DESIGN FOR THE REAL WORLD

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Preface

There are professions more harmful than industrial design, but only a very few of them. And possibly only one profession is phonier. Advertising design, in persuading people to buy things they don't need, with money they don't have, in order to impress others who don't care, is probably the phoniest field in existence today. Industrial design, by concocting the tawdry idiocies hawked by advertisers, comes a close second. Never before in history have grown men sat down and seriously designed electric hairbrushes, rhinestone-covered file boxes, and mink carpeting for bathrooms, and then drawn up elaborate plans to make and sell these gadgets to millions of people. Before (in the 'good old days'), if a person liked killing people, he had to become a general, purchase a coal-mine, or else study nuclear physics. Today, industrial design has put murder on a mass-production basis. By designing criminally unsafe automobiles that kill or maim nearly one million people around the world each year, by creating whole new species of permanent garbage to clutter up the landscape, and by choosing materials and processes that pollute the air we breathe, designers have become a dangerous breed. And the skills needed in these activities are taught carefully to young people.

In an age of mass production when everything must be planned and designed, design has become the most powerful tool with which man shapes his tools and environments (and, by extension, society and himself). This demands high social and moral responsibility from the designer. It also demands greater understanding of the people by those who practise design and more insight into the design process by the public. Not a single volume on the responsibility of the designer, no book on design that considers the public in this way, has ever been published anywhere.

In February 1968, Fortune magazine published an article that foretold the end of the industrial design profession. Predictably, designers reacted with scorn and alarm. But I feel that the main arguments of the Fortune article are valid. It is about time that industrial design, as we have come to know it, should cease to exist. As long as design concerns itself with confecting trivial 'toys for adults', killing machines with gleaming tailfins, and ‘sexed-up' shrouds for typewriters, toasters, telephones, and computers, it has lost all reason to exist.

Design must become an innovative, highly creative, cross- disciplinary tool responsive to the true needs of men. It must be more research-oriented, and we must stop defiling the earth itself with poorly-designed objects and structures. For the last ten years or so, I have worked with designers and student design teams in many parts of the world. Whether on an island in Finland, in a village school in Indonesia, an air-conditioned office overlooking Tokyo, a small fishing village in Norway, or where I teach in the United States, I have tried to give a clear picture of what it means to design within a social context. But there is only so much one can say and do, and even in Marshall McLuhan's electronic era, sooner or later one must fall back on the printed word.

Included in the enormous amount of literature we have about design are hundreds of 'how-to-do-it' books that address themselves exclusively to an audience of other designers or (with the gleam of textbook sales in the author's eye) to students. The social context of design, as well as the public and lay reader, is damned by omission.

Looking at the books on design in seven languages, covering the walls of my home, I realized that the one book I wanted to read, the one book I most wanted to hand to my fellow students and designers, was missing. Because our society makes it crucial for designers to understand clearly the social, economic, and political background of what they do, my problem was not just one of personal frustration. So I decided to write the kind of book that I'd like to read.

This book is written from the viewpoint that there is some- thing basically wrong with the whole concept of patents and copyrights. If I design a toy that provides therapeutic exercise for handicapped children, then I think it is unjust to delay the release of the design by a year and a half, going through a patent application. I feel that ideas are plentiful and cheap, and it is wrong to make money from the needs of others. I have been very lucky in persuading many of my students to accept this view. Much of what you will find as design examples throughout this book has never been patented. In fact, quite the opposite strategy prevails: in many cases students and I have made measured drawings of, say, a play environment for blind children, written a description of how to build it simply, and then mimeographed drawings and all. If any agency, anywhere, will write in, my students will send them all the instructions free of charge. I try to do the same myself. An actual case history may explain this principle better.

Shortly after leaving school nearly two decades ago, I designed a coffee table based on entirely new concepts of structure and assembly. I gave a photograph and drawings of the table to the magazine Sunset, which printed it as a do-it-yourself project in the February 1953 issue. Almost at once a Southern California furniture firm, Modern Colour, Inc., 'ripped-off' the design and went into production. Admittedly they sold about eight thousand tables in 1953. But now it is 1970. Modern Colour has long since gone bankrupt, but Sunset recently reprinted the design in their book Furniture You can Build, so people are still building the table for themselves.

Thomas Jefferson himself entertained grave doubts as to the philosophy inherent in a patent grant. At the time of his invention of the hemp-break, he took positive steps to prevent being granted a patent and wrote to a friend: 'Something of this kind has been so long wanted by cultivators of hemp that as soon as I can speak of its effect with certainty, I shall probably describe it anonymously in the public papers in order to forestall the prevention of its use by some interloping patentee.'

I hope this book will bring new thinking to the design process and start an intelligent dialogue between designer and consumer. It is organized

into two parts, each six chapters long. The first part, 'Like It Is', attempts to define and criticize design as it is practised and taught today. The six chapters of 'How It Could Be' give the reader at least one newer way of looking at things in each chapter.

I have received inspiration and help in many parts of the world, over many years, in forming the ideas and ideals that made the writing of this book so necessary. I have spent large chunks of time living among Navahos, Eskimos, and Balinese, as \\ell as spending nearly one-third of each of the last seven years in Fin- land and Sweden, and I feel that this has shaped my thoughts. In Chapter Four, 'Do-It-Yourself Murder', I am indebted to the late Dr Robert Lindner of Baltimore, with whom I corresponded for a number of years, for his concept of the 'Triad of Limitations'. The idea of *kymmenykset* was first formulated by me during a design conference on the island of *Suomenlinna* in Finland in 1968. The word *Ujamaa,* as a simple way of saying 'we work together and help each other without colonialism or neo- colonial exploitation', was supplied in Africa during my UNESCO work.

Mr Harry M. Philo, an attorney from Detroit, is responsible for many of the examples of unsafe design cited in Chapter Five. Much in Chapter Eleven, 'The Neon Blackboard', reflects similar thinking by my two good friends, Bob Malone of Connecticut, and Bucky Fuller.

Four people are entitled to special thanks. Walter Muhonen of Costa Mesa, California, because the example set by his life has kept me going, even though my goals seemed unattainable. He taught me the real meaning of the Finnish word sisu. Patrick Decker of College Station, Texas, for persuading me to write this book. Telle' Olof Johansson of Halmstad and Stockholm, Sweden, for arguing the fine points of design with me, long into many nights; and for making the actual completion of this book's first Swedish edition possible. My wife, Harlanne, helped me to write what I wanted to say, instead of writing what seemed to sound good. Her searching questions, criticism, and encouragement often made all the difference.

The incisive thinking and the help of my editor, Verne Moberg, have made this revised edition sounder and more direct. In an environment that is screwed up visually, physically, and chemically, the best and simplest thing that architects, industrial designers, planners, etc., could do for humanity would be to stop working entirely. In all pollution, designers are implicated at least partially. But in this book I take a more affirmative view: It seems to me that we can go beyond not working at all, and work positively. Design can and must become a way in which young people can participate in changing society.

As socially and morally involved designers, we must address ourselves to the needs of a world with its back to the wall while the hands on the clock point perpetually to one minute before twelve.

Helsinki - ShigaraJja (Bali) - Stockholm

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WHAT IS DESIGN?

magazine Design poked fun at the designers by attributing to them an outlook of: 'We are like Gods but we must not let anyone know'. Considering all the areas which my list touches upon, it might be easy to assume that I feel that all the problems of the world can be solved through design. But in fact, all I am saying is that a great many problems could use the talents of designers. And this will mean a new role for designers, no longer as tools in the hands of industry but as advocates for users.

Part Two

How It Could Be

REBEL WITH A CAUSE:

Creativity v. Conformity

When you make a thing, a thing
that is new, it is so complicated
making it
that it is bound to be ugly.
But those that make it after you,
they don l have to worry
about making it.
And they can make it pretty, and
so everybody can like it
when the others
make it after you.

PICASSO (as quoted by Gertrude Stein)

It is the prime function of the designer to solve problems. My own view is that this means that the designer must also be more sensitive in realising what problems exist. Frequently a designer will 'discover' the existence of a problem that no one had suspected before, will define that problem and then attempt to solve it. This can be read as a definition of the creative process. Without doubt the number of problems that exist as well as their complexity have increased to such an extent that new and better solutions are needed.

At this point I should like to do a number of things: to attempt to describe the need for solving problems, to define that aspect of problem-solving behaviour which has been called 'creative', and to try to suggest methods for solving problems.

As both a designer and teacher, I am compelled to ask myself the question: 'How can we make design better ?' And the general consensus seems to be, both in schools and offices in this country and abroad, that the answers does not lie in teaching more design. Rather, designers and students have to familiarise themselves with many other fields and, by knowing them, redefine the relevance of the designer to our society. The insights of the social sciences, biology, anthropology, politics, engineering, and technology, the behavioural sciences, and much else, must be brought to bear on the design process. Ways of doing this are suggested in great detail throughout this book. But the most important ability that a designer can bring to his work is the ability to recognise, isolate, define, and solve problems.

A little over a decade ago, the word 'creativity' became a fashionable cliché for this activity. In fact, one California university is offering a course entitled 'Remedial Creativity 201'!

How and why did being 'creative' become a cliché? The ability to solve problems has been an inherent and desirable trait throughout human history. Mass production, mass advertising, the operation of the media, and automation are four contemporary trends that have emphasised conformity and made creativity a harder ideal to attain. In the twenties, Henry Ford, attempting to reduce the price of his cars through standardised production methods, is reputed to have said, 'They [the consumers] can have any colour they want as long as it's black.' This implies that, through curtailing colour differences, the price of individual automobiles will be lowered by some $95; conversely, consumers must be persuaded that black is a desirable colour to have.

The spirit of conformity has accelerated at an amazing rate. The demands on the individual to conform come from all directions: not only do the national, state, and local governments enforce certain standards of behaviour, but there are pressures from neighbours in suburban areas, conformist trends in school, at work, in church, and at play. What happens if we are unable to operate in so aggressively conformist an environment ? We 'blow our top' and are taken to the nearest psychiatrist for help. The first thing this specialist in human thought and motivation may want to say to us (if not in so many words), is 'Well, now, we must adjust you'. And what is adjustment, if not another word for conformity ? This is not to argue for a totally nonconformist world. In fact, conformity is a valuable human trait in that it helps to keep the entire social fabric together. But we have made our severest mistake in confusing conformity in action with conformity in thought.

Extensive psychological testing has shown that the mysterious quality called 'creative imagination' seems to exist in all people but is severely diminished by the time an individual reaches the age of six. The environment of school ('You mustn't do this!' 'You mustn't do that!' 'You call that a drawing of your mother ? Why, your mother only has two legs.' 'Nice girls don't do things like that!') sets up a whole screen of blocks in the mind of the child that later inhibits his ability to ideate freely. Of course, some of these prohibitions have social value: moralists tell us that they help the child establish a conscience; psychologists prefer to call this the formation of the superego; religious leaders call it 'a sense of right and wrong', or 'Soul'.

However, society can go amazingly far in attempting to create greater conformity and protect itself from what the current main- stream of culture is pleased to call 'deviants'. In 1970 Dr Arnold Hutschnecker suggested in a memo to President Nixon that all children between the ages of six and eight be tested psychologically to determine if they might have the kind of tendencies that would turn them towards becoming criminals later in life. The underlying suggestion was that some of these children be tranquillised heavily and maintained in that condition, much as millions of elderly patients in retirement homes are kept under permanent doses of heavy tranquillisers in order to make the work of

the nursing staff easier. Unfortunately, this proposal is characteristic of the kinds of pressures towards conformity that are often found in our institutions today.

Too many blocks can effectively stop problem-solving, and the wrong kind of problem statement can do the same. The old saying, 'Build a better mousetrap and the world will beat a path to your door', is a case in point. What is the real problem here, to catch mice, or to get rid of them ? Supposing my city is overrun by rodents. Suppose I do invent a better mousetrap. The result, next morning I will have ten million captured mice and rats to con- tend with. My solution may have been highly innovative, but the original problem statement was wrong. The real problem was to get rid of the mice and rats. As a fantasised solution, it might have been better to broadcast an ultrasonic or subsonic beam over every radio and TV set for a few hours, which, while harmless to other living creatures, would sterilise all rats and mice. A few months later the rodent population would be gone. (This raises the ethical question as to whether rats and mice should be permitted to watch television.) More seriously, it would raise the environmental question to what extent some small rodents are important links in the ecosystem.

However, most problems requiring immediate and radical new solutions lie in areas that are quite new.

Chad Oliver, in his science-fiction novel *Shadows in the Sun* says,

... he had to figure it out for himself. That sounds easy enough, being one of the familiar figures of speech of the English language, but Paul Ellery knew that it was not so simple. Most people live and die without ever having to solve a totally new problem. Do you wonder how to make the bicycle stay up ? Daddy will show you. Do you wonder how to put the plumbing in your new house ? The plumber will show you. Would it be all right to pay a call on Mrs Layne, after that scandal about the visiting football player ? Well, call up the girls and talk it over. Should you serve grasshoppers at your next barbecue? Why, nobody does that. Shall you come home from the office, change into a light toga, and make a small sacrifice in the backyard ? What would the neighbours think ?

But - how do you deal with a Whumpf in the butter ? What do you do about Grlzeads on the stairs ? How much should you pay for a new Lttangnuf-fel ? Is it okay to abnakave with a prwaatz ? Why, how silly! I never heard of such things. I have enough problems of my own without bothering my head with such goings on.

A Whumpf in the butter! I declare.

A situation completely outside human experience . . .

We live in a society that penalises highly creative individuals for their nonconformist autonomy. This makes the teaching of problem-solving in design both discouraging and difficult. A twenty-two-year-old student arrives at school with massive blocks against new ways of thinking, engendered by some sixteen years of mis-education, a heritage of childhood and pubescence of being 'moulded', 'adjusted', 'shaped'. Naturally, he will shop around for a school and study programme which seems to hold out the greatest immediate personal rewards. Meanwhile our society continuously evolves new social patterns that promise a slight departure from the mainstream, but without ever endangering the patchwork of marginal groups that make up society as a whole.

First of all, we must understand the psychological aspects of problem-solving. While no psychologist or psychiatrist can as yet point to the exact mechanics of the creative process, more and more insights are becoming available. We know that the ability to generate new ideas freely is a function of the unconscious, and that it is the associative faculty of the brain that is at work here. The ability to come up with many new ideas is inherent in all of us, regardless of age (with the exception of senility and anility) or so-called IQ level (always excepting true morons).

In order to be able to associate freely, multi-disciplinary ability helps. The quantity of knowledge, the quality of memory and recall can enrich this process. The ability to look at things in new ways is indispensable. This 'new way of looking at things' can be enhanced through the knowledge and thorough understanding of a second language. For the structure of languages gives us ways of dealing with and experiencing realities, each discreetly different in each language.

It is perfectly possible for instance to say, 'I am going to San Francisco', in English. Verbally the same statement ('Ich gehe nach San Francisco') is possible to frame in German, but it makes no sense whatsoever, linguistically. A qualifier must be added in German, for instance: I am flying to San Francisco, I am driving to San Francisco, etc. In Navaho and the Eskimo languages the statement must be even more specifically qualified to make sense: 'I (alone, or with two friends, or whatever) am driving (some- times I will drive, sometimes my friend will drive) (by cart, by sled) to San Francisco (then I will return and my friend will drive on)'. By bringing more than one language to bear on a problem, we obtain more insight. Whether .the language studied is German, Finnish, Swahili, Piano, Violin, Fortran, or Cobol matters little.

Intolerance creates more powerful blocks. Within the social scene, 'tolerance' is imperative to the ability to solve problems. The folk-mind has anticipated the research findings of psycholo-gists: 'His mind is in a groove', or 'He is in a real rut', are precise definitions of what really happens. If someone says 'Black', 'Jew' 'Commie', 'Hippie', 'Catholic', or 'hard hat', or what have you, and the immediate reaction is 'son of a bitch', this has happened. The associational response of the brain has literally worn a groove (or rut) into the engram-response pattern of the cerebral cortex. Just as Pavlovian psychologists seem impelled by now to ring a bell every time a dog salivates, an intolerant person operates on a conditioned-reflex level.

Someone who routinely solves problems also responds to the concept 'security' in a different way from that of his conformist contemporaries. In 1958 research conducted at U.C.L.A. among artists, architects, engineers with an unusually large number of patents, composers, musicians, writers, research scientists doing breakthrough work, has shown that one characteristic all of these people seem to have in common (regardless of their financial status) is that almost all of them are under-insured compared to standards set by the population at large. Creative individuals usually attempt to find security within themselves, rather than by paying $18-95 a month.

Until they enter school, most people seem to be about equally adept at solving problems. Then the inherent ability to create becomes inhibited by perceptual, cultural, associational, and emotional blocks.

Perceptual blocks are listed here only in order to point out their existence. A dichotomously colour-blind person, for instance, has a slight perceptual block in the area of seeing. Trichotomous colour-blindness constitutes a more serious block, whereas glaucoma, cataracts, and

other phenomena leading to total blindness constitute total perceptual blocks to seeing. Deafness is a complete perceptual block to hearing. Often the psychological inability to use all the senses in observing data will lead to complete blocking. These perceptual blocks, if curable at all, are entirely in the province of the doctor, the surgeon, the psychiatrist.

Cultural blocks, as the name implies, are imposed upon an individual by his cultural surrounding. And in each society a number of taboos endanger independent thinking. The famous Eskimo nine-dot problem which can befuddle the average Westerner for hours on end is solved by Eskimo children within minutes because Eskimo space concepts are quite different from ours. Professor Edward Carpenter explains how the men of the Aklavik tribe in Alaska will draw reliable maps of small islands by waiting for night to close in, and then drawing the map by listening to the waves lapping at the island in the dark. In other words, the island's shape is discerned by a sort of primitive radar. In Eskimo art we are sometimes confused, for we have lost the

Another problem of cultural blocking has been stated by a manufacturer of toilet bowls as follows: while the average American changes his automobile every two and a half years, gets a new suit about every nine months, buys a refrigerator every ten years, and even changes his residence about every five years, he never buys a new toilet bowl. If one could design the sort of bowl that would make people want to 'trade in' their old one, this industry would benefit greatly. At first sight this seems to be a phoney job, calling for artificially created obsolescence. And two answers to it immediately jump to the mind of the 'stylist'. The 'Detroit approach': possibly providing the bowl with tail fins and vast chrome ornamentation. Another would be the 'Toilet bowls are fun' approach: imprinting the surface with, say, little flowers, birds, or what have you. But intelligent research soon showed that all toilet bowls are too high (medically speaking). Ideally, people should assume a lower, squatting position when using this utensil. This can be achieved in two ways: by raising the floor or lowering the bowl. As the client was in the business of manufacturing toilet fixtures, a new lower bowl was designed and built for him. In spite of the obvious medical and sanitary advantages of this, in spite of the fact that now there existed a real reason for buying new toilet bowls, the design was rejected. The manufacturer felt that in this area the cultural block in the public mind was too great, and that it would be impossible for him to advertise his product. This is not an anecdote in somewhat poor taste, but rather an example of a very definite cultural block: the product could have been advertised easily in, say, Finland or Japan. Cultural blocks operating in this area can be extremely counter-productive. On Earth Day, 1970, it was suggested that people might place two or three bricks in the water tanks of their toilets and thus cut down on the amount of water used each time.

Here again I was able to suggest a redesign. Because what one does while sitting on a toilet differs in both quantity and quality, it seemed simple to redesign the apparatus so that one could select whether a great deal or only a minimal amount of water was needed for flushing. This concept again was rejected by my client - a man who makes his living manufacturing toilet bowls - as being 'in bad taste'. Here again the temptation for the designer is just to go ahead and design a product such as the one outlined above, and in this way encourage consumerism. A better strategy is to give the public a series of comparable choices. In the above case this meant providing the redesigned water-saving toilet bowl for those consumers (such as construction firms, housing developers, etc.) about to buy one. At the same time an insert was designed that would have been marketed for under $10 to modify existing bowls to use less water. Finally, the option of just sticking two or three bricks in the water tank would still have been open to people so inclined.

The cultural taboo about elimination processes has made other developments difficult as well. Toilet tissue is made of paper so constituted

that an enormously large quantity of water has to be used in its manufacture. For reasons now obscure to anyone, rolls of toilet paper are of a given width. By reducing this by one inch, millions of gallons of water would be saved daily in the manufacturing process, without cutting down on the function of the tissue itself. Yet here is another idea that is ecologically sound but has gone begging.

If I now try to escalate these examples from the disposal of faecal matter to its constructive use, still more people are turned off. Whenever the concept of recycling body wastes is brought up (for instance in a discussion of space capsules or space stations), people become disturbed. It is useful to remember that, on Life- raft Earth, everything we breathe, drink, eat, wear, or use has gone through billions of digestive systems since the planet was first formed. Our cultural blocks in this area tend to affect our thinking, our thinking affects our acts. We think of streams and lakes as 'polluted by urban wastes', we use words like 'sludge' and are appalled to find that our water sources are 'poisoned' by human excrement. We are confused, as with the better mouse- trap mentioned earlier, about whether we want to get rid of excrement or just separate it from our drinking supply.

I am suggesting that the entire field of anaerobic and aerobic digestion has been completely neglected. At the time of this writing (December 1970), only three major scientists are involved in studying the entire methane-generating process. Aside from occasional paragraphs in The Whole Earth Catalogue about solitary British eccentrics who manage to power their auto- mobiles from chicken droppings, the public is largely unaware of the gigantic energy sources that can be mined from our bodily processes of putrefaction, digestion, and waste-making. Yet the recycling of this energy, it seems to me, would be the first logical step in establishing a new life-style.

It is well within the ability of contemporary research technology to develop a prime energy converter which, by using anaerobic digestion systems, would make a house truly independent of all external connections. In looking through the news- papers of communes and alternative societies, I have always thought it pathetic that much of their gear (transformers, pumps, high-fidelity components, light generators, projectors, etc.) still has to plug in somewhere. The use of biological recycling for energy would not only make true independence possible, but also bring about a breakthrough in ecology. It is curious that virtually no research is going on in this area. It is unimportant whether the research is lacking because the field of study is simply too vast, or whether there is some gigantic conspiracy of power among oil companies to suppress such study. The point is rather that we are dealing with an area that the public has been taught to think of as 'filthy', hence enquiry is aborted by a cultural block.

Much of this has already been tried, but usually just on an individual level. Dr George W. Groth Jr, maintains 1,000 pigs in confinement on his farm near San Diego, California. The pig manure operates a lo-kilowatt war-surplus generator, which provides all the electricity needed for both light and power. The liquid manure pit has been capped, and the sewer gas is tied to a gas engine. Hot water from the engine's cooling system runs through 300 feet of copper tubing coiled inside the pit. A temperature of between 90° and 100° is maintained, which provides the best temperature for maximum 'digestion'. A tiny pump, running off the fan-belt pulley, circulates the water. A complete digestion cycle takes about twenty days, but once the process is an on-going one, it is also continuous. Besides providing electric power, the system has virtually no odour, and attracts no flies. Finally, the manure at first breaks down into simple organic compounds like acids and alcohols. Ultimately, as there is no air, it breaks down into water, carbon dioxide, and methane gas. Experiments of this sort have also been tried in Asia and Africa.

It seems clear that this design strategy can give us a way of using up human and animal waste by converting this material into power sources and recycling what is left. It is curious that what little has been written about it so far has appeared mostly in the underground press and alternative life-style papers.

Associational blocks operate in those areas where psychologically predetermined sets and inhibitions, often going back to our earliest childhood, keep us from thinking freely. An experiment, well known and several years old, will illustrate this point.

In one of our Eastern colleges a six-foot-long steel pipe with a diameter of 1.5 inches was immovably fixed into the cement floor of a basement, so that one foot of the pipe was below floor level and 5 feet stuck straight up. A ping-pong ball was then introduced into the pipe, so that it would rest at the bottom, 6 feet from the top opening. Placed in the room were a miscellaneous collection of tools, utensils, and gadgets. One thousand students were introduced into the room, one at a time, and asked to find some method for getting the ping-pong ball out of the pipe. The attempts to solve the problem were as various as the students themselves: some tried to saw through the pipe, which proved too strong; others dripped steel filings on to the ping-pong ball and then went 'fishing' for it with a magnet, finding that the magnet would adhere to the pipe wall long before it could be lowered all the way down. The attempt was made to raise it with a piece of chewing gum on a piece of string, but enough pendulum action was acquired in raising it so that the ball would inevitably drop off. To stick a series of soda straws together and try to 'suck' it up also proved impossible. But sooner or later almost all of the students, 917 out of 1,000 (a respectable performance indeed) found a mop and a bucket of water in a corner, poured the water into the pipe, and floated the ball to the top. This, how- ever, was only the control group.

A second series of 1,000 students were then asked to solve the problem again; conditions remaining unchanged with one slight exception. The bucket of water was removed, and the psychologists substituted an antique rosewood table on which a finely cut crystal pitcher of water, two glasses, and a silver tray rested. Out of the second group only 188 solved the problem correctly. Why ? Obviously because over 80 per cent in this group failed to 'see' the water. The fact that a crystal pitcher standing on a rosewood table is more noticeable than a pail in a corner is obvious. What we mean to imply is that the second group failed to make the associational link between water and a flotation method. The associational gap was a much more difficult one to make with the handsome pitcher than with the pail, even though normally we are not given to pouring water out of a bucket to float ping-pong balls either.

Shortly after the end of World War II, Raymond Loewy Associates designed a small home fan and succeeded in making the action truly noiseless. To their consternation, consumer response soon forced this design organisation to introduce a new gear into the fan that would give off a slight sound, since the average American housewife associated noise with cooling action and felt that a totally noiseless fan did not provide enough cool air.

Sometimes, the specific training that people have gone through professionally may establish even stronger associational blocks. When faced with the front elevation and the right side elevation of this object, and asked to draw a correct plan view or perspective, architects, engineers, and draftsmen usually fail at a higher rate than that among people untutored in these fields. The correct answer to this particular problem is interesting for another reason as well. Two answers are equally correct, and, depending on which one is given, it becomes possible to see whether the student has arrived at a solution through a species of creative analysis or 'sudden insight'. The reasoning behind giving answer

number one runs somewhat as follows: 'The right side elevation does not really work; it should be a centre section. Therefore, since it would work perfectly as a centre section, I must find a figure where the theoretical centre section and the right side elevation are identical. After selecting an equilateral triangle as the answer, I see that the front edge will show up as a line in the front elevation. By rounding this off, the line disappears and the problem is answered correctly.' In the second case the equally right (but mathematically speaking much more 'elegant') answer is arrived at through sudden insight and intuition.

Needless to say, the particular associational block that keeps people from answering this problem correctly, using either solution, lies in the fact that they set up a totally false, not specified, 90° angle relationship and therefore visualise the figure as being rectangular or square. 'Rectangularity' or 'squareness', then, is the basic block which the solver himself has built into the problem.

Emotional blocks may be the most difficult to overcome. The fear of making a mistake, the fear of making a fool of oneself, a pathological desire for security with an attendant unwillingness to gamble or pioneer, lack of drive to carry an idea through, be- cause of the possibility of eventual failure - all these fall into this category. Other blocks in this area are a deep-seated feeling of inferiority in regard to creation - forcing the designer to 'grab the first idea' instead of exploring several alternative solutions - fear of fellow designers, teachers, students, etc.

These points will recapitulate what has been established so far:

1. With constant pressure towards less individualism and greater conformity forced upon our society by mass advertising, mass media, mass production, and automation, the ability to solve problems in new and unexpected ways is becoming increasingly rare.

2. In a fast-accelerating, increasingly complex society, the designer is faced with more and more problems that can be solved only through new basic insights.

3. Design graduates leave our schools with some know-how, a great many skills, and a certain amount of aesthetic sensitivities, but with almost no method for obtaining any basic insights.

4. They find themselves unfit to solve new problems because of perceptual, cultural, associational, and emotional blocks. These blocks are the direct result of the constantly accelerating rat-race towards conformity and so-called 'adjustment'.

5. This race is not only inimical to all true design creativity but, in a wider sense, violates the very survival characteristics of the human species.

6. The various blocks are not inherited parts of the personality structure but rather learned, limiting, and inhibiting factors.

Our job then becomes one of establishing methods of doing away with these blocks. By repeatedly facing students and young designers with problems far enough removed from everyday reality so as to force them into entirely new thinking patterns, new cortical associations (both feet firmly planted on a pink cloud), by constantly pointing out to them the nature of the various blocks, it is possible to help them realise

their creative design potential. By forcing them into solving problems that have never been solved before, lying outside normal human experience, a habit pattern is slowly established, a habit pattern of solving problems without the interference of blocks (since, with problems removed from everyday experience, blocks cannot operate) and these habit patterns are then carried over into the solving of all problems, familiar or not.

What constitutes a 'totally new problem, outside all previous human experience' ? If we are asked to design some fabulous animal unlike any we are familiar with, we will probably end up with something possessing the body of a horse, the legs of an elephant, the tail of a lion, the neck of a giraffe, the head of a stag, the wings of a bat, and the sting of a honeybee. In other words, we have really put a lot of familiar things together in a totally unworkable, unfunctional, unfamiliar way. This is not solving a problem. If, on the other hand, we are asked to design a bicycle for a man with three legs and no arms we can now solve a specific functional problem far enough removed from everyday previous experience to become valuable in this context.

The late Professor John Arnold, first at M.I.T. and later at Stanford, pioneered in this field with students in engineering and product design. Most famous of his problems is probably the 'Arcturus IV project: here the class is given voluminous reports regarding the inhabitants of the fourth planet in the Arcturus system, as well as the planet itself. An extraordinarily tall, slow- moving species descended from birds, these mythical inhabitants possess many interesting physiological characteristics. They are hatched from eggs, possessed of a beak, have bird-like, hollow- bones, with three fingers on each hand and three eyes, the centre one of which is an X-ray eye. Their reaction speed is almost ten times as slow as that of human beings, the atmosphere they breathe is pure methane. If a class is now asked to design, say, an automobile-like vehicle for these people, important and totally new limits within which to design are immediately established.

Obviously a gasoline gauge is unnecessary, since the Arcturians can always see through the gas tank with their X-ray eye. What about a speedometer ? Obviously top speed will have to be in the neighbourhood of 8 miles per hour since otherwise, with their slow reaction speed, the danger of crashing into another vehicle before being able to react is always present. Perceptually, however, such a people would experience the gradations of speed (up to 8 miles per hour) much as we experience the speed range in our own automobiles. The answer here then seems easy: sub- divide a speedometer dial. But what kind of a numerical system would people use who have three fingers on each hand and three eyes: decimal, duodecimal, binary, sexagesimal? As these vehicles will be built on earth and exported to Arcturus IV, should they use a standard gasoline engine shielded against a methane atmosphere, or must a new type of engine, specifically designed to operate optimally in methane, be designed ? What of the overall shape of the vehicle ? Should it be egg-shaped (a simple and sturdy form resolved when aerodynamics are of no importance), or would putting the Arcturians into an egg-shape become, psychologically speaking, a return to the womb, lulling them into a false feeling of security, and, therefore, be imposing the worst possible shape in terms of vehicular safety ? Maybe our design consideration then becomes one of a shape as unlike an egg as possible - a difficult order to fill indeed!

Arcturus IV is just one of many problems evolved by Professor Arnold and, from the all-too-brief analysis of some of the possible approaches to it, it will be seen that, while fantastic and science-fictional in content, it is nonetheless a serious approach to creative problem-solving.

An even richer and more fertile area for problem statements can be derived from nature. In Chapter Five, I discuss the use of artificial burrs as part of a soil-erosion control device. In Chapter Nine, the flight and spiralling behaviour of various seeds will be discussed in greater detail.

It can be seen from the foregoing that the 'how' in teaching design creativity must consist largely of establishing a milieu in which new approaches can flourish. What has been the function of the school and education in general in this context ? It has presented the cultural status quo of its time by dispersing whatever mass of data is currently acceptable as 'truth'. It has never concerned itself with the individual human brain; rather, the tremendous variation in human minds has been taken into ac- count only as something to be flattened out so that the particular curriculum or theory in vogue at the moment can be 'sold' with minimal effort. We have failed to recognise that discovery, invention, original thought are culture-smashing activities (re- member $E = mc^2$?) whereas so-called education is a culture- preserving mechanism. By its very nature, education, as of now, cannot sponsor any vital new departures in any facet of our culture. It can only appear to do so to preserve the sustaining illusion of progress.

One of the major problems of successfully utilising creative imagination is that 'newness' often implies experiment, and experiment implies failure. In our success-oriented culture, the possibility of failure, although an unavoidable concomitant of experiment, works against the matrix. The creative designer, then, must be given not only the chance to experiment, but also the chance to fail. The history of all our progress is littered with a history of experimental failures. This 'right to fail', however, does not absolve the designer from responsibility. Here, possibly, is the crux of the matter: to instil in the designer a willingness for experimentation, coupled with a sense of responsibility for his failures. Unfortunately, both a sense of responsibility and an atmosphere permissive to failure are rare indeed.

A more ideal creative-design environment will consist of habituating designers and students to work in areas where their many blocks and inhibitions cannot operate, and this will imply a high tolerance level for experimental failure. Furthermore, it must mean the teaching and exploring of basic principles which, by their very nature, have no immediate application. This calls for a 'suspension of belief in ready answers, and in the glib, slicked-up Kitsch that characterises most of the design work coming out of schools and offices.

Unfortunately, our society is so structured that all of this is easily possible, paradoxical as this may sound. We need not journey to Arcturus IV to face designers and students with something completely outside their familiar experiences. All we have to do is to design for low-income families. For while de- signers have addressed themselves to the fads of the middle and upper bourgeoisie, it has also lately become fashionable to do a little bit of token designing for selected 'house niggers' representing the poor. Meanwhile, we have lost sight of the fact that a very substantial part of our population is discriminated against in a more subtle fashion.

I am questioning, then, the entire currently popular direction of design. To 'sex-up' objects (designers' jargon for making things more attractive to mythical consumers) makes no sense in a world in which basic need for design is very real. In an age that seems to be mastering aspects of form, a return to content is long overdue.

Much of what is suggested throughout this volume in the way of alternative areas for attack by designers also has the useful quality that it will be new to designers and students alike. If (within the meaning of this book) we do that which seems right, we will also develop our ability to see things in a new way and to do things that are new.