the living area or to storage. Electronic devices regulate the collection, storage, and distribution of heat within the system. Hybrid systems contain features of both passive and active systems. The successful performance of any solar system depends upon good design, the proper balance among various components of the system, and quality construction and installation.

Active solar heating begins with the collector panel, which captures and converts the sun's energy to heat. Basically, this panel is a glazed, weather-tight box that contains a black metal absorber plate. In colder climates double glazing is generally recommended, and the panel must be well insulated to prevent heat loss. Materials in the panel must be able to withstand extreme weather conditions; for example, freezing, thawing, snow, ice, rain, high winds, exposure to ultraviolet light and summer stagnation temperatures of 400°F. Roof-mounted collectors are most common because they are out of the way and generally have fewer shading problems. However, wall or ground mounts may be desirable in some instances.

Why hasn't the use of solar energy become more widespread, given this renewed interest? One reason has already been referred to: A public misunderstanding of solar technology has people awaiting some giant (but unlikely) technological breakthrough. Other reasons include the fact that oil and natural gas are still relatively cheap; solar installation requires a large one-time investment, whereas other sources of energy can be bought in lower-priced packages usually by the month; landlords typically pass energy costs onto tenants, a system which works easier when the utilities are collecting the debts; and, people seem to want a two- or three-year payback for their investment and the usual payback period for solar installation is five years. One thing for certain is that with increased shortages of energy those individuals with solar installations will be less at the mercy of forces over which they have no control. When the oil, gas, and coal reserves have run out, the sun will still be shining.

Conservation as an Energy Source

There is a source of energy that produces no radioactive waste, nothing in the way of start-up dollars and very little, if any, pollution. Moreover, the source can provide the energy that conventional sources may not be able to furnish (Yergin, 1979). Unhappily, however, it does not receive the emphasis and attention that it deserves to receive. The source of this energy might be called *energy efficiency* but is generally known by the term *conservation.* To be semantically accurate, the source should be called *conservation energy* to remind us of a reality that conservation is no less an energy alternative than oil, gas, coal, or nuclear. If the United States were to make a serious commitment to conservation, it might well consume 30 to 40 percent less energy than it now does and still enjoy the same or an even higher standard of living. These savings would not hinge on any major technological breakthroughs and would require only modest adjustments in the way people live. The possible energy savings would be the equivalent of the elimination of all imported oil and then some.

Three types of conservation are possible. The first is *curtailment.* This is what happened when interstate natural gas ran short in 1976 and 1977, during the coal strike of 1977 and 1978, and during the gasoline lines of 1979. A second category of conservation is *overhaul* (i.e., dramatically changing the way in which Americans live and work). An extreme example might be outlawing of further suburbanization, forcing people to move into the urban center and live in tall buildings not equipped with places to park a car. A third way to think about conservation is a form of *adjustment.* This entails such things as insulating the house, or making automobiles, industrial processes, and home appliances more efficient, or capturing waste heat. Conservation, therefore, is not a theoretical or ideological issue. It should be pursued not as an end in itself but as a means toward greater social and economic welfare.
Voluntary reduction in energy consumption through conservation (coupled with penalties for noncompliance) represents a viable means of saving energy. These strategies seem to make sense, but why have we not adopted them? Some of the answers to this question were discussed in the previous chapter. For pragmatic reasons, perhaps the better question is *how to* get people to adopt these strategies. Some solutions are the subject of the remainder of this book.

The question we would like to put to you now is which of the above two scenarios is most likely to occur in the future given past and current trends? The one you imagined, or the one you didn't? Will the world in which you live out your life afford you the opportunities of the "good life" or will it be beset with shortages and calamity? Will there be clean air to breathe or will it be filled with photo chemicals and particulates? Will the water be pure or will it be contaminated with seepage from toxic chemical disposal sites and agricultural runoff? Will you enjoy geographical mobility or will energy shortages and rationing force you to remain relatively immobile? Will your visual vistas be clear and uncluttered or filled with the discards of a throw-away society? Before you give the reassuring answer, "probably something in between the extremes," we submit that that is a description of the present environment, and the answer is therefore disallowed! The earth's carrying capacity has already been reached in some places on the globe and is being approached in many others. In scanning the issues covered in this text, there seems to be ample support for the likelihood of the more dismal of the two scenarios occurring.

The purpose of the above exercise, however, was not to convince you that your authors are "doomsday prophets" who have joined the likes of Robert Heilbroner (see Chapter 14). We do, indeed, have grave concerns about the future of the environment and the quality of life for humanity in the years to come. We have at times felt overwhelmed by the immensity and complexity of environmental problems and disheartened by the woefully little progress that has been made toward their alleviation. We have watched with no little concern the resources of the earth diminish while simultaneously observing the increasing demands placed on them. Thus, it is safe to say that we are not optimists with respect to such projections of the future. However, we are not pessimists either. Indeed, if the latter were true, we would not have made the
effort to write this book. On the contrary, it is our hope that this book will stimulate readers to think critically about environmental issues and motivate some of them to work toward solutions to environmental problems.

Behavioral Solutions To Environmental Problems

In Chapter 1 it was argued that technology is a two-edged sword: Technological advances have yielded incredible improvements in the quality of life, yet many of these same technologies threaten not only the quality of life, but life itself. Despite these threats, many people still look to technology for solutions to environmental problems. There are any number of possible reasons for this apparent contradiction. Perhaps it is simply too difficult or too unsettling to imagine that technology—the very tool that has served humanity so well over the centuries— could ultimately become the mechanism of our undoing. Perhaps it is due to a belief that new technologies will be discovered as soon as it becomes economically profitable or politically popular to pursue their development. Whatever the reason, many people cling desperately to the notion that increased technology is the solution to environmental problems. We believe that such reasoning is based on a false sense of security in the power of technology, and that it would be a mistake to place all of our hopes in a *deus ex machina* (translated as "god out of machine," a convenient means of resolving many problems in Greek myths).

To be sure, physical technology (e.g., designing more fuel-efficient transportation systems, developing means of eliminating industrial pollution) will play a critical role in solving some problems. However, it is our belief that technology alone will not be enough, or that these discoveries will not be made soon enough to reverse the serious environmental deterioration that has already occurred. What many people overlook is the important—and perhaps overriding—need to produce changes in human behavior to preserve the environment and the quality of life. This social technology entails knowledge of individual human behavior (e.g., techniques to promote use of public transportation, or to encourage energy conservation in the home). The science of psychology has been devoted to understanding human behavior and developing technologies for changing behavior. Such change must always occur at the level of the individual, and this is the unique contribution that psychology has to offer in solving environmental problems.

Environmental Attitudes And Behaviors

Recent investigations have demonstrated relationships between individual characteristics and environmental attitudes and behaviors. For example, Stout-Wie-gand (1986) reported relationships among environmental concern, respondent characteristics, and environmental organization memberships. Among the variables reported to relate to environmental attitudes are age (Schreckengost, 1986), education (Conover, 1986), and socioeconomic status (Griffin, Glynn, & McLeod, 1986; Stephens, 1986). In general, these researchers report that pro-environmental attitudes/behaviors occur with greater frequency among older, more educated, and higher-status respondents. However, Griffin (1989) reported that younger homeowners adopted actions to save energy in the home at a faster rate than did older homeowners. Schahn and Holzer (1990) reported that women are more concerned than men in areas relating to household behavior, whereas men knew more about environmental problems. Others have recently investigated environmental concern among blacks (Taylor, 1989), Hispanics (Noe & Snow, 1990), and people in other countries (Thornton, McMillan, & Romanovsky, 1989).

But why would these people (or others, for that matter) be more likely to engage in environmentally constructive behavior? Some researchers have suggested the importance of motivational factors as determinants of environmentally relevant behaviors. For example, De Young (1986) reported that recycling was associated with a series of specific satisfactions, such as frugality and participation. Goitein and Weinstein (1986) concluded from their research that although satisfaction with a residential energy audit was only weakly correlated with subsequent energy conservation, satisfaction may be important in secondary recruitment and public attitudes. Vining and Ebreo (1990) reported that recyclers were more aware of publicity about recycling and more knowledgeable about materials and means of recycling than were nonrecyclers, while the latter were more concerned with financial incentives to recycle and personal convenience. Sivek and Hungerford (1990) reported that the best predictors of environmentally responsible behaviors were perceived skill in using environmental action strategies and level of environmental sensitivity. Van Houwelingen and Van Raaij (1989) demonstrated that households with a stated conservation goal saved more energy than did those simply provided monthly feedback on energy use or those asked to monitor their energy use. Thus, increased

understanding of the motivations and personal satisfactions of individuals for engaging in pro-environmental behaviors may enhance efforts to promote these behaviors. In the next section of this chapter we will discuss ways in which education and attitude change campaigns might influence such personal determinants of behavior.

Education to Preserve the Environment

It might seem that an important first step in changing attitudes would be to provide realistic information about environmental problems. The assumption here is that rational people will alter their attitudes appropriately when they are informed of the negative environmental consequences of their actions. Environmental education can take many forms, such as media campaigns (e.g., Keep America Beautiful), distributing informational leaflets, or introducing environmental issues into formal educational curricula. Research has shown that educational efforts can significantly increase awareness of and improve attitudes toward the environment (Cohen, 1973). Education is particularly important when individuals are simply lacking in relevant knowledge about environmental issues (Ditton & Goodale, 1974), and is more likely to be effective in changing attitudes of children and young adults than of older adults (Asch & Shore, 1975; Williams, 1991). Finally, educational efforts are likely to be effective if they emphasize solutions as well as awareness of environmental problems (Rankin, 1969). In this regard, Dennis and Soderstrom (1988) concluded that the ideal dissemination of energy information involves specific feedback to consumers who are already seeking answers to existing problems. Burrus, Bammel, and Kopit-sky (1988) suggested ways of increasing the effectiveness of informational brochures, such as depicting more people engaged in wilderness recreation, undomesticated animals, and using a lower reading level

Various recent studies have demonstrated the importance of these factors as determinants of environmental behaviors. For example, Jeppesen (1986) argued that the increased cost of utilities has not been sufficient to motivate energy conservation, but that the public needs clear, concise information of what to do. He presented one group of consumers with residential heat-loss pictures ("thermograms"), a second group with thermograms and a weatherization workshop and a third group with the thermograms, workshop, and a follow-up of mailed information. The latter two groups showed significantly more subsequent conservation behaviors than did the first or a control group receiving no information. Conover (1986) reported that individuals who were offered an audit and an interest-free loan in a retrofitting program were more likely to participate than individuals who did not receive this information. Finally, Jordan, Hunger-ford, and Tomera (1986) conducted a six-day workshop on residential conservation in which groups received either instruction on issue awareness only or instruction plus action strategies. The second group subsequently demonstrated a significantly greater participation in pro-environmental behaviors.

Changing Attitudes to Protect the Environment

Temple (1986) has suggested that a 30 to 50 percent reduction in home energy use could be achieved with current technology and without major disruption in life styles. He argued for a need to address the effective promotion of pro-environmental attitudes and actions. Parthasarathy (1989) suggested exploitation of mass communication and electronic media as the best possible way to achieve significant energy savings, and Winett (1987) concluded that there are growing indications that the media can be effective in changing relatively simple behaviors, including energy conservation. Protess, Cook, Curtin, and Gordon (1987) suggested that the impact of news media investigative journalism has greater impact on policymakers than on the general public and argued that changes in public policy could be facilitated by collaboration between journalists and government officials. Costanzo, Archer, Aronson, and Pettigrew (1986) argued that informational appeals should emphasize convincing the consumer of the payoff in energy conservation. Rockwell, Dickey, and Jasa (1990) suggest capitalizing on the personal factor by using a team approach to conservation. All of these articles indicate the importance of the processes of attitude change in efforts to preserve the environment. In the following section we review some of the research demonstrating how these processes might be facilitated.

Social psychologists have exerted considerable effort to understanding the processes of persuasion and

investigating factors that can promote attitude change. Carl Hovland and his associates conducted one of the most systematic programs of research in this area (Hovland, Janis, & Kelley, 1953). They identified three major categories of variables that should be considered in attitude change: the communicator (variables related to the individual delivering a persuasive message), the message (variables related to the communication itself), and the audience (variables related to the recipients of a persuasive communication).

Examples of communicator variables include expertness (Aronson, Turner, & Carlsmith, 1963) and trustworthiness (Walster, Aronson, & Abrahams, 1966). As you might expect, individuals who are perceived as experts (i.e., having some relevant knowledge that the audience does not) and as trustworthy (i.e., having nothing personal to gain by persuading the audience) are more influential than are nonexpert or untrustworthy communicators. Both of these variables can be thought of as related to the credibility of the communicator (i.e., is this a person I should bother listening to in the first place?). This suggests that persuasive appeals to save the environment should be delivered by people who are recognized as experts on the particular issue (e.g., the Surgeon General discussing health effects of air pollution) and as having nothing to gain by persuading the audience (e.g., Lee lacocca arguing for walking rather than driving to work). Gonzales, Aronson, and Costanzo (1988) suggested a variety of strategies to increase communicator effectiveness, emphasizing training home-energy auditors to communicate vividly, to personalize their recommendations, to induce commitment, and to frame recommendations in terms of loss rather than gain.

Two major variables related to the message are the discrepancy between the communication and the audience's initial position (Hovland & Pritzker, 1957) and the degree of fear arousal created by the message (Janis, 1967). For both variables, an intermediate level seems to produce the greatest attitude change. That is, for *a* message to produce attitude change, it must deviate from the target's initial position, but extremely discrepant communications can result in a boomerang effect leading to a strengthening of the original position by either derogating the source or rejecting the argument outright. Also, messages need to arouse the audience, but extremely frightening scenarios could result in a defensive repression of the message to prevent anxiety. Thus, communications designed to promote environmentally constructive attitudes should not be too radical (e.g., arguing that people should not drive their cars at all) nor too pessimistic (you may have noted that your authors have not adopted Robert Heil-broner's dismal analysis of the human prospect).

A major variable related to the audience, or recipient(s), of a persuasive communication is the degree of commitment to the original position (Petty & Cacioppo, 1979). People who are very committed to their attitudes are extremely resistant to change, whereas people who do not feel more strongly one way or the other about an issue are more likely to be persuaded. Thus, efforts to produce changes in environmental attitudes are best directed at individuals who do not hold extreme positions. Also, commitment interacts with message discrepancy (i.e., the higher the commitment, the less discrepancy is required to produce the boomerang effect). The lesson here is that smaller attitude changes should be attempted for extremely committed individuals, whereas greater changes can be expected from middle-of-the-road audiences.

One of the problems with educational and attitude-change campaigns is the tenuous link between attitudes and behavior. As we discussed in Chapter 4, studies attempting to predict behavior from attitudes have generally reported a disconcerting inconsistency between the two. Similar findings have been reported by investigators of environmental attitudes and behavior (Cone & Hayes, 1980; Lingwood, 1971), while others (Arcury, 1990; Heberlein, 1989) have argued for the utility of attitude studies in promoting environmentally responsible behavior. It may be that attitude-behavior inconsistency is due to a real absence of a causal relationship between general environmental attitudes and specific environmental behaviors, or to methodological problems in assessing attitude-behavior relationships. A number of researchers have recently identified specific issues in the evaluation of the effectiveness of change programs (Bennett, 1989; Hanna, 1989; Heilman, 1989; Keating, 1989; Kushler, 1989). Whatever the reason for the lack of consistency, educational and attitude-change programs are worth pursuing—it may be that not enough time has elapsed since serious efforts to educate the public about environmental issues began in order to see an improvement in environmentally constructive behavior. Nonetheless, a great deal of research has taken the more direct approach of changing behavior vis-avis the

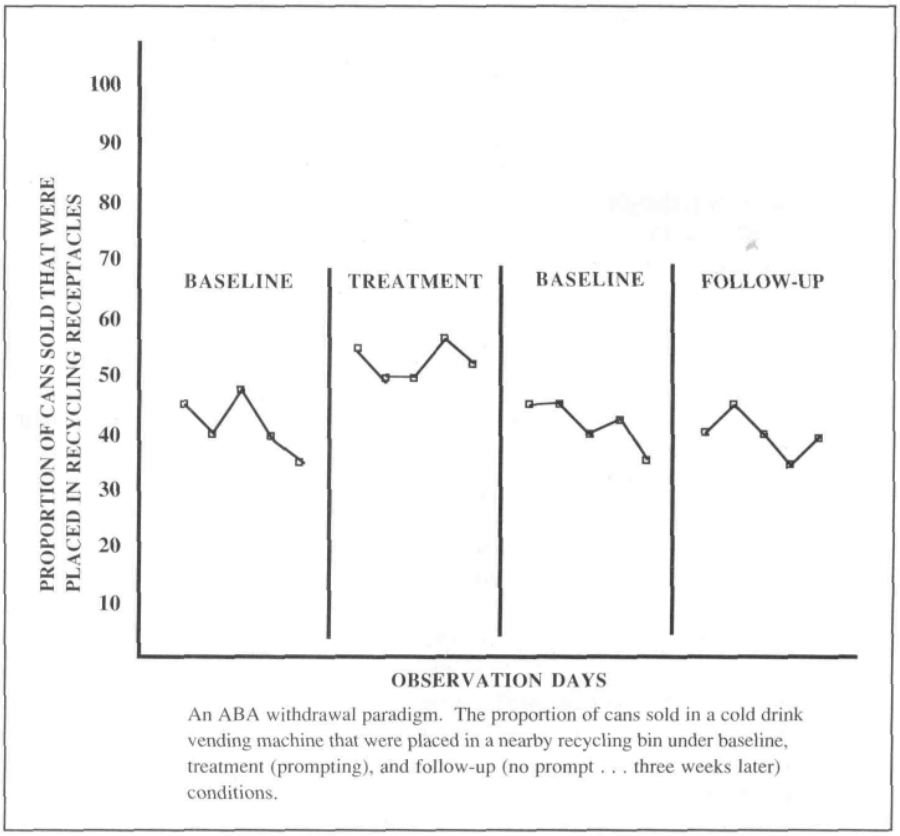
environment. Indeed, some researchers and theoreticians have argued that an effective way to change attitudes is to first change behaviors (Bern, 1972).

We turn now to this application of behavioral technology to solving environmental problems.

Changing Behavior to Preserve the Environment

Earlier in this chapter it was suggested that conservation should actually be considered as a source of energy. The variability in energy use within the home is quite large, with researchers reporting that some families use as much as two or three times the energy as other families living in identical houses (Socolow, 1978). This difference can be traced to specific conservation behaviors in some homes that do not occur in others. Finding ways to encourage people on a large-scale basis to engage in behaviors to conserve energy in the home could result in a substantial energy savings. We also discussed the enormous energy cost involved in disposing of trash in our country. Thus, finding ways to reduce specific behaviors (e.g., littering) and to increase other behaviors (e.g., recycling) could also result in a major energy savings. Finally, we also discussed the immense difference in energy required for private versus public transportation. Here, also, encouraging individuals to choose public transportation could contribute to energy conservation.

All of the above examples represent specific behaviors of individual people, which if modified could take us a long way toward preserving the environment for posterity. As mentioned earlier in this chapter, behavior modification lies within the domain of expertise of psychologists, and this is one contribution that psychology can make toward solving environmental problems. A number of environmental psychologists have already conducted much research on this issue. Perhaps most impressive among these efforts has been the work of E. Scott Geller and his associates (Geller, Winett, & Everett, 1982). Much of what follows is described in greater detail in their book *Preserving the Environment: New Strategies for Behavior Change*. The serious student of environment-behavior relationships and the future is urged to read this book.



An ABA withdrawal paradigm. The proportion of cans sold in a cold drink vending machine that were placed in a nearby recycling bin under baseline, treatment (prompting), and follow-up (no prompt . . . three weeks later) conditions.

ors, just as any other ior modification. This and specific terms the conserving energy via placed in appropriate g incidence of these rned off in restrooms,

and those dropping it se, the *treatment period.* ding and/or following l target behavior (e.g., e lights on), providing ing this phase and are *iod* during which the l an ABA design (see ncreases (or decreases)

re placed in a nearby . three weeks later)

periods, and at least remains above (or below) the original baseline level during the post treatment follow-up

period.

The above design is appropriate for a single target group, but sometimes the behavior of a control group (individuals not receiving the treatment) is also observed during the three phases to rule out extraneous variables as explanations of frequency changes observed during the treatment and/or follow-up periods. Also, it should be clear that a critical feature of applied behavior analysis and intervention is the treatment period. Environmental psychologists have employed a wide variety of intervention strategies in this regard, and in the following section we will review some of these techniques. These can be generally classified as either antecedent strategies (stimuli or events presented before the target behaviors designed to either prompt or prevent their occurrence) or consequence strategies (stimuli or events presented after the target behaviors designed to either increase or decrease the probability of their recurrence). We will discuss these separately, although both strategies can (and in many instances should) be employed in combination.

Antecedent Strategies. This intervention typically involves the use of either a written message (such as a "Please don't litter" sign) or a verbal statement (such as a radio or TV spot reminding people to turn off the lights in unoccupied rooms). These techniques are often referred to as *prompts* in that they are designed to trigger the occurrence or nonoccurrence of a particular response that may not have been performed without the reminder. As we shall see, prompts are relatively easy and inexpensive to employ, and they can be effective as well. A recent demonstration of their effectiveness was provided by Yu and Martin (1987). Golfers were given an explanation and photograph of hallmarks (i.e., damage to the putting green resulting from balls landing on the green hit from a distance) and recommended steps to repair them. This simple prompt produced a significant decrease in the number of unrepaired hallmarks at the course. The effectiveness of a prompt has been related to features of the prompt itself as well as aspects of the behaviors it is designed to encourage or discourage.

Prompts can be general (e.g., "Don't be a litterbug") or specific (e.g., "Please deposit litter in receptacle in back of room"). Specific prompts tend to be more effective, especially if they are close to where the desired behavior is to occur. For example, Winett (1978) was able to increase significantly the response of shutting off lights in public buildings by placing signs next to switches indicating that lights should be turned off when leaving the room. Prompts that are attractive or unusual are more effective than unattractive or unobtrusive prompts. For example, Geller, Brasted, and Mann (1980) found people much more likely to employ decorated trash receptacles than a standard trash can, and O'Neill, Blanck, and Joyner (1980) reported that on the Clemson University campus twice as much litter was deposited in a receptacle that looked like a hat students at Clemson typically wore to football games than in a standard container.

Finally, prompts that are polite rather than demanding are less likely to trigger psychological reactance (Brehm, 1972). For example, Reich and Robertson (1979) handed out flyers at a public swimming pool with the message, "Help Keep Your Pool Clean," "Don't Litter," or "Don't you DARE litter." The first message produced the least littering and the last produced the greatest amount. In general, prompting strategies are most effective for responses that are easy and convenient to make. Responses that require more effort—that is, are either inconvenient or time-consuming, tend not to be very amenable to prompting strategies (Geller, 1982). These types of behaviors are more likely to be responsive to consequence strategies.

behavior) or *removed* (e.g., lifting a ban on federal highway subsidies when a community lowers its pollution levels, known as *negative reinforcement* because it removes an unpleasant event; cancelling federal contracts with a corporation that has contaminated area water supplies, known as *negative punishment* because it removes a pleasant event). Finally, consequences can be either response-based (i.e., contingent upon the performance of a specific behavior, such as carpooling) or they can be outcome-based (i.e., contingent upon a specified standard of performance, such as sulfur dioxide emission levels). These relationships are summarized in Figure 15-5).

Geller and colleagues (1982) note that while psychologists have consistently demonstrated that positive reinforcement is more effective than either negative reinforcement or punishment, it is ironic that government has tended to rely on the latter methods in passing laws applying sanctions for undesirable behaviors rather than incentives for desirable behaviors. A problem with the control of behavior through aversive means is the lack of internal acceptance of the behavioral change. In other words, people perceive a greater threat to their freedom by aversive contingencies, resulting in psychological reactance and, at best, overt compliance in their behavior in order to avoid aversive consequences. People are more apt to internalize behavioral change when they perceive

that they are working toward pleasant consequences. Thus, we will focus on positive reinforcement for response-based and outcome-based contingencies.

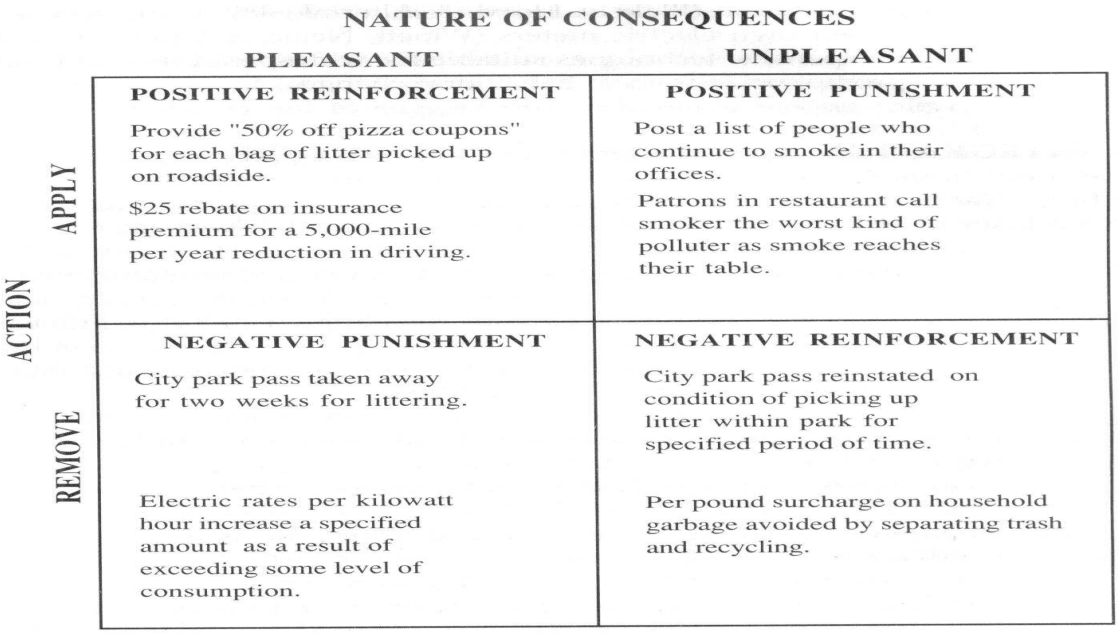
A great many studies have reported success in encouraging environmentally constructive behavior through positive reinforcement. Witmer and Geller (1976) were able to promote recycling paper by awarding raffle tickets to people who brought a specified amount of paper to a recycling center. Walker (1979) demonstrated that apartment renters were willing to set their room temperature at 74°F in the summer and keep windows and doors closed when the air conditioner was running in return for a $5.00 reduction in their rent. Kohlen-berg and Phillips (1973) decreased littering by offering a coupon redeemable for a soft drink for depositing litter in a particular receptacle. Everett, Haywood,and Meyers (1974) were able to increase bus ridership by offering tokens redeemable at local businesses. Hake and Foxx (1978) produced a 10 percent reduction in miles of travel over a month by a $5.00 incentive, and Winett and Nietzel (1975) were able to produce reductions in home-heating energy through a similar incentive program. More recently, Levitt and Leventhal (1986) reported the effectiveness of the New York State "Bottle Bill" (requiring a five-cent deposit on returnable containers) on littering. They reported a significant difference in the number of returnable containers (but not nonreturnable containers) between New York and New Jersey (which did not have such legislation) as much as a year later. Clearly, even the consequence of only five cents can influence environmental behavior.

The above examples of reinforcement procedures represent only a small sampling of programs that have been shown to be effective in producing at least temporary changes in a wide range of environmentally relevant behaviors. The applications of consequence strategies are limited only by imagination and ere-

FIGURE 15-5 Four types of strategies for promoting the preservation of the environment.

NATURE OF CONSEQUENCES

PLEASANT UNPLEASANT



Four types of consequence strategies for promoting the preservation of the environment. The first example in each cell has the consequence dependent on some particular response, whereas the second example has the consequence dependent on a specified outcome.

Four types of consequence strategies for promoting the preservation of the environment. The first example in each cell has the consequence dependent on some particular response, whereas the second example has the consequence dependent on a specified outcome.

A serious problem with these approaches, however, is the high costs of implementation on a large scale. Another problem characteristic of behavior modification programs in general is the maintenance of the desired behavior after the treatment period is over. A potential alternative that would alleviate these problems is simply to provide feedback to the individual regarding his or her behavior vis-a-vis the environment. Such information is useful in selfmonitoring of behavior and can yield a sense of self-efficacy and satisfaction as a result of self-control. Examples of such methods include sending a special feedback card monthly regarding residential energy use (Seaver & Patterson, 1976), installing a device that illuminates a light when electricity use exceeds a particular criterion (Blakely, Lloyd, & Alferink, 1977), and teaching people how to read their own electric meters (Winett, Neale, & Grier, 1979). These are relatively inexpensive techniques suitable for widespread use, and they can be helpful in promoting long-term behavioral change.

OUR ENERGY FUTURE

The last two decades have dramatically changed the way most people think about energy. In fact, 20 years ago most of us probably didn't think much about it at all. It was abundant and cheap, and we used lots of it. Then came a series of "energy crises" that changed our awareness and understanding of energy use. We had to face the implications of being dependent on limited supplies of non-renewable fuels, fuels that would never be cheap again.

A very important turning point came in 1970 when America's surplus capacity vanished and production reached what proved to be its peak (approximately 11.3 million barrels per day). From that point on, oil production declined but demand continued to increase and cheap imported oil took a greater share of the U.S. market. In response to sporadic shortages that began to develop around the country, the Nixon administration abandoned oil import quotas in 1973 and imported oil poured in. Our decline in production was interrupted briefly in 1978 by an on-rush of Alaskan oil, but in 1979 domestic output turned down once again. In the two decades from 1960 to 1980 American consumption of oil doubled from approximately 9.7 to 17.9 million barrels a day (Stobaugh, 1979). In this same period, production increased from approximately 8 million barrels a day to only 10.2 million, and imports went from 1.8 million barrels a day in 1960 to 8.4 million barrels a day in 1979.

On what kind of nation has the world become so dependent? We have become highly dependent on the oil empires of the Middle East including Saudi Arabia, Iran, South Yemen, Iraq, Syria, Egypt, and Libya. But political unrest is rampant in these countries. The numerous succession of crises occurring there represents not only an internal threat to these nations but also an external one. In 1977 and 1978 political assassinations occurred in Syria, South Yemen, and North Yemen, and in the past 30 years dissidents have overthrown ruling groups in Libya, Egypt, Iraq, Syria, South Yemen, and Iran. The press has also reported attempted coups in Saudi Arabia. Too little is known about the internal relations in Saudi Arabia, however, to make solid predictions about that country's political stability.

Without doubt we are highly dependent on sources of oil which are in a state of turmoil and for which no stability can be predicted. It is necessary for us, as a nation and as a world, to try to develop alternate energy sources. While a number of energy sources are possible including wind, coal, natural and synthetic gases, and nuclear, the remainder of this chapter will deal with two major sources—solar energy and conservation. We will look at these two because they are the ones over which we as individuals are able to exert the most control. The others are more likely to be influenced by technologies and politics, which we as individuals lack the expertise or the power to influence. Furthermore, Richard Stein (1978) suggests that as much as 43.5 percent of all energy used for all purposes is directly related to the relationship between architecture and energy. Architectural and energy decisions, he says, are affected by conflicting and partisan attitudes, cultural, financial, political, psychological, and aesthetic factors reflecting a diverse cast of characters who are involved in the process. The individual (or corporate or government) client, the source of the financing of the construction, the producers of the building materials, the building tradespeople who assemble and erect buildings, the contractors who hire them, the newspapers, magazines, TV and radio that influence public opinion, the professional journals and, of course, all members of the building design professions (i.e., the various engineers as well as the architects) all influence the energy consumption of our built environments and energy-consuming technology.

ALTERNATE ENERGY RESOURCES

Solar Energy

In the broadest sense, nearly all fuel systems in use today are based on solar energy. Fossil fuels store solar energy over millions of years. Natural gas, coal, and petroleum are stored reserves that cannot be renewed in our planet's lifetime. Wood fuels store solar energy for hundreds of years and can be a renewable energy resource if used with careful reforestation. Solar energy is also stored in plants and crop residue and can be released into biomass energy generation systems and renewed in periods as short as months or years. Systems which make direct use of solar radiation are using energy that is renewed daily, hourly, or instantaneously. The term *renewable energy system* generally refers to the use of these last energy alternatives, and it is to these systems that we now turn.

Renewable energy systems can take many forms. Wind energy conversion systems use airflow patterns generated by solar radiation. This energy is usually used to perform mechanical work or is converted into electricity. Systems which use the sun's rays directly for heat are usually referred to as either active or passive solar systems. These systems can be used either to heat or cool a home, to heat domestic hot water, or to maintain comfortable swimming pool temperatures. The sun's energy is well suited to these relatively low temperature tasks.

Passive solar systems. These systems have no solar panels; instead, part of the building collects, stores, and distributes solar energy. Passive solar buildings or additions are designed and built with materials that enable the structure to perform these functions. South-facing windows, doorways, greenhouses or skylights serve as solar collectors, while floors or walls contain the thermal storage mass necessary to store excess heat until it is needed. A variety of energy-conserving techniques are incorporated into the building to help keep heat in. These systems rely on natural processes of heat transfer (i.e. radiation, convection, and conduction) to distribute collected heat.

Active solar systems. Active solar systems use solar panels for heat collection and electrically driven pumps or fans to transport the heat to the living area or to storage. Electronic devices regulate the collection, storage, and distribution of heat within the system. Hybrid systems contain features of both passive and active systems. The successful performance of any solar system depends upon good design, the proper balance among various components of the system, and quality construction and installation.

Active solar heating begins with the collector panel, which captures and converts the sun's energy to heat. Basically, this panel is a glazed, weather-tight box that contains a black metal absorber plate. In colder climates double glazing is generally recommended, and the panel must be well insulated to prevent heat loss. Materials in the panel must be able to withstand extreme weather conditions; for example, freezing, thawing, snow, ice, rain, high winds, exposure to ultraviolet light and summer stagnation temperatures of 400°F. Roof-mounted collectors are most common because they are out of the way and generally have fewer shading problems. However, wall or ground mounts may be desirable in some instances.

Why hasn't the use of solar energy become more widespread, given this renewed interest? One reason has already been referred to: A public misunderstanding of solar technology has people awaiting some giant (but unlikely) technological breakthrough. Other reasons include the fact that oil and natural gas are still relatively cheap; solar installation requires a large one-time investment, whereas other sources of energy can be bought in lower-priced packages usually by the month; landlords typically pass energy costs onto tenants, a system which works easier when the utilities are collecting the debts; and, people seem to want a two- or three-year payback for their investment and the usual payback period for solar installation is five years. One thing for certain is that with increased shortages of energy those individuals with solar installations will be less at the mercy of forces over which they have no control. When the oil, gas, and coal reserves have run out, the sun will still be shining.

Lesson 44

LANS – CITIES AND GLOBAL INTERACTION IN REFERENCE TO ISSUES STUDIED

Urban Sprawl

Urban Sprawl is the name of a phenomenon resulting in rising numbers of far flung urban suburban network of low density residential areas, shopping malls, industrial facilities and other facilities loosely laced together by multilane highways.

Sprawl

Perimeters of city have simply been extended outward into the country side. One development after the next, with little plan as to where the expansion is going and no notion as to where it will stop. Almost everywhere we go near urban areas, we are confronted by farms and natural areas giving way to new developments, new highways being constructed and old roadways being expanded and upgraded Cars and sprawl are co-dependent; they need each other.

Origins of Urban Sprawl

In the early days of Pakistan, hardly anyone owned a car Cities had developed in ways that allowed people to meet their needs by means of transportation that was available – mainly walking, bicycles, and tongas. Every few blocks had a small grocery, a pharmacy, and other stores as well as professional offices integrated with residences. School were scattered through the city as were the parks for outdoor recreation and.

Commuting

Walking distances were generally short, and bicycling made going somewhere even more convenient For more specialized needs people boarded public transport, tongas and buses from neighborhoods to the "downtown" where specialty stores and big offices were located.

What Used to be: Cities to Villages

Public transport didn't change the compact structure of cities. The outer ends of the cities gave way to farms and fields that provided most of the food for the cities The small towns and villages surrounding the cities were also compact for the same reason and mainly served farmers in the immediate area.

Suburbs

Gradually there was a pent up demand for consumer goods and industrialization started setting in Transportation became speedier, and more private. Bicycles gave way to motorcycles, and cars Tangas gave way to auto rickshaws and vans.

The Dream

Despite the many advantages many people found cities less than pleasant places to live especially in industrial cities poor housing, inadequate sewage, pollution of the industries and generally noisy congested conditions were common many people had the desire to live in their own house on their own piece of land, away from the city.

Faster private means of transportation

With private cars people were no longer restricted to living within walking distances of their work places they could move out of their city dwellings into homes of their own outside the city. Their motorcycle, scooters and cars would allow them to drive back and forth easily to their jobs, shopping, and recreation.

Housing boom

To meet with the growing housing demand developers responded quickly They bought farmlands and natural areas to put up houses In some time the government aided this trend by offering mortgages People preferred paying monthly installment for their own houses in the suburbs than paying rent for equivalent or less living space in the city Thus mushrooming development around the cities.

Haphazard mushrooming development

Mushrooming development around cities did not proceed according to any plan, rather it happened wherever developers could acquire land Cities gradually started to be surrounded by a maze of housing colonies with more or less autonomous local jurisdictions of housing societies.

Local Governments

Local governments were soon thrown into catch up role of trying to provide schools, sewers, water systems, public facilities and most of all roads to accommodate uncontrolled growth Local zoning laws kept residential and commercial uses separate. It became more difficult to walk to a grocery or an office.

Highways

Influx of commuters into previously rural areas soon resulted onto traffic congestion, creating a need for new and larger roads.

Vicious Cycle

New highways that were intended to reduce congestion actually fostered the development of open land and commuting by more drivers from distant locations Soon traffic conditions became as congested as ever Average commuting distance has doubled but average commuting time has remained the same.

Residential to Shopping Malls

Residential developments have inevitably followed (or sometimes led by) shopping malls, industrial parks, motels, and office complexes The commercial centers are usually situated in such a way that the only possible access to them is by cars The situation in turn has only changed the direction of commuting Whereas in the early days of suburban sprawl, the major traffic flow was into and out of cities, it is now between the sub-urban centers.

Exurbs

Urban sprawl is the process of ex-urban migration – relocation of residences, shopping areas and workplaces from their traditional spaces into the cities to outlaying areas Population growth has played havoc into this.

Love Affair with Cars

Around the world in both developed and developing countries people aspire to own cars and adopt the car dependent life style. Urban sprawl is occurring around many developing countries in the world as people become affluent enough to own cars.

Higher Vehicle Ownership and Driving Mileage

Cars are driven greater distances per person in high sprawl areas (Gujrat VS. Lahore) Chauffeuring kids to and from schools or after school activities (sports or music lessons) requires more driving in sprawl areas As the values for miles driven and cars owned aggregate over many metropolitan areas they add up to millions more miles driven and cars on the roads.

Greater Risk of Fatal Accidents

The higher risk of vehicle use lead to higher highway fatalities

Lowered Rate of Walking

Greater dependence on cars leads to lowered rate of walking

No Change in Congestion Delays

There is hardly any difference between the commuting times in high and low sprawl areas moving out on the suburbs or the exurbs to get away from traffic congestion do not work.

Higher Cost of Municipal Services

The development in outlaying areas, all have to be serviced with schools, sewers, water, electricity, roads, and other infrastructure elements, often forcing country and town budgets (and therefore) taxes to escalate More compact forms of development are less expensive.

Higher Incidence of Obesity and high Blood Pressure

People in high sprawl areas drive more, while those in more compact areas walk more Walking and other moderate physical activities have many health benefits Studies have found highly significant correlation between the degree of sprawl on one hand and obesity and.

Environmental Aspects of Urban Sprawl

Depletion of Energy Resources

Shifting to a car dependent lifestyle has entailed an ever increasing demand of petroleum

Air Pollution

Vehicles are responsible for an estimated 80% of the air pollution in metropolitan regions the higher use of gasoline produces greater amount of carbon dioxide.

Water pollution and Degradation of Water resources

Highways, parking lots, driveways and other paved areas are associated with urban sprawl lead to a substantial increase of run-off resulting in increased flooding and erosion of stream banks Water quality is degraded by runoff fertilizers, pesticides, crankcase oil (oil that drips from engines)

Loss of Agricultural Lands

Most serious impact in the long run is los of agricultural land as most of the farms turn into housing schemes It is estimates that food now travels an average of 400-800 miles from where it is produced to where it is eaten The loss is not just the locally grown produce but also the social interactions and ties with the farm communities.

Loss of Landscape and Wildlife

New developments are consuming land at an alarming pace the fragmentation of wildlife habitat due to urban sprawl has led to marked decline in many species ranging from birds to amphibians Expanding numbers of highways lead to increasing numbers of road kills today much more wildlife is killed by vehicles than by hunters.

Benefits of Urban Sprawl

Quality of life issues tend to be decisive for people and these issues seem to be heavily weighted in favor of urban sprawl In general sprawl involves: Lower density residential living, Larger lot size, Larger single family homes, Better quality public schools, Lower crime rate, Better social services, Greater opportunity for participation in local government .

No Benefits?

Greater distances to drive and no advantages in commute times and traffic congestions Worst traffic fatality rate, since speed alone allows people to drive greater distances and achieve an equivalent commuting time.

Common Good?

Environmental costs of sprawl are real but these are seldom perceived as decisive by people moving to sprawl suburbs They are more a matter of common good and people tend to make choices based on personal good rather than common good More observer who have studied sprawl believe that the costs of sprawl outweigh the benefits.

Lesson 45

URBAN BLIGHT

In the developed world the other end of ex-urban migration is the city from which people are moving. A completely different set of factors is responsible for urban blight in developing countries. In this case people are moving *to* the cities at a rate that far exceeds the capacities of cities to assimilate them. The result is urban slums that surround virtually every city in the poorer developing countries.

The economies of rural areas, often based only on subsistence farming simply do not provide the jobs needed by a growing population. So people move to the cities, where at least they have the hope for the employment.

City housing

City housing is overwhelmed by the influx of migrants who could not afford the rents even if housing was available this leads to the formation of slums

Slums surrounding the cities

Vast slums surrounding the cities are a great challenge to the institutional structure of developing countries Because slums are unauthorized areas, cities rarely provide them with electricity, water, sanitation and other social amenities Yet the slums often represent essential workforce to the city taking low paying jobs that keep the city and its inhabitants functioning People live in the fear of bulldozers coming in any time and leveling down the shanty town A great need in such neighborhood is home security People in the slums also need more jobs Greatest need for people living in these areas is government representation. Their voices are seldom heard because they are among the poorest and most powerless in the society.

What Makes Cities Livable

A sustainable future will depend upon both reining the urban sprawl and revitalizing the cities. The urban blight in the cities in the developing countries requires deliberate policies to address the social needs of people flocking to the shanty towns. The only possible way to sustain the global population is by having viable, resource efficient cities, leaving the country side for agriculture and natural eco system.

Viable

Viable means livable No one wants to and should be required to live in the conditions that have come to typify the urban blight Livability is a general concept based on people's response to the question "Do you like living here, or would you rather live somewhere else?"

Livable Cities around the World

The common denominator of livable cities in the world is: Maintaining high population density Preserving heterogeneity of residences, businesses, stores, and shops keeping layouts on human dimension so that people can meet, visit or conduct business incidentally over coffee at side walk café or stroll through an open area.

People VS Automobiles

In livable cities the space is designed for and devoted to people In contrast development of the last fifty years has concentrated on accommodating automobiles and traffic Two thirds of the land in the cities that have grown up in the ear of automobiles is devoted to moving, parking or servicing the cars.

A Matter of Design

The world's most livable cities are not those with perfect auto access between all points. Instead they are the cities that have taken measures to reduce outward sprawl, diminish automobile traffic, and improve access by foot and bicycle in conjunction with mass transit.

Examples of Cities around the World

Geneva, Switzerland prohibits automobile parking at workplaces in the city's center forcing customers to use excellent

public transport system Copenhagen bans all on-street parking in the downtown core Paris has removed 200,000 parking places in the downtown area Curitiba, Brazil with a population of 1.6 million is cited to be one of the most livable city in the entire Latin America because they have guided development around the idea of mass transit system rather than cars.

Livable = Sustainable

Livability of a city leads to its sustainability Reduction of auto traffic and greater reliance on foot and public transportation reduce energy consumption and pollution Urban heterogeneity can facilitate the re-cycling of materials Housing can be retrofitted with passive solar space heating and heating for hot water Landscaping can provide cooling Vacant or cleared areas can be converted into garden plots Rooftop hydroponic gardens can be made popular. Such gardens may not make the cities agriculturally self sufficient but they add to urban livability By making the urban areas more appealing and economically viable we not only improve the lives of city residents but also spare the surrounding areas Parks, wilderness and farms will not be replaced by exurbs and shopping malls but rather will be saved for future generations.

Moving Towards Sustainable Communities

A joint facility of the UN Environment Program and the UN Human Settlement Program, the Sustainable Cities Program (SCP) is designed to foster the planning and management of needed to move cities in the developing countries towards sustainability.

Sustainable City

Sustainable Cities Program (SCP) defines sustainable city as a city in which achievements in social, economic and physical development are made to last. Cities are the focus of the program because they are absorbing two-thirds of population growth in developing countries and in the process we are experiencing serious environmental degradation in and around the growing urban centers.

Bottom up Approach

Bottom up approach calls for the involvement of all people at all economic and social levels and reconciling their interests when conflicts are evident Common principles seen in sustainable development theory are principles such as: Social equity, Economic efficiency and Environmental planning and management.

SCP Cities

To date there are twenty SCP cities some of them are: Madras (India), Dar es Salam (Tanzania), Accra (Ghana), and Shenyang (China), Concepcion (Chile).

Towards the Common Good

How must we live our planet? There are three strategic themes to answer the question:
Sustainability, Stewardship and Sound Science.