Disability and design: a study of practical problems

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Disability and Design; A Study of Practical Problems

by

W.B. Maple B.A.

A Master's Thesis

Submitted in partial fulfilment of the requirements for the award of

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PREFACE

There is no single best method - questionnaire, interview simulation or experiment - for studying man's adaptation to his environment or artefacts. How then do we approach a problem such as designing aids for the disabled when the people in question are not a homogeneous group, but include as wide a range of personal characteristics - age, interests or education - as an able-bodied population.

Two broad strategies can be followed. The first sees the designer applying certain pre-determined beliefs in the pursuit of a problem, a problem that he has identified as a possible need, and where a solution can be found. The second involves using common sense in the selection of a problem, supplemented with a clear appreciation of the difficulties that the user may have and culminating in the application of an expertise to determine a successful solution.

The study herein falls into the latter category. An attempt has been made within the confines of the strategy to broadly analyse the intrinsic problems of disability, to understand and to comment, being aware that every human is a complex system of interrelated needs, skills and personal characteristics. No attempt has been made to practice any measurement techniques such as surveys or questionnaires. The direction of the study has been towards practical observation and discussion, taking into account the modus operandi of a variety of establishments concerned with the needs of the disabled.

The theme of the observations and discussions hinged on the broad issue of disability, and specifically on the environmental needs of the disabled in their various walks of life. To complement the overall theme of further objective was to identify areas of "design neglect" and as a result propose solutions in a prototype or completed form.
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Part One
1.1 A Comment

Lord Snowden, president of the International Year of Disabled People in Britain, set a hopeful tone when he launched the Year talking about "a new era of understanding and action, the start of the breakdown of all social barriers of fear, prejudice and ignorance. For far too long the needs of disabled people have been ignored. This Year is the time and the opportunity to start putting things right."

However, remoulding the formless jelly of public opinion round to a new point of view is a difficult task as these two true anecdotes show. A couple of Englishmen were sitting in a bar in Cannes when, by chance, a women they knew walked in pushing a man in a wheelchair, his limbs wasted and distorted by polio. "Hello", said one of the drinkers to the other, "surely that isn't Melissa's new kink?"

Here's another anecdote showing the other side of the coin. A women was giving a talk to some disabled people in a London teaching hospital, in the course of her discussion she dropped a remark about disabled people as opposed to normal people, she was promptly set upon by her audience. "What do you mean normal?" they asked angrily. "No one is normal. You mean able-bodied!"

These sad stories, the first illustrating unabashed prejudice and the second showing hurt defensiveness, are good examples to show the gulf of misunderstanding that exists between the disabled and the able-bodied. The International Year, so designated in 1981, was not organised in order that money could be raised or better facilities could be provided for the disabled. The purpose of the Year was to attempt to change the whole way in which people think about disabled people and the way in which the disabled think about themselves.

The origins of the International Year lie in the Libyan representation to the United Nations in 1976, suggesting an International Year of the Disadvantaged. This was felt to cover far too wide a spectrum of need and so Britain seconded a motion to turn it into a specific year for disabled people. Britain kept up the momentum of its early involvement with Prince Charles
agreeing to be patron and with the Department of Health granting £160,000 towards staff, offices, publicity and other costs.

On a world spectrum UNESCO estimates that one person in ten is disabled. The IYDP organisers go further than that pointing out that old age and physical decay result in nearly everyone eventually being numbered in the ranks of the "disabled".

What can the International Year claim to have achieved? There are many different areas in the field of disability where improvements are needed and where public opinion is a major tool in effecting change, one of these areas is concerned with environmental barriers. The IYDP can claim an outstanding success in its campaign to show the problems that disabled people have in getting access to many public and private buildings. For example, disabled people in many cases cannot simply go to a theatre, they have to find someone to drive them there and when they arrive the problem of getting in to the auditorium is often insurmountable, because of steep steps and heavy doors. Coupled with this is the problem of getting out of a building quickly in the case of a fire alarm.

In order to drive home some of the problems that are confronted especially by the wheelchaired disabled, certain organisations representing the disabled arranged for a body of architects to place themselves in the position of disabled people. This involved architects in wheelchairs being given the opportunity to try the access to their own buildings and use their own toilets, it was a practical attempt to show how wide and frustrating the problems really are for disabled people.

Although the IYDP was aiming its campaign of change very much at the social, psychological and practical problems of the disabled and at times receiving a good response, in stark contrast the opportunities for the disabled in terms of better facilities and better job prospects has slowly been eroded as a result of local government cuts and an increase in the national unemployment level. The high level of unemployment generally has made things difficult for the disabled as whatever the level of able-bodied
unemployment the percentage of disabled that are unemployed will be two or three times higher.

Employers have not learned to look beyond the obvious disability, they only see the problems of access, toilets, fire escaped not aware that help is available with government grants to permit employers to alter their buildings, or aware that in many respects the disabled have proved to be loyal and conscientious as they realise the true value of being able to work.

In some cases the disabled can be a positive benefit as in a factory where there is a very high noise level. In this type of environment deaf people can and do work quite happily while hearing people find the noise very uncomfortable.

The major impetus of the IYDP has been towards publicity with many issues about disability being brought out into open forum for the first time. Internationally the IYDP has gone down well in rich countries like Britain, America and Australia, but in underdeveloped countries where the problems of disability are most acute, there is simply not enough money or commitment to make a dent into the problem.

Help for these countries has had to come from Western charitable appeals, such as in Norway where 10,000 volunteers knocked on every door in the country and raised eight million pounds to send to the underdeveloped world. The Japanese Government made a grant of five million pounds to be used in poor countries, while the EEC set up an all party committee to work out how to change policies on employment, benefits and access to buildings.

In Britain Mrs. Thatcher accepted a Charter for the Eighties which set out an agenda for action to prevent disability and to help disabled people integrate into society. Britain, if compared with other countries has a very good international reputation in many fields of care for the disabled, yet the benefits that are available still only nibble at the fringe of the whole problem.
The overall effect of the IYDP has had a mixed reception. From some disabled people it has been regarded with scepticism as an exercise in role play: the helper and the helped. Forcible opinion has been held on both sides with some disabled people laying the onus on the disabled themselves for not declaring their opinions and problems earlier, and also on the able-bodied for closing their eyes to an issue that they find embarrassing.

The IYDP committee would claim to have made no more than a small impression on the amorphous weight of public opinion, due in part, to the problems of the disabled being as complex as the human organism with which it is concerned. The International Year placed the disabled on a pedestal for all to see, it has given time for reflection on both sides, for argument and counter argument, for ideas to be suggested and decisions to be made, but most important it has brought to the surface an issue concerning human welfare that has long been neglected, not only in practical and every-day terms, but also at the level of our human conscience.
Part Two

The Society of Man
2.1 Attitudes and Behaviour

When discussing Man and his Society two basic facts should be recognised. Firstly, the behaviour of human beings shows regular and recurrent patterns, and secondly human beings are social animals and not isolated creatures. A society therefore can be seen "as any group of people who live and work together long enough to get themselves organised and to think of themselves as a social unit with well-defined limits." Ralph Linton. The Study of Man.

In its most general usage society is merely the basic fact of human association, with relationships hinging upon the fact that human behaviour is orientated in innumerable ways to other people. Not only do men live together and share common opinions, values, beliefs and customs, they also continually interact, responding to one another and shaping their behaviour in relation to the standards and expectations of others. The politician's attempt to win the support of the electorate, our reaction to the comments of a police officer, teacher or senior manager at work, - these constitute familiar examples of behaviour displaying the desires and wishes, whether real or imagined, of others.

Within the context of Man's behaviour to his fellow man Aristotle wrote more than two thousand years ago "Man is naturally a political animal (in modern terms political can be substituted for social) and ... whosoever is naturally and not artifically unfit for society must be either inferior or superior to men." Adam Ferguson, an eighteenth-century Scottish moral philosopher, once observed in terms which are still appropriate: "Both the earliest and the latest accounts collected from every quarter of the earth, represent mankind as assembled in troops and companies; ... a fact which must be admitted as the foundation of all our reasoning relative to man."
Both these extracts serve to illustrate that Man consciously, or unconsciously, from his very beginnings, categorised himself, as to his behaviour whether hostile or passive, his value to society good or bad, and other factors to be found in the "web of social relationships."

From this point of view society consists not only of individuals related to one another, but also of interconnected and overlapping groups. It is within these groups a family, a peer group, a union, a working environment, a profession that the individual can find identity in relation to other people around him. A society, then, can be analysed in terms of its constituent groups and their relations to one another.

Within a society various groups complement each other, oppose each other or are not recognised by each other. As a section of society the disabled are regarded as a minority and as such have not received the same recognition as stronger and more acceptable sections of society. Not only has society categorised the group known as disabled, but within that group the individuals who through misfortune have deflected from societies accepted "norms" in terms of physical and mental ability.

"It is without reason that the world of physically disabled people in our society is cloaked in mystery. It is a historic truth that a society will isolate those who jeopardize the collective image of what is desirable in life, and physically disabled people are a case in point. They raise the spectre of our own frailty and create a certain guilt that with all our belief in community we cannot contain them, with all our technology we cannot "heal"them."

The Centre for Independent Living, U.S.A.

To most disabled people the primary problem that exists in society as regards their own position, is prejudice, as it is one of the central issues in any move towards acceptable social participation. The darkening of attitudes involving prejudice, therefore, is an important matter necessitating special attention.
It may seem obvious that the way to change negative attitudes towards the disabled is by writing about the subject. One could draw attention to the fact that they are human beings worthy of "accepting" attitudes, that "despite" disability many make a positive contribution to society, that any able-bodied person might become disabled and the target of negative attitudes, and so on.

Many people have written on the problems of the disabled with the focus of their attention being fully on the disabled person and not on the other factors involved. Subjects for research have involved the integration of the disabled into society but few have thought about the responsibility of society to coming to terms with the disabled. If the attention solely remains on the disabled and the part that they should play then the negative attitudes will continue. If the focus is on the environment, social relationships, particular activities, or any external situation or problem, then we may be able to nurture more positive attitudes.

In the past society has looked upon disablement as an aberration, something unnatural. Society has been loth to admit of disablement as a natural feature of society. It has only acknowledged disablement in its grosser forms and it has always sought to isolate and banish this discomforting, threatening and tiresome disruption of its normal pursuits.

Society is reluctant to acknowledge that it has responsibilities, outside of a normal and minimal provision of basic needs, towards anyone who cannot be identified as having a claim upon society which is other than merely suffering the consequences of disablement. Partly it is because of the lack of understanding about disablement, partly a vague resentment at the thought of someone "getting something for nothing", at someone being supported by the contributions of others, with no discernable contribution being made in return.
The overriding feeling of society is that people are best motivated by the absence of an alternative which of course would be the provision of "needs" by others, others being the able-bodied.

There has been a significant change in the attitudes towards the disabled over the last forty years in part due to the social consensus which decided that the consequences of adverse fate should not be compounded by the blind selfishness of man.

The beginning of particular benefits and services towards the disabled was almost an indirect result of the change in attitudes, rather than a specific component of it. The Social Security system in this country was at its inception largely intended as a state provision for those near to destitution with the intention of keeping the recipient not only afloat but swimming under his own power, until a new job opportunity arose or the temporary difficulty or sickness, or whatever, diminished.

The question of integrating the disabled people, who are excluded from society by their physical appearance or difficulty of communication as well as their physical helplessness, is answered not by accepting that they are abnormal in relation to society as an entity but by acknowledging that they are seen as abnormal by much of society and often by themselves. Disabled people need support and help to varying degrees. With various kinds of support they will be able to enter into the community, but they may remain isolated within that community if their presence is seen as an admission that they don't need any assistance and would regard assistance as an insult to their attempts at self reliance.

Integration will be a recognition on the part of society that disabled people are in fact a normal facet of society. Integration means that society must accept a responsibility to guarantee that people are not cast out of society because of disablement, this guarantee will of course require a wide consensus of support.
What of the personality of the person with the physical disability, does this help in bringing down the psychological barriers? In my opinion most definitely, yes. The make-up of disabled people does significantly determine their integration into the community. If the disabled person has a clear comprehension of how society reacts towards him accompanied by a thick skin to fend off the irrational attitudes he will be confronted with, then he has the qualities available to react dispassionately to a possibly hostile and confused world.

"It is true that the only thing that disabled people have in common is physical limitation". This statement of course in a broad sense emphasises that disabled people are only categorised as disabled because of their physical difficulties, outlying this they are as individual in every other respect as the able-bodied.

Despite the fact that physical limitation is the only common denominator which categorises the disabled into a recognised body of people socially derogatory attitudes towards the physically disabled are displayed in many ways. Most commonly they are observed in devaluing expressions of pity which say in effect "thank God I am healthy and not like you". This attitude is insulting because it implies that the disabled person is a less valuable member of society merely because of his physical attributes.

An important reason that contributes to the common belief that disabled people are inferior lies in the importance that every one places on good health and normal physique.

Athleticism and physical beauty are greatly prized and sought after. The belief that these attributes are vitally important, and that success in life is dependent upon them is in part generated by a sophisticated mass media which encourages pressure advertising displaying "beautiful people" enjoying a life of ease and contentment.
If this philosophy is accepted uncritically it is natural to infer that a disabled person, because he lacks the crucial property of normal physique, has suffered a great misfortune which has damaged his whole life. There is a tendency to image that because the individual is inferior in this all important area of physique he must inevitably be inferior in other respects as well.

The effects of disability are exaggerated; because of the power of physique to evoke a variety of stereotyped impressions about people there is a tendency among non-disabled people to regard the disability itself as the dominant factor determining the behaviour and personality of someone who is disabled.

To most disabled people the problem of prejudice is deeply rooted in the image that society has about the disabled, an image created through ignorance and one that has to be removed if the disabled are to be allowed to participate fully in society. The darkening of attitudes involving prejudice, therefore, is an important matter necessitating special attention.

At different times in their lives many people have felt themselves to be isolated, neglected, spurned or somehow stigmatized. Whatever the reason for such feelings, the reactions are often acute and can range from a sense of inadequacy, self-pity or fear to despair and fury.

For the physically impaired the stigma that they are labelled disabled can result in a detrimental self-image which is further enhanced by society's condescending opinion.

Prejudiced people, of course, always attribute their attempts to devalue others as the "natural" result of negative qualities possessed by those they wish to devalue.
The effects that society has had on the disabled has been defined many times but I feel that this definition by the Union of Physically Impaired Against Segregation outlines the feelings of the disabled towards society from first hand experience: "In our view, it is society which disables physically impaired people. Disability is something imposed on top of our impairments by the way we are unnecessarily isolated and excluded from full participation in society. Disabled people are therefore an oppressed group in society. We define disability as the disadvantage of restriction of activity caused by a contemporary social organisation which takes no or little account of people who have physical impairments and thus excludes them from participation in the mainstream of social activities. Physical disability is therefore a particular form of social oppression".

A statement like this should give the incentive for change, changes to society, material changes to the environment, changes in environmental control systems, changes in social roles, and specifically changes in attitudes by people in the community as a whole.

The focus of attention should be equally distributed between all the social factors that pigment the full picture with the disabled having a significant say in what colours the picture should be completed.

The systematic barring of disabled people from integration into society is fundamentally a question of "what the eye doesn't see the heart will not grieve." Because society turns a blind eye to those who are different from the accepted norm, social attitudes towards them are then based on misconceptions. Many social attitudes are irrational. They are built up on ignorance and fear and as a result create spontaneous reactions of alarm or pity. The sight of a disabled person in many people's eyes rocks their view of the status quo, their picture of normality, where everyone has two legs and arms and is able to walk unaided.
Where has the stigma of disability come from? A brief analysis of the affects on disabled people throughout history brings clearly to the surface a demeanour that has remained until this day. The reason for this branding according to Finkelstein (1) lies in the make-up of society going back to the 19th century.

During the 19th century crippled people clustered at the bottom end of the social scale together with social out-casts. Historically, society has established norms, and those who did not conform were frequently ghettoized or dealt with most severely. Survival depended upon cooperation and reliance on each others abilities. This genetically programmed behaviour of sharing resulted in a system in which productivity not only ensured basic survival but also, to some degree, a developing prosperity. Those who did not contribute to the common good could destroy the group. The programmed behaviour of survival was so strong at times that families abandoned their newborn and elders. Even today the elders are abandoned to nursing homes.

With the separation of weaker members of society from society as a whole the inadequacies of the minority were further reinforced by placing much of the blame for the plight of society squarely on their shoulders. The characteristic way of holding attitudes towards cripples at this time was based on spurious ideology - e.g. they were cripples because of their sins, wanton behaviour, etc., or because of the sins of their fathers.

Finkelstein regards this attitude as a first stage in the grounding of beliefs about the disabled. The second stage arises out of growth of hospital-based medicine and the subsequent creation of large asylums.

These institutions thus began the process of removing the "inadequate" from the eyes of society a process of physical segregation which purged society of its failures. Here the attitudes must have been to view disabled people as suffering personal tragedies, being unable to care for themselves and consequently in need of care and protection.
Before this segregation physically impaired people such as cripples were socially active asserting their right to live and to be in the community and being seen as responsible for their actions. With the new approach to segregation the physically impaired were now seen as passive, needing others to do things for and to them; as disabled. It is therefore understandable that from this point on the disabled began to view themselves as not able to function without the physical and psychological support of an institution.

With custodial institutions (such as asylums and almshouses) creating the segregation of the disabled from society, one trend that took shape was the development of organised professional workers. The hospital environment now gave rise to the introduction of nurses, physiotherapists, psychologists, occupational therapists, social workers (almoners), counsellors, etc and with the almshouses, asylums and charitable homes the disabled were assured that their future was secured from the eyes of a compassionate society.

With the increased development of successful medical practices in hospitals the physically impaired received better treatment and were guaranteed greater chances of survival, thus significantly increasing the connection between the disabled and the institutions.

The stage has now been reached where provision for the disabled has become so comprehensive that avenues are now available for the disabled to remove themselves from the clutches of the institutional system, and take steps to fend for themselves, but still have the security of knowing that professional help is available outside the confines of a controlled environment.

The most important impetus for this change has been the steady development of new technology, specifically new electronics which in its turn has increased automation in industry. This technology has enabled the severely physically impaired to operate environmental controls which has enabled them to live relatively independently in the community.
The situation has now arisen where the nature of society's attitudes towards the disabled is under ever closer scrutiny. The emergence of this concern can be viewed as a twinge of social conscience helped considerably by a stubborn lobby from the disabled over a good many years.

If people with physical impairments are seen as having a long history of oppressive social relationships, then a perspective can be achieved for the disabled and able-bodied alike.

It can clearly be seen if we take Finkelstein's appraisal of history that the first stage in the saga was the oppression of "cripples" in the lower strata of society. As industrial knowledge and wealth was generated the physical means to overcome the material deficiencies of cripples was found and hence the institutions were created beginning the segregation that has existed for a hundred years. We are now at a turning point where the next stage will generate new attitudes and hopefully eliminate the stigma of disability.

2.2 A Time of Change

Undoubtedly, the most significant recognition of the presence of the disabled as a section of society has been the legislation embodied in the 1970 Chronically Sick and Disabled Persons Act. It is important to note that the introduction of this Act came about through a private member's Bill sponsored by Mr. Alfred Morris who vigorously pointed out that Britain had reached a level of economic affluence which not only made it possible for her to provide adequately for the victims of disablement, but which would make it positively shameful for the victims of disablement to be neglected by the country any longer. It showed that if the will was strong enough the resources were available.
The arguments expressed by Mr. Morris highlight the extent to which a civilised society will protect itself against social change or from a social policy that creates a preference to a section of society. It is obviously clear that the plight of the disabled when viewed as a moral obligation can only be seen as viable as long as the economic rationale complies with public sympathy and political tactics.

Social change is not achieved over night or simply because it seems like a good idea, it is brought about by processes of varying degrees of complexity, processes which are deeply rooted in social order and organisation. Many theories of social change have highlighted one important factor - while underestimating or neglecting others: Karl Marx's economic determinism. Thorstein Veblen's technological determinism, theories that attribute importance to ideology or religion or to geography and climate. These theories show that the cause of economic development can be and frequently is influenced by political or religious institutions "Ideas and beliefs do not exist in an ivory tower free from the influence of the market place or the political arena". The legislation that has come about for the disabled has arrived through the long process of historical change inter-woven with social change. It is worth considering that what is important in one era is not necessarily important in another.

This century the world as a whole and societies in general have become more closely knit in terms of communication, with greater contact between societies meaning an increase in the flow of ideas and opinions.

The result has been a sounding of ideas and has enabled comparisons to be made as to the vices and virtues of different societies. Fundamentally the structure of mankind wherever you look is universal. In every society some men are seen as superior and others as inferior, patricians and plebians, aristocrats and commoners, masters and slaves, the classes and the masses. Everywhere some rule and others obey, although the latter do have a degree of choice in the degree of freedom they
can exercise, a choice usually exerted by the rulers. These contrasts between higher and lower, rich and poor, powerful and powerless make-up the structure of a society.

So complex and inter-woven are the facts of social organisation that they have and can be described in many different ways. An important part of an individual's make-up within society concerns that individuals' social worth. The question of status is not the only criteria in which men assess themselves, but prestige and social standing can play a significant part in a person's recognition within society.

The differences in status are derived from many sources: the power or authority attached to some roles, the relative importance assigned to alternative roles by society, the number of persons capable of performing the necessary tasks, the rewards they carry. Other values such as ancestry, education, race, life style may provide alternative or additional bases of social ranking. The system of ranking therefore covers a wide range of inter-related and complex components.

The status of individuals in society is therefore achieved through personal ambition or attributed to fixed criteria which we have very little or no control over. The initial status of an individual is determined by ancestry, race, life style, but ultimately the maintaining of social worth hinges on the individual's ability to show and use his skills, prove his independence and show that he fits into society's patterns of accepted behaviour and codes of conduct.

The disabled by the nature of their afflictions do not or cannot always comply with society's standards usually because of the inhibiting nature of their personal handicap or because society bars them from advancing their personal status. They are kept at an artificial level as they "wouldn't be able to cope, it would cost too much to employ a disabled person, the morale of the work force would drop seeing a disabled person at work." These explanations have become standard replies in the reasons given for not accepting the disabled into the mainstream of social participation.
Disability is related to social norms as H.G.Well's fiction tells in "The Valley of the Blind" which describes how a sighted traveller is accidentally stranded in a remote and undiscovered valley inhabited by a very civilized people without sight. The traveller is treated humanely but not really accepted because his abnormality of seeing is noticed. One young girl is particularly kind to him and they fall in love and plan to marry. She, however, is constantly urging him to submit to treatment to restore him to sightless normality, whereas his standards of normality are those of his country of upbringing, and rather than be blinded, he leaves the valley, and his love behind him.

This romantic story serves to illustrate how a perceived abnormality can cause further handicap and prejudice, simply because it deviates from the accepted norm in a society.

The legislation in the 1970 Act is a constructive step towards achieving greater social awareness for the disabled, and through this, greater opportunities for the disabled to take increased responsibilities for themselves and for others in society. Greater awareness of the disabled will help to displace old prejudices and will hopefully create new horizons in social understanding. Ultimately the real question in our affluent society should not be whether social legislation should in general have economic aims, but to what extent and in what areas of need, our society can afford to and should ignore the arguments of cost benefits in promoting individual welfare, there has to be a time when society does not cry "can't be done" simply because there is no money.

Sympathy for the disabled has now been translated into effective legislation, society now has the backing of the political and religious institutions. Progress for social harmony lies in the will of the individual with an acceptance that everyone, disabled or able-bodied has the right to an existence that has equal and fair opportunities.
Part Three

Physical Disability
3.1 The Personal Aspect.

How do disabled people see themselves in today's society? This question can be answered in a thousand individual ways, depending on the personality, intellect and the disability of the individual you ask. To gain an insight into what disability means at a personal level it would be beneficial to evaluate how both disabled and "normal" people perceive bodily disfigurement.

The disabled have been portrayed in a very poor light in both literature and the visual medias in a world where manufactured images attract our attention and influence our beliefs.

Physical deformity, chronic illness and any outer defect of the body have come to symbolise an inner defect. Take the classic horror stories of Dr. Frankenstein's organ transplant and Dr. No's iron fist quite naturally they generate a certain propensity for monstrous behaviour. One could protest that these are the extremes, but what about Captain Hook, the ferocious tyrant of the sea, who despite his evil doings is vanquished by the pure and saintly figure of Peter Pan? Captain Hook of course wears a prosthesis, a hooked hand, which enables him to carry out his villany with even greater effect.

What is plainly obvious, if you take even a transient look at literature, is that perfect physique and good health are the requirements for the virtues of honour, goodness and truth. Superman is seen as the perfect physical specimen to overcome the evil of the world.

Why make a comparison here between disabilities experienced by people today and of those of popular fictional characters? The comparison should be made because the use of disability in literature, film etc., may on the surface seem innocuous enough, but it is in fact a very blatant and harmful form of stereotyping, and because of this stereotyping the individual disabled person has to endure (if not unconsciously adopt) the prejudicial associations of his or her situation.
Today the writers and film directors seem to have a fascination for the handicapped character. Currently running in America and Britain are films and plays such as: The Elephant Man (congenital deformity); Whose Life Is It Anyway? (paralysis); Wings (stroke) and Nevis Mountain Dew (paralysis).

In many of these portrayals the view of disability has been romanticized with the individual being seen as oppressed, eventually turning out to be a hero and above normal able-bodied mortals. Again, as in the fairy stories and comic strip characters, the people who star in these plays and films are not full human beings who happen to be disabled. They are portrayed in such a way as to emphasize their incapacity, and because of the standardized associations such incapacity is able to engender in the audience.

Why do the characters of these old and new stories whether they are in books, plays or films, affect the relationship between able-bodied and disabled?

For the able-bodied the threat comes from an inherent fear that, "I could be like that, Thank God I'm not" or "I hope to God I never become like that". As we see the projected image through films etc., we can identify with it at a safe distance, our guilt is under control and causes no discomfort. The image of the disabled person shows an external threat, something we don't have to talk to or come to terms with if we don't want to, we know that once the credits roll we can leave and push any uneasy feelings away.

No wonder that these types of films and plays are always fascinating, as we retain a distance yet get an intriguing insight into an affliction without having to confront it.

So what happens when we do confront someone with a disability? From the point of view of the disabled the stereotyped image that has been created can result in a painful under estimation of ones confidence to stand up and be counted.
For most of us, most of the time, the world is properly coloured in. Grass and trees are green, buses and roses are red, people in their clothes are an interesting jumble of blues, yellows, pinks, mauves, but for some disabled people the colour of the world is left an insubstantial grey by the reality of their affliction; their pigment is seen as abhorrent by the able-bodied on looker and also by the disabled themselves.

The images of abhorrent are as much a pigment of human fraility in the disabled as the able-bodied, the only difference is that the disabled cannot sweep the problems under the carpet; the disabled person has to live with an affliction and see it as a permanent part of his life.

The disabled are often regarded as apart from society, although able to cope on their own or with the help of a special institution, the idea that they can mix with the public and even offer something to society is not generally accepted.

There are many instances when disabled people have been isolated from the rest of the community. A result of this isolation is a deepening frustration and a bitterness towards society. A disabled individual's view of the world can be one of cruelty and indifference. In a family situation, even loved ones, mother, father, sister and brother can shunt the member with a serious disability into an airless corridor devoid of physical and mental stimulation. If the family rejects the disabled person, the community is not far behind in ignoring demonstrated needs.

A possible reason for this rejection lies in the negative attitudes towards disability, the idea that disabled people will always be dependent on others. We are often prone to assess the capacity of the disabled by considering what they lack rather than what they still have, forgetting that provided a man has the wherewithal to perform a particular job, he is, for the purpose of that job, a hundred percent able-bodied, no matter what his other limitations may be. His power will almost always prove to be greater, rather than less, than might be expected, because of the determination which he will bring to bear on the achievement of his objective.
"What most disabled people want more than anything else is to lessen their dependence on other people, to get on with living their own lives as normally as they can in their own homes among their families and wherever possible to have the opportunity of contributing to society as fully as their abilities allow". Alfred Morris. M.P.

Disability has for a long time implied a failure to meet socially imposed normal able-bodied standards. Disability has been based upon a comparison with the able-bodied, it therefore follows that disabled people not only fail to achieve specific able-bodied skills, but they are also seen to be unable to achieve complete equality as human beings. This fundamental belief held by both disabled and able-bodied alike has resulted in the negative attitudes held by some disabled and some able-bodied people.

At a national level the awareness that disability is apart of and not excluded from normal human existence is much more evident today. Despite this enlightenment, there are numerous ambiguities and contradictions which surround attitudes to disablement, which recur constantly.

On the other hand social values are, generally speaking more liberally inclined and public recognition of, and sympathy towards disablement and its attendant difficulties is high. This is particularly noticeable in the press and other mass media, where cases like the thalidomide children and less spectacular examples of distress have widespread appeal.

While at a national and legislative level concern is generated, at a person to person level the situation although improving, still leaves many people in a state of bewilderment. There is resentment on both sides, from the able-bodied that "we" have to make all the allowances for "you" and from the disabled that "you" don't make allowances for "us".
It is extremely easy to overgeneralize about the rights and wrongs of such an issue. It is much easier to understand if you experience the problem personally.

I (the author) was a "normal" able-bodied person for twenty years until suddenly I lost a leg. In many peoples eyes this would be regarded as a great blow, in fact to many people it is a terrible blow. If a person has had an injury or disease resulting in an impairment, he or she has suffered a physical loss. The physical loss has to be acknowledged in order that the individual can manage life with a loss - in effect to come to terms with loss or misfortune.

I am of an optimistic nature and was quite prepared to accept my new circumstances and whatever they offered. The first acknowledgement that I was obliged to make was that I was now disabled, different from before, in truth I did not feel any different at all about my capabilities or prospects in life. I very much felt as if I had been tested emotionally, physically, suffered to a certain degree, but disabled, never.

My innate stubborn nature and will to succeed in whatever I attempt, gave me the tenacity to tackle whatever problems came my way. I regard life in all its permutations as a challenge, a battle to be won, a hill to be climbed.

I am very fortunate to have the psychological capacity to have an optimistic outlook on life. I have a tendency to thrive on problems that are put my way. Not everyone enjoys such challenges, we are all created differently.

I have experienced and can fully appreciate the apprehension felt by many disabled people, perhaps in a wheelchair or on crutches who find the cold reflection of passers by disturbing and hostile. There is no warmth of feeling reflected in their faces, just alarm.
I feel that it is for the disabled person with whatever handicap to take the initiative to try and break down the barriers and so provide avenues for better understanding. "Does he take sugar in his tea?" is the kind of query unthinking people will put to the companion of a disabled person, rather than ask the tea drinker himself. Exaggerated heartiness or a blunt question like "What's the matter with you?" can be extremely irritating, but it might well be an innocent enquiry or a cover-up for uneasiness.

I feel that if the disabled person is able it is much better that he makes the first move, the response will be all together different. The art is in trying to be perceptive of the people you talk to answering questions as you would like to be answered, and so trying to build a bridge of mutual understanding.

Goldman (1947), a sensitive and powerful writer, describes his own experiences in living with crippled legs: "I've discovered something else: The gym teacher was embarrassed when he began to talk to me today. It was almost as if he felt the shame that he expected me to feel. But when he saw that I was not ashamed, his embarrassment disappeared. Is that a manifestation of a kind of power that human beings hold over each other? His attitude was in my control, it was I, not he, who determined what that attitude towards me should be..."

The question of disablement requires that society pays due regard to the consequences of disability from a national and organisational level, and also just as important sees that society reflects the concern that it projects on a personal level, where the real psychological and physical barriers exist, causing resentment and distress.

The question of integrating the disabled who are excluded from society by their appearance or difficulty of communication, as well as physical helplessness, is answered not by accepting that they are abnormal in relation to society as an entity but by acknowledging that they are seen as abnormal by much of society and by themselves.
We can agree that the extent of a person's disability is related in a large part to his outlook on life, coupled with the immediate environment he lives in. We live in a three-dimensional world where the five senses are vital physical tools which enable us to comprehend, communicate and feel. If we are lacking in one of these physical tools it therefore follows that fewer options for coping with the environment exist, and there is a higher probability of encountering physical problems.

As an example, a teacher in a wheelchair teaches a course on the second floor of a building that has a lift. His able-bodied students can reach the class either via the staircase or the lift. The teacher has only the option of using the lift. However, sometimes the lift breaks down and the combination of his paralyzed legs and the lift's inability to work means a problem for him that the able-bodied students do not have. Of course the lift has become a problem for the maintenance men, but the teacher is still left with a problem that would not exist if he had the ability to walk upstairs.

Although society can and should do all it can to eliminate the physical barriers, even in the best of planned environments, things will break; and those who have fewer alternative courses of action will experience more problems.

My own feelings are that instead of constantly chastising "society" for failing to create a perfect world, we should personally concern ourselves both with the removal of physical barriers, and also try to teach the disabled as individuals to work out strategies that will enable them to achieve their desired aims in life and so overcome the barriers. "We form our environment and our environment forms us". Winston Churchill.
Of course this philosophy again places a large burden on the disabled, the people who already have so much to contend with. I have always believed that we as human beings, whatever our circumstances, never realise our full potential, are never aware of all our skills and aptitudes until we are placed in a position where we are forced to use them, much of our real potential lies dormant.

The disabled are in a position where knowing one's self is a case of gaining self definition. Through gaining self definition we achieve a perspective on life than can build and reinforce personal confidence, a confidence that allows us to accept life's imperfections for what they are, real or imagined.
Part Four
4.1 The Designer and the Disabled

"We live in an abundant society where nobody wants for anything." This is the generally accepted maxim today, a dictum which reassures everyone that the vast majority of us are happy, and well content with our lot.

From this initial declaration two points arise, firstly who are "us" and secondly who has decreed that nobody wants for anything? These questions can relate to many people in many different ways depending on the forum you broach, whether it be political, social, economic or religious. For the purpose of this thesis I will be specific and relate this statement to the dilemma that designers are confronted with.

The first consideration of the designer is to solve problems, and in this light a designer has to be sensitive to the fact that a problem exists. For the designer his source of inspiration lies in the physical world - people and their environments as they are and as they could be. The designer's job is to attempt to reconcile what we want with what we have. Design is therefore very obviously an expression in a concrete form of certain ideas and ideals that have deeper moral and social implications. It is the deeper moral and social implications that cause the dilemma.

It is quite obvious that design does not accept facts just because they are there; design does not always set right obvious wrongs as a list of facts soon displays:
A young man is paralysed for life because the power on his workbench is accidentally activated;
Six hundred women (a year) lose their hands in top loading washers (U.S.A. statistics);
A young girl leaving a shop is literally cut to ribbons because the plate glass door fails to pivot properly after a pebble gets caught in its track;
Three children are paralysed from the neck down because they went down a slide head first (slides are badly designed, yet no attention has been given to redesigning them);
A gymnast is made a quadriplegic because his portable horizontal bar is inherently unstable; a baby drinks a toxic household cleaner and is brain-damaged for life.

These facts are tragic in human cost but it is a cost that society is prepared to accept. People are persuaded and victimised through advertising and propaganda into accepting planned obsolescence, to accepting all consumer goods, most human values and human beings themselves to be disposable, as part of a replenishing way of life.

The designer has designed the ultimate circle of life, a life cycle that ensures a designer of his existence and his marketplace. The designer has made himself available for use by mankind. In response man has been able to fulfil his insatiable desire for more luxury items that are designed to pamper his growing materialistic appetite.

Within this cycle fits the average, the normal the perfect consumer. In spite of the consumers differing age, occupation, sex, schooling, etc., most designers seem to design for an exclusively sexist, male, chauvinist audience. The ideal consumer is between eighteen and twenty-five, male, white, middle income, and exactly six feet tall, weighing exactly 185 pounds. Design is therefore discriminating against major sections of the population, a disparity which on the face of it would seem obvious but unfortunately is lost in a malaise of indifference.

Not only does the discrimination occur at the expense of "normal" people but more important it occurs against the minorities of people which when added together begin to form a significant majority.

Because the minorities are in many cases requiring design solutions that do not affect the majority of people, the majority offers greater incentive for the designer in terms of prestige and financial reward. Where do the priorities lie; with the demands of an insatiable majority or the small voice of the minority?
It has often been said that design whether from a moral or practical point of view, should be for all, not just an elite, as every one has the right to benefit from a democratic society. Design can and does isolate and at the same time create psychological and physical barriers, barriers which from the point of view of the minority concerned compound social injustice.

As a minority in society the disabled are constantly confronted with physical obstacles that undermine their self-respect and confidence. Today's philosophy about the disabled is to accept them as "normal" human beings, as human beings with the same rights as other citizens but although we can regard the disabled in many ways as normal to other people it is difficult to accept them as normal when confined to a wheelchair or on crutches if the physical environment causes barriers to their agility and movement.

Who or what is responsible for the physical limitations of the disabled? Well firstly it is the individual disease that is responsible for the impairment of the disabled person and secondly the compounding of that disability is increased by society and the way it has designed the structure of its environment. The integration of the disabled into the community should have profound implications for design and designers as improved awareness of the problems of the disabled can and does mean better and thoughtful design solutions for all members of society.

The designer has to organise his intentions to the point where he can design honestly. It is important that the designer highlights the specific area to be investigated so that he will not be diverted and can concentrate his efforts. This does not mean that he should not focus on the whole picture, he must do that before he pinpoints the problem. The main purpose in isolating a specific problem is so that, as in the area of designing for the disabled, the specific objective does not become clouded by periphery argument and discussion. The designer cannot afford to be side tracked but must deal with "specifics."
When dealing with a design that is to be specifically used for and by people the designer has to be aware of the situations other people are confronted with. He should know how the recipients of his design will respond and how they view their needs in relation to the proposed ideas.

There are two approaches that a designer can take when beginning his research. I will relate it specifically to the disabled although the same approaches can be used in many other situations.

The first approach involves developing and understanding of the nature of the disabled people that are involved and this means that to a certain degree the disabled must collaborate with the designer. The designer contributes his expertise, in return, he learns more about disabled people.

How can or should the designer learn more about the disabled? Firstly, he must approach the disabled, the specific group of people he is interested in, and be honest with them and with himself about his proposed intentions. Above all he must spend time with the disabled becoming involved in their everyday routines, and where he can, witness and help in the physical problems that the disabled are confronted with. With this type of participation the designer can gain a balanced view between what he had previously read about the disabled, what he was told, what he felt about the disabled, with, what he saw, experienced and felt at first hand. It would be fair to say that in the process the designer will gradually shed his assumptions about the disabled and their needs, and will soon begin to develop a clearer insight.

Another approach that the designer can follow is one where the designer designs from a distance. With no particular knowledge of the disabled the designer may arrive at certain assumptions that are unfounded and based on his own or other peoples bias. If he turns to the design manuals that discuss and layout the specifications for the disabled wheelchair user or the ambulant disabled he can grasp the relevant information with alacrity.
At face value an approach like this could produce a satisfactory design solution provided that it did not call for personal requirements specific to an individual. This type of approach lacks any feeling for the everyday life of disabled people and simply shows the designer using the disabled as an extension of his own design solution, as part of the finished article. The designer that simply uses a design manual can receive a distorted picture of the disabled showing the disabled able to compensate for their disabilities. A person who has spent any time with wheelchair-using paraplegics soon comes to realise that their physical problems are more often greater than simply the problem of mobility.

Even with paraplegics who on the whole have good upper limbs, the same problems that have paralysed or rendered their lower bodies uncontrollable may eventually have the same effect on their upper bodies in time. The design manuals display the disabled clinically in their various categories. One reason is the need to display an average example so that an overall impression can be achieved, but the average that is displayed does not show the side effects experienced by individuals. The designer who plans from a specification manual or from other peoples recommendations without gaining an understanding of the people he is designing for, will not fully appreciate the meaning of his design or its implications for the disabled.

The two approaches to designing for the disabled, or any section of people, does not need comparative analysis, as the implications for both are obvious. An important point that can be extracted from both these approaches lies in the designer achieving a fuller understanding, and to this end he must begin to learn a new dialect - one that is related to the feelings and expectations of the section of people he is designing for.
4.2 Designing for the Disabled: Why?

First, we have to accept that there is a need for provision to be made for the disabled. Are we convinced that the disabled matter enough in our society to warrant physical and psychological concern, social and environmental priority and on the whole the time and effort with the attached expenditure? As a society where in fact do the limits of our concern lie?

In Britain there is a certain ambivalence regarding the matter of provision to meet the needs of the disabled. Where does this emotional confusion come from? We can identify the sources through two fallacies that underlie many peoples attitudes. The first assumes that disability is merely a temporary aberration and that in the course of time the abnormality of disability will be eliminated from existence by science and medicine. As this is the ultimate goal why bother with long term planning for the disabled as the "cure" will eventually arrive, there is no justification in this case for provision, as this amounts to self-indulgence and a financial commitment that is unworthy of consideration.

The second fallacy takes the opposite tack and identifies the disabled as a permanent part of our society on a long term basis, but by doing this it shows the disabled as "disabled" en masse. There is no appreciation of the complexities of various disabilities, their characteristics and related needs. We have to ask at what point impairment alone can be accepted as disablement. Everyone is impaired, to the extent that some people are less intelligent or beautiful than others, or have warts or are fat, but how far can or should this be compensated? With a lack of working criteria to separate the disabled from the non-disabled there now appears a vast body of so called disabled who swamp the provisions provided for the genuine disabled, and therefore resources are being badly used.
On reflection the first fallacy does not bear very high consideration as it bases its creditability on a precept that defies common sense and well known knowledge about the complexities of the human species: "the normality of abnormality", which makes it more difficult to find human beings without impairments than it is to find them with them (Pearse and Crocker, 1944). As disability does not always develop or occur because of congenital disease or mishap there is therefore no reason to believe that disability will just "go away".

The second fallacy although accepting disability ignores the basic concept about disability as a fact of human life. Disability is without doubt a human idea, defined broadly as an effect that reduces a human being in performance from the accepted norm. This fallacy does not allow for the definition of the individual who is disabled, a personal autonomy that everyone expects in a democratic society.

If we take the broad acceptance of the second argument, that disability is here to stay the way would seem clear for the designer to continue or take on more problems connected with disability. An argument that is often put forward against this is that "it would cost too much". Correspondingly, the counter argument goes "we cannot afford not to", meaning that the cost of "not-meeting" the needs of the disabled would be greater than the cost of meeting their needs.

This can be seen in both a financial and a personal sense where the cost of simply housing the disabled in institutions rather than encouraging them to live independent lives could cost more, or by placing the disabled in institutions so creating psychological problems for the disabled by isolating them from the "real world" and "real experiences".

The designer has a valuable role to play in the development of the disabled as independent people, he can take the initiative and determine that it is worth offering the disabled the aids and environments that will enable them to live as whole human beings, on other words creating
"normality out of abnormality", or he can ignore the obvious need and funnel his energies into designing solely for an avaricious consumer market.

So where does the designers imperative lie? If the designer was dealing purely with technology the maxim that would resound would be, "if it can be done - it must be done". In the area of bureaucracy the cry would be, "once it is done - it cannot be undone", and in a time of crisis the Imperative would be "if it must be done - do it at the moment".

The problem lies in the belief that the Imperative has to be revolutionary therefore "whatever change that comes - it will be disruptive". Change does need to take place in the attitudes of the designers and society as a whole, but the change does not have to signal revolution in physical terms.

Man is an individual but he is also an element in the human community which makes possible his many attributes, like communication, reasoning and feeling. The growth of the individuals relationship with the world is made possible by the accumulation of experiences and the contribution that the individual makes through insight, knowledge and participation. Have we the right to forbid the disabled to participate to their fullest ability simply because we as a society cannot provide physical and psychological support? It is worth reflecting at this point on mans fundamental weaknesses which are encompassed in ignorance. Perhaps by expressing the awareness of this ignorance we are showing one of the profoundest elements of knowledge man is capable of.

The designer wishes to change the world, but we still cannot basically understand our own faltering position in the world. Man has increased his ability to control more aspects of his destiny, but despite this he is still unaware of his own nature, a nature that he is reluctant to change for fear of discovering its real self. Because of the nature of man he has not yet developed the capacity for love and brotherhood and his moral sensitivity to a degree that would insure his continued development, and to this end it can be
said that "all time progress is progress in the ability to love".

The development of a modern, caring civilisation lies in the understanding and acceptance of social and moral issues and the awareness that responsibility has to be taken for all members of society. For the designer, the quality of life can be determined by his scope of understanding. He is responsible to society and can be identified through bad design or by default: by having thrown away his responsible creative abilities, by not "getting involved", or "by muddling through".

Designing in times of rapid change is quite clearly more difficult than designing for a stable and predictable world. We should remember that designers are not dependent on the course of the future, they are apart of the momentum that helps create it. Each design response helps to fashion the future whether it be a large shopping centre in an inner city or a small household item. As J.C. Jones (1970) (22) put it: "to design is no longer to increase the stability of the man-made world: it is to alter, for good or ill, things that determine the course of its development."

Jones is implying that we have reached a time where we no longer need to progress outwardly, the progress lies inward. Man does not need to push for greater technological feats, he needs to reserve his efforts to the problems that have accumulated in the wake of his ambitions, problems of neglect concerning the poor, the disabled and the minorities that have no voice.

Victor Papanek in "Design for the Real World", (15) views the designer as a professional who sees himself as one of the "givers" in the complex military-industrial society believing that if the low income groups or minorities only had more money then they could participate in the consumer dream.
It is blatantly clear that the skills of the designer need to be made more accessible to all people. In Papanek's view this would entail a restructuring of the role of the designer into that of a community problem-solver. His allegiance should be to the direct client, the actual user of devices, tools, products and environments so that a bond can be cemented between the designer, the problem and the client.

The immediate problem lies in the turning of attitudes, from designing for the people's wants, or artificially created wants, to designing for their needs. This is the only meaningful direction that we can take, as every man deserves to be the subject as well as the object of a caring and compassionate society.
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5.1 General Considerations

The proportions of the human body are the basis of all design. One of the first to state this fact was Pythagoras of Samos. Many years later Euclid restated the same ideas and presented his views in a mathematical formula. In the 15th century Leonardo De Vinci illustrated Euclid's formula with the diagram of a man's body inside a circle and square. Euclid's formula by now had become known as "The Golden Rule".

Proper application of the Golden Rule, the relation of alpha to sigma, should enable the designer to design anything from an oven to a shopfront and have it in correct proportion. But it really isn't necessary to know much about algebra and plain geometry, or their application to design successfully. To understand the nature of design and the human element in design, for many people, it involves learning and practice, the higher mathematics of design do not help, they simply serve to illustrate that man's proportions are definable.

When undertaking the design of a piece of equipment or furniture or any equipment for work or leisure we are always seeking the ideal for a person or persons.

The problem of designing for a highly variable population is of course immense but not insuperable. The key to the solution lies in a thorough acquaintance with the problem.

One only has to view a cross section of people to be struck by the range of diversity in the size and shape of mankind. This diversity can be a source of annoyance to the designer. For those involved in design problems, the human body seems to have an inordinate number of irregularly curved and angular depressions and projections, as well as an assortment of appendages, all of which tend to impede a straightforward design solution.
Despite the variance in the potential users, the designer of equipment must arrive at a design solution which will be adequate to accommodate the irregularities of size, shape and mobility of potential users. What we should hope to do is to design equipment for people that is as well suited to the situation as possible to perform the required tasks. This requires a good deal of imagination and practical experience in understanding the requirements of a design in relation to the needs of the user.

Man has limitations and many possibilities: not least in his ability to stand up to stress. The designer must know that there is a price every user has to pay eventually for going beyond his capacity. The body is made of deformable materials, materials that cannot be put under too much stress before the physiological processes have said, "enough is enough". This is particularly important to the situation of the disabled, wheelchaired or ambulant, where the body is not performing perfectly and so is more likely to be prone to physical distress. Therefore knowledge of body size and potential performance within a particular design population is of significant value if equipment is to be designed and made to accommodate the users requirements.

The grasp of the facts and figures relative to variations in sizes is only the beginning. An understanding of the implications of this knowledge is indispensable within the framework of the particular task in hand.

5.2 The Measurement of Man

Anthropometry is the practice of measuring the parts and proportions of the human body, which encompass a variety of techniques for determining an almost limitless number of dimensions. Each user of anthropometric data has his own list of dimensions that he considers essential for his purposes. Unfortunately the list of one user seldom coincides with the list preferred by another.
As a consequence the literature of anthropometry contains many tables of information that are unique to a particular investigation, survey or design brief. At the same time the number of measured variables grows and it becomes increasingly difficult to tabulate them in any usable fashion.

Despite the obvious problems of using such information it is invaluable to the designer in the process of investigation, as he is able to analyse the problem thoroughly to the benefit of his own procedure and the eventual user of the product.

For what ever purpose anthropometric data is collected there are characteristics in the tabulated information which the user has to be aware of.

All measurable human qualities can be graded between two extremes, with the majority of measurements being found somewhere in between the two extreme values. As a result of the cluster of a majority of measurements in one place we are confronted by the average, the mean, or mode which when we define it, appears as the average person of a number of typical persons, that have emerged from a considerable number of persons.

Because the average is a measure of proportion it appears logical to assume that it must serve some important role in design.

If, for example, the average value of stature is used as the design criteria for clearance of a doorway, it would soon be apparent that approximately half the potential users would not be able to walk through it without stooping. To design for the average can lead to dangerous errors, as very few persons in a population will be essentially average in all dimensions. This is a rather common extension of the idea that body proportions are more or less constant and that a small individual is a miniature version of an average sized individual while the larger person is an expanded version of an average.
sized individual. Nothing could be further from the truth as the study by Churchill and Daniels in 1952 shows, (25).

For this study 4,063 subjects were used, of which 1,055 were classified as being of average stature. In the next step, the average range of each of the nine additional selected measures were added with the following results:

"The Average Man"

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range Defining Average (cm)</th>
<th>No. Included</th>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stature</td>
<td>173.95 - 177.95</td>
<td>1055</td>
<td>25.97</td>
</tr>
<tr>
<td>Chest Circ</td>
<td>96.95 - 100.95</td>
<td>302</td>
<td>7.43</td>
</tr>
<tr>
<td>Sleeve Length</td>
<td>83.95 - 86.95</td>
<td>143</td>
<td>3.52</td>
</tr>
<tr>
<td>Crotch Height</td>
<td>81.95 - 84.95</td>
<td>73</td>
<td>1.80</td>
</tr>
<tr>
<td>Vert.Torso Circ</td>
<td>162.95 - 166.95</td>
<td>28</td>
<td>0.69</td>
</tr>
<tr>
<td>Hip Circ</td>
<td>103.95 - 108.95</td>
<td>12</td>
<td>0.30</td>
</tr>
<tr>
<td>Neck Circ</td>
<td>36.95 - 38.95</td>
<td>6</td>
<td>0.15</td>
</tr>
<tr>
<td>Waist Circ</td>
<td>78.95 - 83.95</td>
<td>3</td>
<td>0.07</td>
</tr>
<tr>
<td>Thigh Circ</td>
<td>54.95 - 57.95</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Crotch Length</td>
<td>69.95 - 72.95</td>
<td>0</td>
<td>---</td>
</tr>
</tbody>
</table>

The table above shows clearly that when the bodily sizes are shown as separate components there is no such thing as an "average" person.

Of the 1,055 men of average stature, only 302 were also of average chest circumference, of these only 143 had average sleeve lengths and so on. The conclusions drawn from this study were that the "average man can be a misleading and illusory concept as a basis for design criteria therefore it is suggested that the range of variability in body dimensions is more valid than an average value in design solutions". (Daniels, 1952), (25).
The more aware a designer is of the misleading values that average measurements give the more he will look beyond the "average" and think in terms of a design concept which will try to incorporate the two extremes as well as the average. The two extremes in the distribution range will in many cases be difficult to include in the design, but if the designer is aware of the overall range of sizes he can try to make allowances where he can, inevitably, he may not be able to satisfy everyone.

The aim of a designer who is fully aware of the wide difference in human physique will be to seek a design solution which will try to benefit as many people as possible.

All too often the designer assumes that because he is human, he is typical of all people who may eventually use the equipment he designs. This is why we find tables and chairs too high or too low - or why there isn't enough room in the cockpit of an aeroplane. Fortunately, designers can design many things which will fit a majority of the user population, based on a designers good judgement and experience. However, as people are becoming more aware of their requirements and much more critical about design, it has become more important for the designer to be tuned to new skills and disciplines in his quest for the best possible solution to a design problem.

The question arises, how can a designer ensure that his equipment will fulfil the needs of various potential users? A century ago, anthropometric measurement was virtually unknown. In schools and homes, on assembly lines and in the armed forces, the equipment made or used was of first consideration and the user came second. If the worker could not be squeezed into the work area provided he was dispensable. If a piece of furniture was uncomfortable and gave the user back ache one would tolerate it. It should be emphasised here that not all equipment or furniture was created without thorough consideration for the user. Specific pieces of furniture do demonstrate carefully evolved features that complement the human requirement for correct posture, yet generally there was little attempt to ensure that man's adaptations were working for him and not against him.
ANTHROPOMETRIC DESIGN GUIDE

MR AVERAGE  
DISABLED  
MISS LARGE  
MASTER KID  

MR OLD  
MR SHORT  
MRS PREGGY  

SPOT THE ODD ONE OUT
With the gradual introduction of the belief that equipment should be designed around man and not that man should fit around the design, three distinctive approaches began to emerge with human measurement being taken as a focal point in the design process.

The simplest approach which was used extensively prior to World War II, included the design of fighter aircraft. All fighter aircraft were made to a specific size relying on the particular physique of chosen aircrew to fly them. For a period to World War II the stature of pilots was carefully regulated until the demand for aircrew meant that any stature of pilot had to fit into the standardised cockpits. The problems that resulted from this turn of events was documented by Randall et al (1946), (26). This type of design solution, sometimes used as an expedient, often proves to be no solution as redesign and modification is inevitably needed.

In the first approach the designer isolates the size and physique of the human user and then builds his design around that chosen size of user. The designer effectively excludes anyone who does not fit into his chosen category.

A second method is to design and tailor to the individual concerned. This approach, unless the design is regarded as a "one off" or of such a specialist nature that it warrants special attention, is the most expensive and the least flexible.

Both the approaches to design so far mentioned rely very heavily on controls that can be applied to achieve either the right person for the design or the right design for the selected person. Both concepts work, but both are inflexible and to the most part impractical for all but very special applications.
The third of the anthropometric design approaches and the one that is most relevant to furniture design involves the designer in building a certain amount of adjustability and flexibility into the item or equipment. Anthropometric data is taken into account so that a wide range of body sizes can be used in the design analysis.

This method of approach requires a comprehensive understanding of the function of the equipment to be designed and the part the user plays in its operation.

The approach to this design process can be outlined in sections starting with:

Section 1. an introduction and examination of the potential users and the selection of appropriate anthropometric information for analysis.

Section 2. will involve the establishment of a full understanding of what the equipment must do for the user in terms of form, function and interaction.

Section 3. involves the use of anthropometric information relevant to the design brief to establish the practical aspects related to dimensions i.e. the relationship between the user and the equipment.

Section 4. is the beginning of the design process with the evaluation of the practical nature of the design through mock-ups to the finished article.

Each of these sections outlines a comprehensive and thorough development which takes as its prime consideration, the welfare of the potential user. The development is important for the designing of equipment for normal able-bodied people, but it is even more important for the designing of equipment for the disabled, as much closer considerations have to be made as to the capabilities of the disabled.
The first section in the design analysis is very important and in many cases difficult to comply with. It is more than probable that the user population that the designer wants to research is not available. If this is the case it is therefore up to the designer either to collect the necessary information himself or to utilise existing data which most closely matches the user population he is considering. It is possible to select and extract from existing anthropometric surveys.

For example, a designer is asked to design a new safety helmet for British Rail, yet there is no anthropometric information available for British Rail maintenance staff. This either means that the designer has to undertake a survey of the user population in British Rail, or he gleans his information from another source. The predominate factors are that the staff are male, European and between 20 to 55 years, this gives the designer enough information to initially characterise the head size of the user population. The designer with this information can use either previous surveys done by commercial firms or can use military information for helmet sizes, hence there is no need for the designer to carry out his own survey.

In the second section of this design process the designer has to come to terms with the nature of the design, for what purpose is the design being created and what does the user population require from the design? This section will involve the designer in an analysis of the deficiencies of previous designs and the assessment of the users opinions, so that lessons can be learnt from past experience.

The third section involves the practical analysis of anthropometric information that has either been collected from previous surveys or has been collected by the designer. The information that is available can now be put into practice to ascertain its accuracy and also its relevance to the design brief in question. The use of measurement in a practical setting with the potential users would be of great benefit here to the designer and the user so that criticism can be made.
Initial design ideas can be discussed verbally and on paper.

The fourth and final section involves all the collected information to the point where a final design has been arrived at, drawn and assessed as to the adequacy of the design for the potential users.

The true test of any design is how well it meets the needs of the user population and whether it accommodates the wide range of body sizes for which it was intended. It is at this stage modifications can be made in the design.

The designer who uses anthropometric principles in the design process should remember that it is not an exact science. Rather, it is a philosophy or an approach to problems of designing and constructing things which people are expected to use. In this light the designer aims to achieve more efficiency in the use of his design by the user. In addition, the designers' efforts are towards making his designs more convenient, more comfortable, less confusing, and, in the end, less exasperating or fatiguing to the user.

These principles are by no means a law unto themselves. The designer must use his initiative and imagination as well as his own experience and judgement to make them work. Two guiding principles should be kept in mind. The first being that designers must not assume that they necessarily represent a Model of People as a Whole, in mental and physical characteristics or likes or dislikes. Secondly the designer must remember that nothing is designed except for the use of or by Man.
5.3 The Treatment of Measurement

To know about man is to know a great deal about the possible environments in which he can function. To be a successful designer of products for a part, or the whole, of a human environment, a designer must be conversant with different types of human physique and be informed about the limitations of human performance. Also now, more than ever before, man demands products that are tailor-made to suit specific requirements.

Everything is designed for people. This categorical statement is invariably questioned at first glance; therefore it is important to understand why we must accept it to develop a sound philosophy. If one were to analyse each and every designed or constructed object, one would not be able to escape this fact.

A lead pencil was designed because man wanted to write and communicate, a passenger plane was designed to enable the transport of people. Houses were designed to house and protect people, a complex computer is built to store and speed up processes man finds tedious.

All these things are designed and constructed to extend Man's capabilities - and therefore are built for Man.

Why have I made so much emphasis here to man and design? Simply because if we keep man in mind as the central reason for design, we will learn to accept an important principle, that of "designing from the man-out." That is starting with the man and providing what accessories he needs to carry out or reach a prescribed objective.

When man and his needs are the object of study it is understandably more convenient to consider him en masse in terms of population. A population may be surveyed and sampled
as a whole or in specific sections of users. Populations can be defined fairly readily in relation to a design project under consideration. In fact the design project itself more often than not chooses the population. Dentists chairs, school desks and kitchens pick their own victims.

In the special case of designing for the disabled much more care has to be taken to understand the physical limitations that various disabilities create. The designer will find it extremely difficult to quantify data about the disabled population as a population en masse and will become aware that he is dealing with a unique body of people.

The reason for this is self explanatory. The disabled population is totally individual in its appearance only being recognisable in categories which refer to specific disabilities or to the aids that help them i.e. wheelchairs, artificial limbs, sticks etc.

From the point of view of the designer the analysis has to be more specialised with a full understanding being achieved of the various problems and limitations of the category of disability he is designing for. The designer has to be specific in his aims and objectives.

This is where the use of anthropometric data can help the designer achieve physical evidence as to the limits and extremes he can go to in his design. By researching the available information and or assembling it himself the designer can see that distinctions have to be made between able-bodied, ambulant disabled, wheelchaired disabled etc.

The differences are significant because the disabled, by the nature of their situation, in relation to the able-bodied show greater incidence of disabling conditions which restrict the range of joint movement, and also because normal or abnormal physical changes occur which affect agility, posture, stance and reach.
When the designer has identified the population group he is concerned with he can research the available information. In the case of the disabled the information that the designer will find is by no means comprehensive. Studies have been carried out but they have only achieved a general picture, as there have been difficulties in collecting and selecting relevant data.

In the case of the ambulant disabled, (those people who can walk despite disability on crutches, frame or sticks), in anthropometric terms these people are not distinguishable from the able-bodied. On the surface this would seem to be acceptable but in practice many ambulant disabled people have severe limitations, particularly in respect of reaching ability, so any design recommendations that are based on normal anthropometric data for the ambulant disabled must be treated with extreme caution. The two main studies that are referred to here are by Dreyfuss and Roberts (27) which took account of people outside normal statistical limits.

The other category of disabled person are the wheelchair users. As yet no authoritative anthropometric study of the total wheelchair population has been attempted in this country, as already stated mainly because of the difficulties in collecting the information.

Government statistics on the disabled as a population are not at all accurate mainly because of the lack of definition concerning the various degrees of disability. There is no compunction on any disabled person to identify himself as disabled or to register himself as disabled with the Department of Employment. As a result the only disabled people to be found available for statistical analysis are those in hospital, in residential homes, centres for the handicapped and those that are on the official government register.
There are in some cases as described by Harris in her survey of the Handicapped and Impaired (28) good reasons for impairments not to be admitted. "A man who holds a driving licence, and whose sight has deteriorated, may be reluctant to admit to this in case he loses his licence, or an epileptic, fearing that his condition might lead an employer to dispense with his services, may not be prepared to admit to his condition." So whatever study is undertaken it is extremely difficult to get at the truth and as a result quantify the evidence taken in a scientific manner.

I will concern myself chiefly with the anthropometric data that has been carried out on the wheelchair disabled as this bears closer scrutiny in relation to the overall theme of this study.

For the purpose of anthropometric investigation, how do we define a wheelchair user? Firstly, it would be inappropriate to include all people who have wheelchairs since many do not regularly use them. Secondly, of those who do, many can stand for most functional activities and it would be difficult to define in operational terms which wheelchair users are properly describable as chairbound, and which are not. Thirdly, the characteristics of the wheelchair population vary much more markedly than do those of the normal able-bodied population in respect of personal mobility and independence from a wheelchair; therefore there could be no confidence that a sample representative of the population in one set of circumstances would be as representative in other circumstances.

The obvious difficulties of carrying out a comprehensive survey have been outlined, which leaves two alternatives, firstly the use of information already collated and secondly the designer can collect his own information and make comparisons to other published findings.
The most recent studies that have been carried out on the wheelchair disabled are by Floyd et al, and Knight. This information was collated in 1964 and 1965 respectively, and to this day has remained the main reference for those interested in designing for the wheelchair disabled.

In the case of Floyd (29) the sample chosen for analysis were 127 paraplegics. The sample was biased in that it had a 5:2 ratio of men to women compared with a ratio of nearly 1:2 in the general population. Also in age 85% of the sample were less than 45 years compared with less than 30% in the general population.

In the analysis made by Knight (30) the sample chosen were sufferers of multiple sclerotics and rheumatoid arthritics. In this sample there is a marked difference between the paraplegic population studied by Floyd and the multiple sclerotics and rheumatoid arthritics population.

The difference lies in the nature of the various disabilities. Paraplegics are people who generally have good upper limbs while multiple sclerotics and rheumatoid arthritics sufferers have generally worse bodily impairments, and also tend to be older. With reference to Table I, it seems that the sample chosen by Knight are more representative of the general wheelchair population than the paraplegics. This is only an assessment of the figures shown and cannot be seen as conclusive evidence based on scientific principles, mainly because the samples chosen in both studies were very selective and very small.

As already stated, the use of anthropometric principles for the general chairbound population assuming it could be isolated would be impossible in practice. Because of the constraints of various disabilities it is extremely difficult for the designer to take every physical limitation into account when he is designing for as wide a range of disabled people as possible. Inevitably there has to be a compromise, where the
<table>
<thead>
<tr>
<th></th>
<th><strong>Floyd: paraplegics</strong></th>
<th><strong>Knight: multiple sclerotics</strong></th>
<th><strong>Knight: rheumatoid arthritics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5th %ile</td>
<td>Mean</td>
<td>95th %ile</td>
</tr>
<tr>
<td><strong>Head Height</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.247</td>
<td>1.331</td>
<td>1.415</td>
</tr>
<tr>
<td>Women</td>
<td>1.192</td>
<td>1.258</td>
<td>1.366</td>
</tr>
<tr>
<td><strong>Shoulder Height</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0.973</td>
<td>1.036</td>
<td>1.099</td>
</tr>
<tr>
<td>Women</td>
<td>0.923</td>
<td>0.996</td>
<td>1.073</td>
</tr>
<tr>
<td><strong>Elbow Level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0.630</td>
<td>0.693</td>
<td>0.736</td>
</tr>
<tr>
<td>Women</td>
<td>0.590</td>
<td>0.678</td>
<td>0.766</td>
</tr>
<tr>
<td><strong>Comfortable Vertical Reach</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1.569</td>
<td>1.661</td>
<td>1.753</td>
</tr>
<tr>
<td>Women</td>
<td>1.479</td>
<td>1.586</td>
<td>1.697</td>
</tr>
<tr>
<td><strong>Mean Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>34.7 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>32.1 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For male rheumatoid arthritics in Knight's sample numbers were too small for percentile values to be reliable.

Table 1: Anthropometric data from surveys of chairbound people
designer makes the assumption that the disabled person will have good or capable arm movements, as a bicycle designer designs with the assumption that the user has two legs to make the bicycle work.

Because of the immense difficulties of defining a wheelchair population for anthropometric study, and in obtaining a representative body of people there is little likelihood that the information illustrated by Floyd and Knight will be superseded with information that can be justified as being any better.

In applying anthropometric measurements in problems of furniture design, there is a need for caution, this especially applies in the special case of the disabled. Published anthropometric data gives measurements taken on a static body often in a fixed unnatural position while the functional measurements need to refer to the body in a more usual posture. For instance, as a basis for dimensions of work surfaces, it is necessary to know not only details of forward and lateral reach when the subject is sitting upright, but also how far he can reach by bending and twisting the trunk, and what tasks he can and does do with his hands at various distances away from his trunk. The translation of descriptive measurements into functional measurements presents problems, the successful solution of which frequently lies in the experimental approach to a particular design problem.

The use of static arm reach measurements taken from able-bodied persons is generally usable for the chairbound if we assume that the chairbound have "normal" arm and reach movement. Many of the studies carried out on the able-bodied and chairbound people in the same category, that of seated subjects.

Traditional measurements of arm length, such as shoulder - elbow or elbow - fingertip lengths, or of leg length such as thigh-knee length, have been included in many of the studies taken in anthropometric surveys. These measurements which are
taken with the body in a "static" position have generally been of little use to those concerned with how far a person can perform some specific task.

In an attempt to give greater flexibility in measurement some researchers such as Hertzburg et al (1954), (31) included dimensions as "arm reach from wall", a wall to fingertip dimension taken with both shoulders against a vertical surface and the arms extended horizontally. Similar studies have been carried out by Clauser et al (1972), (32) White and Churchill (1971), (33) but ultimately they are of limited use in the design of equipment or workspace, because the dimensions collated describe specific reach measurements to single points such as vertical, directly in front of and to one side, there are of course an infinite number of points of reference that could be taken.

Most anthropometric studies have focused on the design of equipment systems and personal clothing for industry and the armed services; and it is not until recently that attention has been given to the domestic or civilian scene.

Because of the one sided view in the collection of data there is a limited amount of relevant information available for use in projects related to furniture. This does not mean that the industrial data cannot be used but care has to be taken, if using data to establish who the subjects were, for example, one of the earliest attempts to deal with the measurement of arm reach was by King, Morrow and Vollner (1947), (34) who measured 139 naval personnel to "determine the boundaries of the maximum area for the operation of manual controls." The subjects were pilots who were exclusively male, 18-25 years of age and American. This select body of people cannot obviously be used as a standard representative of other people, as disabled chairbound people cannot be used as a standard for other people.
The information needed can be found if a selective approach is taken. Two surveys which come much closer to the situation of the disabled chairbound are by Stoudt et al (1970) and Woodson et al (1971) The Stoudt Study obtained arm reach measurements on 100 subjects, 50 male and 50 female, selected to approximate the general U.S. adult driving population in height and weight. The purpose was to provide information for designers as to the best position to place various controls. One hundred and twenty designated reach points were used on every subject. The Woodson study was arranged very much on the same lines as the Stoudt investigation.

The information collated in these studies was carried out with a particular design problem in mind where reach measurements could be taken to see if particular controls were placed in the right place for the largest percentile range of users. Static measurements can be applied more strictly in this type of design situation. In the design of furniture where no specific controls like switches or levers are present, the reach measurements for instance over a work surface have to be taken and translated into an arc of reach where the designer can assume that any article can be reached by the user within the arc. (See Fig.1)

The question of man's size is related to genetic factors and environmental influences, which ultimately determines the matter of chance way in which human measurement varies.

When measurements are taken for investigation, care and thought must be taken as to the way in which the selection of subjects is achieved. For a sample to be unselective it is necessary to devise procedures that are without bias, and that offer every subject of the population being viewed an equal chance of being chosen for measurement.

Thorough sampling requires the collection of a sufficient quantity of data that will show the full ranges of particular measurements in a population. It is not practical to use a whole population of subjects especially when the population is large. However, a minimum number of subjects has to be used to make a study plausible. A hundred subjects is regarded as
Horizontal arc of grasp, and working area at table top height.

The grasping distance takes account of the distance from shoulder to hand; the working distance only elbow to hand. The value includes the 5th percentile and so will apply to men and women of less than average size.
the very least number likely to produce a result that would be worthwhile. Three to five hundred is better, but as the number of subjects increases it means that the researcher will need help from assistants to collect information, which in turn requires a high degree of organisation.

An anthropometric investigation related to chairbound people would not be plausible within the design brief proposed. As explained, an impartial well-organised study takes a tremendous amount of goodwill and cooperation from a lot of people, and will take a considerable length of time to carry out, in terms of selection of subjects, data collection and the final analysis of findings.

Therefore the two studies that I will use as a basis of reference in relation to dimensions I myself will take in the practical investigation, will be the Floyd and Knight studies which have been illustrated in Figs. 2 to 8.

5.4 Presentation of data

Percentiles are the single most effective way of presenting anthropometric information provided that they are properly used and understood. To determine appropriate limits for the range of the population to be accommodated, the anthropometric information is expressed in terms of percentiles.

For example, the 50th percentile (which is usually the average) in reach measurement, means that one half of the subjects in a given population have reaches shorter than that value, and one half have longer reaches.

In similar manner, the value of the 95th percentile reach is usually that of a fairly large, or long armed person. Only 5 percent of all the people in the population measured have longer arm reaches.
Vertical Reach. 50:2.110 5:1.960
Oblique Reach. 50:1.945 5:1.810
Eye Level. 5:1.740 50:1.650
Head Height. 95:1.800 50:1.755 5:1.650
50:1.430
5:1.330
Shoulder Height. 95:1.205 50:1.120 5:1.035

Forward Reach. 5:0.480 50:0.545
Elbow Level. 95:0.835 50:0.770
Knuckle Height. 50:0.770 5:0.770
95:0.645 50:0.595 Sitting Erect.
95:0.720 50:0.675 Sitting Back.
95:0.460 50:0.420 Chair Frame.
Front Edge Chair.

0.475

Foot.
95:0.315 35:0.165
Comfortable forward reach low table.

Head Height:
- 35: 1.155
- 50: 1.225
- 5'1: 1.155

Maximum forward reach low table:
- 5'0: 0.255
- 50: 0.470

Forward reach over high table:
- 5'0: 0.495
- 50: 0.550

Shoulder Height:
- 95: 1.080
- 50: 0.990
- 5'0: 0.900

Elbow Level:
- 95: 0.745
- 50: 0.690
- 5'0: 0.635

Foot height:
- 95: 0.210
- 50: 0.165
The 5th percentile ranges occur at the top and the bottom of the collated information. For example, if the 5 percent value of arm reach measurement is 0.480 cm then 5 percent of the population have reach measurements less than 0.480 cm while 95 percent have a reach of 0.480 cm or greater.

Because the 5 percent value at either end of the scale are regarded as the extremes it is generally reasonable to design for the 90 percent of the population between the 5 percent and the 95 percent.

There will be certain measurements that will have particular significance to various designers. Among anthropometric measures, height is often the controlling variable and has special significance. Other measures such as shoulder width and length of limbs have their own percentile ranges and will have varying degrees of relevance in accordance with different design situations.

In the graph of percentile distribution where the population covers the accepted pattern of distribution where there is an equal number of people either side of the average and very few at the two extremes, the values will rise steeply over the first 5 percent, there will then be a shallow gradient from 5 to 95 percent to 100 percent, see figure 9.

From an array of percentile measurements we can find the measurement that will include 95 percent of the population. This information for example could be used to give the height for a door, that would only inconvenience the remaining 5 percent values, the same procedure can be used to obtain similar measurements for other products.
Graph of percentile distribution.
The measurements for the design of products wherever possible should be collected from the user population under investigation. The final measurements should be selected from percentile values based on the distribution of users measurements. In practice an attempt is always made to fit 90 percent of the population to a design and a serious attempt is made to incorporate at least 5 to 8 percent of the population.

It can be seen when looking at the percentile distribution graph, that the range of dimensions will be comparatively narrow against the possible wide range of dimensions that the designer can plan to in his design. For the designer the narrow margin in percentile measurements means very careful consideration has to be taken when making adjustments to the measurements of a design, slight adjustment the wrong way could cause problems to the overall comfortable dimensions of the design.
Part Six

The Wheelchair
6.1 An aid to independence

A wheelchair to many people can be many different things. To the user it can mean a sign of weakness that their bodies have failed and that they are now reduced to a lower level in practical and psychological terms, looking up at the greater stature of the able-bodied. Correspondingly the able-bodied have a tendency to look down at the wheelchair user again in the practical sense and the psychological sense. Some able-bodied people equate wheelchairs with infirmity. They find it difficult to accept the wheelchaired as independent adults and treat them like children. The barriers lie as a hinderance to the chairbound, but this is only because of innate prejudices and misconceptions.

Attitudes of inadequacy can soon vanish if the wheelchair is accepted as an extension of the body, and aid for compensation for disability.

There should be no stigma attached to using a wheelchair as once mastered and used with the right frame of mind it can give the disabled the same opportunities as the able-bodied, although it has to be remembered that all wheelchairs present a compromise, a compromise which becomes self-evident once in use.

The wheelchair if used correctly can give a high degree of independence to the user yet physical barriers do remain as the main cause for lack of parity with the able-bodied.

6.2 Background

The very first type of wheelchair was an ordinary chair which had casters or rollers attached to it. The modern wheelchair has evolved from this humble beginning using the same principle, that of providing increased mobility to the infirmed and with increased mobility a higher degree of independence.
The significant changes in the development of wheelchairs have been related to the use of new materials, more thought in the design analysis of the problems of using a wheelchair and the increased demand for better wheelchairs.

The use of new materials has significantly widened the possibilities for more adventurous designs and more features being available to deal with an individual's requirements. Wheelchairs are now more manoeuvrable in use, lighter in appearance and weight, and are more aesthetically acceptable.

The first real analysis into wheelchairs and their users was in 1963 at a symposium called "A Symposium on the Wheelchair" (Guttmann 1964). This was the first constructive investigation into wheelchair problems where the Ministry of Health, medical specialists, engineers and concerned wheelchair users pooled their opinions and criticisms.

The main functions of the wheelchair were known, but little precise information was available about the users and the activities they undertook, all except the severely disabled who were usually institutionalised and could be observed closely. The symposium accepted that progress was required on the development of more advanced wheelchairs and hence gave undertakings to pursue further research.

6.3 The Modern Wheelchair: Description

The modern standard wheelchair has a straight back and arms that are fixed to the chair. It has large drive wheels at the back with smaller casters at the front, brakes which are applied to the drive wheels and footrests which are removable.
If we take this basic description as the standard wheelchair (see fig.10) modified versions can be designed for one hand propelling with special double rimmed wheels; models for leg amputees with the drive wheels set further back to compensate for the shift in weight and models with lower seats so the wheelchairs can be propelled using the legs.

Most manufacturers produce their M.G. of wheelchairs which is a streamlined "sportsman's" model for people who want to take part in team or individual sports.

It has to be remembered that no wheelchair is "all-purpose", so there has to be a certain amount of compromise on behalf of the user.

**6.3.1 Characteristics**

The frames of most standard wheelchairs are made of chromium-plated or stove enamelled steel and weigh in the region of forty to fifty pounds depending on the model. There are lightweight models as well as heavyweight models. The lighter chairs are made of lightweight aluminium and special alloyed metals, so folding and transporting the chair becomes much easier. The heavier duty models are reinforced at points of maximum stress.

Wheelchairs come in various standard sizes with adaptations being made on the seat and back rest where necessary. All manufacturers offer a "standard adult", a "narrow adult" as well as sizes for tall, extra large people and children. Most manufacturers build their wheelchairs to similar specifications, see Table 2.

On a standard wheelchair there are many optional extras, such as detachable arms instead of fixed, which makes it easier to slide on and off the chair from a bed or static chair. Desk length detachable arms are lower at the front so that the chair can be easily slid under desks and tables. Adjustable detachable arms can also be fitted to some chairs.
Skirtguard to protect clothing from wheels.

Armrest.

Handgrips of plastic or rubber.

Brake locks onto drive wheel.

Pneumatic tire.

Axle.

Tipping lever.

Handrim to enable self-propulsion.

Hanger bracket.

Foot rest consists of hanger bracket, heel loop and foot plate.

Crossbrace, supports the underframe.

Foot rest consists of hanger bracket, heel loop and foot plate.

The Everest and Jennings Premier Wheelchair.
<table>
<thead>
<tr>
<th>Self-Propelled Wheelchairs</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Height above floor</th>
<th>Height to top of back from seat</th>
<th>Height to top of back from seat with backrest.</th>
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<tr>
<td>Everest and Jennings. Adult size.</td>
<td>1.060</td>
<td>0.605</td>
<td>0.920</td>
<td>0.400</td>
<td>0.400</td>
<td>0.440</td>
<td>0.755</td>
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<td></td>
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<tr>
<td>Everest and Jennings. Junior size.</td>
<td>1.050</td>
<td>0.565</td>
<td>0.845</td>
<td>0.400</td>
<td>0.550</td>
<td>0.440</td>
<td>0.635</td>
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<tr>
<td>DHSS Model 8L. Lightweight.</td>
<td>1.726</td>
<td>0.625</td>
<td>0.935</td>
<td>0.490</td>
<td>0.425</td>
<td>0.440</td>
<td>0.710</td>
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<tr>
<td>DHSS Model 3BL. General Purpose.</td>
<td>0.915</td>
<td>0.560</td>
<td>0.945</td>
<td>0.470</td>
<td>0.400</td>
<td>0.420</td>
<td>0.710</td>
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<tr>
<td>DHSS Model 8G. General Purpose.</td>
<td>1.075</td>
<td>0.630</td>
<td>0.965</td>
<td>0.490</td>
<td>0.440</td>
<td>0.435</td>
<td>0.710</td>
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<tr>
<td>DHSS Model 3C. Child's chair.</td>
<td>0.940</td>
<td>0.560</td>
<td>0.895</td>
<td>0.460</td>
<td>0.305</td>
<td>0.375</td>
<td>0.620</td>
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<tr>
<td>DHSS Model 1L. Indoor chair.</td>
<td>0.970</td>
<td>0.640</td>
<td>1.015</td>
<td>0.515</td>
<td>0.450</td>
<td>0.460</td>
<td>0.745</td>
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<td>Attendant-Propelled Wheelchairs.</td>
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<tr>
<td>Everest and Jennings. Airslide.</td>
<td>1.025</td>
<td>0.570</td>
<td>0.930</td>
<td>0.470</td>
<td>0.400</td>
<td>0.440</td>
<td>0.755</td>
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<td>DHSS Model 9. Car chair.</td>
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<td>0.645</td>
<td>0.970</td>
<td>0.475</td>
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<td>0.455</td>
<td>0.705</td>
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<td>DHSS Model 13. Standard.</td>
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<td>0.645</td>
<td>1.090</td>
<td>0.590</td>
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<td>DHSS Model 21. Buggy pushchair.</td>
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<td>0.520</td>
<td>0.985</td>
<td>0.470</td>
<td>0.420</td>
<td>0.305</td>
<td>no armrest</td>
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<td>Electrically Powered Wheelchairs.</td>
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<tr>
<td>Everest and Jennings. Powerdrive.</td>
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<td>0.965</td>
<td>0.495</td>
<td>0.465</td>
<td>0.430</td>
<td>0.795</td>
<td></td>
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<tr>
<td>Everest and Jennings. Sleyride.</td>
<td>0.955</td>
<td>0.570</td>
<td>0.910</td>
<td>0.535</td>
<td>0.465</td>
<td>0.410</td>
<td>0.755</td>
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<tr>
<td>DHSS Model 102.</td>
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<td>0.935</td>
<td>0.550</td>
<td>0.435</td>
<td>0.465</td>
<td>0.740</td>
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<tr>
<td>BBC Model 103.</td>
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<td>0.925</td>
<td>0.475</td>
<td>0.430</td>
<td>0.400</td>
<td>0.735</td>
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<tr>
<td>DHSS Model 28B. Attendant-Controlled.</td>
<td>1.080</td>
<td>0.610</td>
<td>1.025</td>
<td>0.615</td>
<td>0.455</td>
<td>0.425</td>
<td>0.725</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2
The footrests on most standard wheelchairs are removable and are adjustable with folding footplates. The footrests can be removed if the chair is to be packed away or put in a car. The footrests are also removed if the user moves the wheelchair using his legs.

The brakes on wheelchairs work either on a lever or toggle and both lock the drive wheels which are usually the largest wheels. The drive wheels can be solid rubber which are best used indoors. For outdoor use where surfaces are uneven pneumatic tyres are available and are usually similar to standard bicycle tyres. On the side of the drive wheels are metal handrims which enable the wheelchair to be propelled without the user having to touch the roadwheel. If the user has weak hands rubber tipped projections can be fitted to obtain greater thrust.

The casters on the front or on the back of the wheelchair can be semi-pneumatic or solid and are usually 200mm in diameter.

Probably the most important part of a wheelchair to most users is the seat. For people who are permanently confined in a wheelchair comfort is extremely important. There are many different kinds of cushion available for wheelchairs all designed to reduce pressure and increase comfort. Standard wheelchairs are upholstered in a vinyl-coated fabric reinforced with canvas.

The characteristics described are for a standard wheelchair, that is a wheelchair which is self propelled through the handrim by the user. The other two types of chair are the attendant propelled and the electrically powered wheelchair which have the same fundamental characteristics in construction as the standard chair.

The attendant propelled wheelchair has smaller wheels or casters and is generally pushed by an attendant. This type of chair can be propelled by the user with his feet or by punting the chair using sticks. Both these forms of propulsion are exhausting so reducing the distance and manoeuvrability of the chair and user.
Electrically powered chairs frequently provide the opportunity for some degree of independence for the severely disabled. The chairs are operated through controls that are finger pressure sensitive and if necessary they can be operated by using head, chin, feet or pneumatic (suck-blow) switches.

Electrically powered chairs are being used more frequently by not only the severely disabled but also by those who are able to propel themselves. It is often preferable to abandon time and energy consuming walking or self propelling techniques to enable the patient to become more efficiently mobile and use his available energy to pursue creative activities or work. However, when a disabled person relies on a powered chair for most if not all of his mobility, then mechanical failure can mean great inconvenience in terms of time off work and restricted mobility. As yet there is no provision for spare powered chairs by the Department of Health and Social Security which would bridge the gap between a mechanical failure and waiting for repairs.

6.4 The Problems of Living on Wheels

The object of developing a disabled persons independence of mobility is to help that individual achieve some form of independence either at home with the family or on his own. The independence of the disabled in wheelchairs is related to the extent of the disability and the determination that the individual has to overcome the problems he will be confronted with.

According to figures issued in 1977 there are about 192,000 wheelchair users in the United Kingdom and about 57,000 wheelchairs being issued each year by the Department of Health. Approximately 14% of wheelchairs are for sufferers of rheumatoid arthritis, 14% for osteo-arthritis, 13% for cerebrovascular lesions, 9% for lower limb amputations, 8% for cerebral palsy and 7% for spinal injury. The wheelchair population includes rather more women than men (mean 44%, women 56%); 60% of wheelchair users are over 50 years of age.
As shown in these figures there are a considerable number of disabled people being rehabilitated and achieving greater freedom by the use of better wheelchairs. In turn the greater independence achieved by the wheelchair disabled has created pressures on the physical environment. A situation which is impossible for the wheelchair user may be ideal for an ambulant disabled person; a narrow corridor with walls near enough to use for support may be negotiable for an ambulant arthritic yet a positive barrier to a wheelchair user. Slowly but surely architects and designers are becoming more aware of these types of problems.

Furniture and fittings, as well as the architectural design of the home must all be considered. Frequently, a simple adaptation, such as, for example, removing a built-in cupboard under a sink to provide sufficient space for the wheelchair footplates will enable a wheelchair user to increase his range of activities. Often it is necessary to compromise between altering the environment and altering the users techniques for daily living.

A significant problem that confronts many wheelchair users is their acceptance in the social environment especially at work. The wheelchair users ability to work does depend on a combination of factors. Firstly there is the need for the right type of employment coupled with the need to solve the problem of transport and accessability within the building where the wheelchair user is to work.

For the wheelchair user who leads an independent life plans of campaign have to be drawn up mentally and physically in order to map out a journey or a routine. The wheelchair user has to be aware of the places he will not be able to get to because of steep steps, awkward doors, etc. The everyday domestic act of getting ready for work can be very time consuming and needs to be planned so that dressing, feeding and coping with personal toilet can be achieved efficiently and with the least amount of upset.
Living on wheels inevitably limits a person's activities and because his disability has put him in a wheelchair it inevitably increases the physical and psychological effects of being disabled. Not only is the wheelchair user obliged to operate at a lower level than standing people, but always on the same level, he has to contend with a vehicle for mobility which is cumbersome, awkwardly space-consuming, distinctive and on the whole inelegant.

At this point it is worth speculating, as Finkelstein says (1), "how we might manage if we were all dependant on wheelchairs for mobility?" Our houses would have to be on the same level, with ceilings at about half the height they are now. We would have wider doors and in many cases do away with them altogether. Radical design changes would soon be made in furniture fittings for the bathroom and kitchen. Private and public transport would be radically redesigned.

The speculation could continue highlighting the design deficiencies of the physical environment in relation to the wheelchair disabled, although the concept of everyone using wheelchairs is rather bizarre. Although the able-bodied can only surmise at the real consequences of being chairbound, by posing a hypothetical situation we can begin to comprehend some of the physical barriers the chairbound are confronted with and then try to understand the deeper psychological implications.

6.5 Wheelchair Users: Conflicts in Design

The campaign to force the relevant authorities and professional bodies into taking note of the complaints of the wheelchair disabled, has used as its main argument the precept that if the environment was designed more sympathetically with the wheelchair user in mind it would mean a safer and on the whole a better environment for all.
In the United States the campaign for better consideration for the wheelchair disabled can be summed up in the American National Standard specifications for building access, "where it states that the entire physical environment "should be designed to cater for all people without discrimination." In backing up this statement the National Commission on Architectural Barriers, Design for All Americans, highlights two facts that it considers relevant, one being that "the greatest single obstacle to employment for the handicapped is the physical design of the buildings and facilities they must use." The second fact is that "one out of ten persons has some disability which prevent him from using buildings and facilities designed for the physically fit".

It is worth pointing out that these two facts were expressed without any evidence to back them up. Despite this, the statements are extremely important and are worth closer consideration.

At face value both the statements put forward make sense until we take a closer look at the implications they expound.

For the purpose of defining the degree of mobility, we need to make comparisons. For example, the fit able-bodied person walks, runs and jumps on two feet, can negotiate level, up and down inclines and walk or run up and down steps without too much thought or effort. The person who is confined to a wheelchair is restricted by his own capabilities and that of the vehicle he is using. A fit person in a self-propelled wheelchair can move along level ground up or down gentle inclines and also go down single low steps. If the wheelchair user is particularly fit and adept at using his wheelchair he may even be able to get up single low steps, but if he wishes to get to a higher floor in a building he must use a lift or be man-handled up the steps, provided he can find two strong men willing to help him.
An important feature in the physical environment that enables better access for the wheelchaired is the ramp. This enables the wheelchair user easy access into buildings. The points against the use of ramps are practical. Firstly, they can take up considerably more room than steps, or stairs which can be designed and built to be compact.

Ramps are particularly difficult to fit into older buildings where alterations to floors and structure may be needed. More care and consideration can be achieved in a new building with a level or ramped entrance purposefully built as an architectural feature.

An important consideration and one that is not often realised, is related to other disabled or older people who use ramped walkways. To many ambulant disabled people, who are collectively a larger category than the wheelchair users, a ramp is an obstacle, not an insurmountable one but still a hindrance to an easy passage into a building.

As an amputee myself I would much rather climb a stair case than walk up or down a ramp. The reason is straightforward enough if you contemplate the question of balance. To the able-bodied balance can be easily compensated for by an automatic adjustment of the bodies stance using the legs and arms to shift the distribution of weight. To someone walking with the aid of crutches, sticks or calipers the reaction to a sudden change in ground level can be a confused sense of balance with the counter reaction leading to the person stumbling or falling, simply because they are not agile enough to react quickly enough.

A set of steps or stair case would seem to be more difficult to negotiate than a ramp, but the steps are level and set out at regular intervals and can be tackled carefully and methodically. In bad weather ramps can be much more slippery than a flight of steps.
Ramps are of crucial importance to the wheelchair user and so have to be set out at the right gradient. In a study set out in "Access for the disabled to buildings, Part 1", British Standard Code Practice, it was determined that a maximum gradient of 1:12 is permissible but that there cannot be a right gradient for ramps that satisfy all wheelchair users. The only acceptable situation is a level passageway or a very shallow one.

Coupled with the incline of ramps is the textural quality of the floor surface and the ability of the surface to prevent slipping by the wheelchair user and the ambulant. For the ambulant disabled floor surfaces are important especially when wearing an artificial leg or walking on crutches. The slightest sense of insecurity about the floor surface can lead to panic and a loss of balance. I have experienced this feeling myself; it is something that is possible to overcome by walking around floor surfaces that you are worried of. Of course this is not always possible and you may be forced to walk across a surface which you know to be dangerous. It is very important that the disabled do not injure themselves from falls, created because of bad floor surfaces or architectural obstacles. An injury can and does inflict further incapacity. For example, I have one leg and walk on crutches. If I fell and did nothing more than sustain a sprained wrist or ankle, I would not be able to walk at all and so would be further disabled. An injury like this would be much less of an inconvenience to the able-bodied, they would not be incapacitated to the same degree.

Further comparisons between designing for various bodies of people can and does illustrate the dilemma that the designer is placed in.

A wheelchair user is restricted to the capabilities of the vehicle he uses, which is rigid in its construction and manoeuvrability. The able-bodied person on the other hand can flex his movements to fit with whatever access he wishes to make, from a low door to a narrow opening.
The wheelchair user takes up about five times the amount of space as a standing person does. To turn his wheelchair he needs nine times the amount of space as the able-bodied, who can turn within the space they occupy. A relevant comparison would be the ability of the able-bodied and wheelchair user to get through a doorway. The able-bodied can get comfortably through a doorway of 500mm whereas the wheelchair user needs at least 800mm, coupled with this is the position of the door in relation to approach and also the way in which the door is hung, which could again reduce the opening.

The designer has to work within the boundaries of space, space which is determined by a restricted physical environment and a stringent financial budget. Because of the obvious implications of these limiting factors it is rare that there is enough space for wheelchair users in many houses and buildings.

There are specific architectural features that are very awkward for the wheelchair user. As an example, the toilet facilities that many public conveniences or public buildings offer. The wheelchair user needs a considerable amount of room to manoeuvre the wheelchair and then transfer to the toilet, in many instances the toilets are completely inaccessible because of double doored entrances with narrow passages. There are many such facilities that are difficult for the able-bodied to use because of restricted space and as such are impossible for the wheelchair.

The poor facilities available for the wheelchairer as regards toilet facilities has caused much suffering and has restricted movement, if a disabled person cannot find toilet facilities he is reluctant to venture too far afield.
Areas of access which are considerably better for the wheelchair are department stores, large open plan offices and some shopping centres. As a rule in these buildings the access is level and there are large lifts. Ironically these buildings were not built with the wheelchair in mind but were built to cope with the increasing traffic of ambulant people. This is a situation where architectural barriers have been lifted through an expansion of facilities for the general population.

When recently, the designer of a shopping complex in the north of England was congratulated on his very successful design which provided better access for the wheelchair disabled, using kerb cuts, ramps, wider doors, etc., he was honest enough to admit that he had not considered the wheelchair, as his original specifications were related to access for the elderly and mothers with prams and small children. The overall benefits were quite coincidental.

The wheelchair user as seen from simple observation operates at a lower level from the able-bodied. This is taken for granted by the able-bodied who cannot always appreciate the problems that a restriction in height means whether that restriction is because of a wheelchair or from the affliction of Dwarfism.

"A woman gets into a lift at the ground floor of a block of flats. She presses the sixth floor button in the lift, gets out on the sixth floor and walks the rest of the way up the staircase to her flat on the tenth floor, why?
Answer: The woman is a dwarf and cannot reach any of the buttons above the sixth, so she is forced to climb the rest of the way.

A well known riddle candidly illustrates a design problem and an individual's frustration.

It would be fair to state that the more a piece of equipment is geared to be used from a seated position the less convenient it is when used from a standing position. As a result there are many everyday tasks that able-bodied people
prefer to do while standing, such as working in the kitchen, washing and shaving at a wash basin. Because of this the design criteria have to change for the wheelchair user in terms of height, reach and accessibility within the room being used. Also the positioning of mirrors, shelving, light switches, socket outlets, window and door fixtures, etc have to be considered as inconvenient positioning can cause problems for the wheelchair user and able-bodied alike.

The comparisons that have been illustrated outline the real problems that exist between conscientious designing for the wheelchair user and designing for the general population which is on the whole ambulant. The difference between the able-bodied and the ambulant disabled is a question of degree. The difference between the able-bodied and the wheelchair user is very much broader and as a result places the wheelchair user in a special category. Because of this, consideration and care has to be taken in design so as not to discriminate against a minority which can so easily be overlooked. To enable the designer to understand the wider implications of disability more detailed work needs to be done to find out who the wheelchair users are, what their life styles are and what types of problems they are confronted with on a physical and psychological level.
Part Seven
7.1 The Concept

The ultimate goal of rehabilitation has been stated to be the attainment of "the maximum physical and psychological adjustment of each disabled person within the limits of his impairment; to enable him to live as useful and satisfying a life as is humanly possible."

In general terms this statement can be seen as an aim for the adjustment or correction of a disability, a disability being a limitation in an individual's capacity to perform activities which are generally accepted as basic facets of daily life. Activities such as self-care, the fulfilment of social relationships and the capacity for independent earning are problems created as a result of some physical or mental impairment.

Within the concept of rehabilitation lies a philosophy which reflects the individuals right to equal acceptance and opportunity within society, a sentiment which has been reinforced by the United Nations. "All human beings are born free and equal in dignity and rights" proclaims the United Nations Universal Declaration of Human Rights. "The handicapped person is an individual with full human rights which he shares in common with the able-bodied." (Report of the Secretary General on an International Programme for the Rehabilitation of the Physically Handicapped E/CN 5/259).

Rehabilitation is very much a modern concept gaining significant momentum after the First World War when tens of thousands of soldiers were severely injured and disabled. It was soon realised that there was considerable economic and social sense in the rehabilitation of ex-soldiers so that potentially useless members of society could be retrained both physically and mentally for employment in industry and commerce. Coupled with the national benefits were the benefits
afforded to the individual offering some purpose and fulfilment in life despite disability. The political maxim had become "England would be a land fit for heroes.", the truth for the individual especially the disabled individual was totally different. England was about to suffer the consequences for pursuing a long and devastating war, not only had she suffered considerably with the loss in manpower but she had also suffered extremely badly economically. Despite the impending depression the government accepted its statutory responsibility for the rehabilitation of the disabled mainly because of public sympathy and also because of men such as Varrier-Jones who saw rehabilitation as a social obligation.

Government training centres were set up to retrain the war disabled and a form of quota system was introduced. These facilities were later extended to civilians although the consequences of a severe economic depression created great problems in the resettlement of the disabled into jobs.

The fundamental philosophy behind rehabilitation was the availability of medical supervision for the individual, the formulation of work which would complement an individual's physical and psychological capabilities coupled with an incentive to earn a living wage and so increase independence. With independence came the individuals respect for himself and his position within the family and the community. This philosophy is still seen as the backbone to rehabilitation today.

The next significant phase in the development of rehabilitation facilities came during the Second World War in 1941. The Tomlinson Committee was put to work to reorganise existing facilities and coordinate new schemes for the rehabilitation and training of the disabled.
The Committee recognised the benefits of a post hospital rehabilitation system which offered facilities such as "fresh air, good food, physical training and exercises, together with a limited amount of useful indoor occupation" where a patient could become more attuned to his own physical capabilities and so as a result be assessed for the right type of work.

With the belief that employment must be the eventual goal after rehabilitation, provision for light work under non-competitive conditions with medical supervision available was seen as a step to complete and full-time employment. The report drafted by the Tomlinson Committee reinforced its beliefs by saying that "the only satisfactory form of re-settlement for a disabled person is employment which he can take and keep on his merits as a worker in normal competition with his fellows."

This statement linked the chain between hospital, the post hospital rehabilitation unit and a vocational rehabilitation unit. The first all purpose rehabilitation centre where industrial training and assessment could be given was set up in an empty country house in Egham. Its aims were to "restore confidence and mental and physical fitness through healthy indoor and outdoor occupation and physical exercise". The assessment of a patient's capabilities were carried out in "workshops fitted with machine, bench and other equipment which tested the patient's suitability for various occupations in the building and engineering trades." The centre was staffed by a manager, a medical officer and tradesmen who supervised the work programmes.

To fully implement the proposals made by the Tomlinson Committee further legislation was needed. This was seen in the Disabled Persons (Employment) Act 1944 which outlined comprehensive measures to promote the rehabilitation and employment of the disabled, whatever the type or cause of their disability.
The Act established that the disabled individual should be assessed for his capabilities in every day self sufficiency and for employment, that further rehabilitation centres should be established providing vocational training courses, that disabled people should be placed on a government employment register, and that any employer with more than twenty employees should be required to take up to 3% of his staff from the Disabled Persons Employment Register. The Register was specifically implemented to assist such persons who are seriously disabled to obtain work on their own account under special conditions.

From the very beginning of the rehabilitation concept medical care and assessment was the first link in the chain. With the new legislation in the Disabled Persons (Employment) Act 1944 and the formation of the National Health Service the difficulty was now in coordinating the efforts of two different government departments, concerned respectively with employment and health.

When the provision for the rehabilitation and resettlement of disabled people was reviewed in the Piercy Report of 1956 it was observed that there was a lack of coordination between the two services. The report noted deficiencies in the medical assessment of many disabled people and suggested that better liaison between hospital consultants, the patient's G.P., and the local social services should be sought after.

Rehabilitation has been called "the planned withdrawal of facilities". Its aim is "to prevent undue loss of physical and mental function during illness, to assist convalescent patients to recover full function and to resume their normal way of life without undue delay and to help those for whom permanent physical disability is unavoidable to regain the maximum possible physical and mental function, to adapt to
Fig. 11 The links between services and the stages in rehabilitation.
their residual disability and to live and work in the conditions best suited to their capacity" (Central Office of Information, 1969).

For many, medical supervision and rehabilitation is enough to allow a patient to return to his normal way of life, including employment. For others with residual disabilities continued help is needed in the search for the right type of employment, possibly employment which is closely supervised.

7.2 Rehabilitation and Work

The central figure in the Department of Employment able to help the disabled with the right type of employment is the Disablement Resettlement Officer (DRO), at least one such officer is available in each employment district. The officer's tasks involve the maintaining of the register of Disabled Persons and the surveying of local firms offering jobs that might be within the capabilities of certain disabled people. The officer is not specially trained in the problems of the disabled but does have the expertise and contacts to be aware of the best types of employment for various disabled people. If the officer feels that the disabled person would benefit from a retraining programme he can recommend that he go to an Industrial Rehabilitation Centre now named Employment Rehabilitation Centres, rather than straight into full-time employment. These centres are viewed as a half-way house to retraining and returning to complete employment, and the next step when medical rehabilitation has finished.

As already stated not everyone needs a course of industrial training as many people are able to return to their former occupations. The people who need the help of the Employment Rehabilitation Centres are those who lack confidence, who need time to adjust to a full working day or those who need help to retrain or consider another occupation. Although no vocational training is given at these centres, it is possible on the basis of assessments, for a disabled person to be recommended for a training course elsewhere.
There is no doubt that working is one of the most important areas where problems may arise for the physically disabled. For people who have little education, training or skill, a serious sudden disablement caused by illness or accident can transform their whole existence. If a worker has only his physical strength to offer the employment market he may because of the sudden change in circumstances become devalued as a viable employee and also as a person. A person in this situation may not have the resources to restructure his life around his changed circumstances. The Employment Rehabilitation Centres are there to offer support and a sense of direction.

The concept of non-vocational rehabilitation has caused some misunderstanding. Many people have a mistaken image of what an Employment Rehabilitation Centre does: on the one hand disabled people may admit the centres value as a place for physiotherapy and supervised physical medicine, but may not see the need for the centres to supply rehabilitation for work.

The aims of the Rehabilitation Centres as already stated are primarily to recondition men for a working environment and give them stamina and confidence. These are very much blanket terms which when uncovered show not only the physical problems that have to be overcome but also the psychological problems. The physical problems are obvious and the difficulties they induce definable, but psychological problems may not be perceived until external stresses, as in a working environment, are applied. The Rehabilitation Centre can assess and help an individual if any psychological problems occur, problems that will effect an individuals ability to perform in a working environment.
A large majority of disabled people are retrained in the field of manual work. Very few are placed or recommended for courses leading to clerical, administrative or professional qualifications. The reason for this possibly lies in the nature of these occupations where employment after disability does not necessarily need retraining or adjustment as these occupations can on the whole be regarded as sedentary i.e. not requiring great physical effort, a feature of a job which may be important to some disabled people.

It is when a person's occupation is of a manual nature, skilled or unskilled, that retraining is sometimes required for a completely sedentary job or a manual job that is not too demanding in terms of physical exertion.

The Employment Rehabilitation Unit with its fundamental aims of estimating a man's working capacity, his aptitude and abilities, by fostering an industrial environment backed up by its security and its ability to offer medical supervision to tackle physical and psychological problems, is often the last link in the chain of rehabilitation before a return to full employment.

For the severely disabled who may not be capable of doing many industrial processes the next stage in the rehabilitation chain offers close supervision in a factory atmosphere where a variety of jobs offer differing degrees of complexity. These factories are government run and come under the heading of sheltered employment, their trade name is Remploy.

The workers within these factories have the satisfaction of being able to work a normal day and earn a wage although the wages are significantly lower than able-bodied workers in comparable trades. This is mainly because of the lower turnover achieved by the disabled workers in relation to able-bodied workers. Because of the variance in the speed of production by various disabled workers there are differing pay scales.
Despite the low wage incentives there has always been a waiting list for people wanting to work at the Remploy factories, a clear indication that despite disability people want work even when severely incapacitated. The problem with supplying severely disabled people with the right type of work, work that is within their capabilities, lies in the conflict between a changing economic climate and the therapeutic aims of sheltered employment.

The Disabled Persons (Employment) Act 1944 was originally intended to stimulate the progress of rehabilitation for the disabled, those who were still willing and capable of working at a viable economic level. The new legislation offered severely disabled people the chance to work for their self-respect, a purpose in life and for social contacts and stimulation. The pressure to supply such people with work has caused conflict as services have led to subordinate economic realities for the humane or therapeutic consideration of the individual.

The Remploy factories, because of this conflict, do not make any profit and at times barely manage to cover their running costs. As a result Remploy relies on government subsidies. The Piercy Report in 1956 argued that only disabled people who could contribute on a viable level should be employed and that severely disabled people should be more the responsibility of the Social Services than the Department of Employment. The report stated that "sheltered workshops need to function as efficiently as possible. Workshops organised cost effectively on an industrial basis ... ensure that scarce resources ... are not used wastefully."

The Piercy Committee tried to draw a distinction between the responsibilities of two government departments. It was seen as beneficial to everyone that sheltered employment should be run on a viable economic level but the
problem was how to provide stimulating work for severely disabled people outside the factory environment without highlighting their individual problems and so isolating them from the therapeutic environment of the factory.

At present there is a compromise situation between a person's economic benefit to the Remploy company and the therapeutic and humanitarian benefits afforded to that person. This compromise continues because as yet no alternative ways of using the residual abilities of very severely disabled persons have been developed. This is mainly because of a lack of resources.

A limited attempt by Remploy to set up work programmes at home for the severely disabled who cannot attain the standards required in the factories have been practically abandoned, again because they have proved uneconomical and impractical to coordinate and organise. The Department of Employment considers that it is "unlikely to prove an effective service for the future."

Disabled people are confronted, as is everyone else, by the economic situation and an employment market that is looking for young, well qualified and physically fit workers. The employment prospects for any disabled person have been difficult in the past, but today in the 1980's the situation is even worse. With able-bodied young men not able to find work the prospects for the disabled who want to work and who are capable of work looks bleak. It is strikingly obvious that an economy can only be generous to the less fortunate members of society provided it is healthy and is functioning well, therefore it is unrealistic to expect the employment services to consider the physical and psychological needs of disabled people prior to the need of the economy and an increasingly competitive labour force.
Rehabilitation can be viewed as a concept or as a practical reality, it is fair to say that the concept does not always exist in reality, as practical situations and people do not conform when confounded by the realities of social change and economic fluctuation.

The gains achieved in rehabilitation can be viewed in two dimensions. Firstly, the human dimension which includes the feelings and the well-being of the individual, the improved ability for independence self-care and the capacity for more numerous relationships with other people encouraged as a result of rehabilitation services. These individual gains can also be linked to social gains, another dimension in the structure of rehabilitation. The rehabilitation of the disabled may assure all members of society of the possibilities of re-entering active life should disability occur. In this sense rehabilitation can "not only remove the pains of the sick but also the fears of the healthy."
Part Eight

An Investigation
8.1 The Nature of the Problem

To complement the academic study into disability with its repercussions on society and the individual, it was important to gather personal opinion and to see evidence of how society and individuals react to disability as a topic and as a reality.

To enable me to gain an insight into the professional workings and attitudes of people who work with and for disabled people I felt it important that I visit various selected establishments in the chain of provision for disabled people. From these visits I hoped to gain a personal comprehension from both staff and the disabled.

8.1.1 Method of Approach

The first decision to make was how should I approach the establishments that I wished to visit. I considered that the best course of action was to contact someone with an overall view of what provisions were available and someone who could make contact with the establishments on my behalf. The person I contacted was the Social Worker responsible for the Physically Handicapped in my home area Social Services. Contact was made with her and an interview was arranged at the Social Services Offices.

At the interview I explained the broad outline of my study and expressed a wish to visit a selection of establishments that offered various types of provision for the disabled. The social worker was very helpful and eager to explain the various levels of provision by the county council. She was in direct contact with a variety of establishments and offered me the chance to visit the centres best suited to my requirements. During the interview we agreed that I should visit a school for the physically handicapped, a residential home for the handicapped, a rehabilitation centre and an adult day centre. These visits were later confirmed by telephone and took place the week following the interview.
8.1.2. The Approach

The visits that I had requested, now arranged, prompted the question how should I approach the visits, what was I looking for?

I concluded that the best approach to my visits would take the form of an interview technique that would make a survey of opinions and the physical environment.

The interview technique would take the form of initially, two parts, firstly that of careful observation (preserved where possible using photographs) and also through questioning leading hopefully to discussion.

The observations of the environment in the various establishments, the physical problems and capabilities of wheelchair users in the work areas would be assessed and conclusions drawn from personal observation and criticism from staff and disabled people. The informal interviewing of staff and the disabled would help create an atmosphere whereby as clear an impression of peoples feeling would be achieved with the aim set on gaining an insight into the broad and where possible specific problems of living in a wheelchair.

8.2 First Visit

The first visit was on the 18th January 1982 at Dorin Park School for the Physically Handicapped, Chester catering for children between the ages 6 to 16. The social worker that arranged my visits invited me on behalf of the school's headmaster to sit in on a case conference which was being held to assess various children's progress in school and at home.

The conference was conducted by the teacher responsible for the children under review and was attended by two General Practitioners, the school Nurse, Occupational Therapist, Physiotherapist, Headmaster and three Social Workers each concerned with an individual child.
The conference was called to discuss the sixth monthly assessments on various aspects of each child's development. The discussions ranged from academic attainment, social relationships between staff and peer group to provision of equipment outside school e.g. as in one case a hoist that had been incorrectly installed in a child's home.

The case conference under the direction of the teacher concerned made recommendations as to the future of each child, with individuals taking charge of various aspects of each case that needed to be followed up e.g. making enquiries as to further education courses for one child.

The conference lasted for about 90 minutes and quickly dispersed as various individuals returned to their normal routines.

The next stage in my visit consisted of a guided tour of the school given by the headmaster.

The headmaster immediately showed that he was totally involved in every aspect of the children's development and as the tour progressed he emphasised the importance of the link between a child's development and the physical environment.

The school was purpose built for the physically handicapped yet as the headmaster explained in great detail there were various problems that staff and children encountered in the building. For example, one of the most important facilities in a school like this are the toilets. The provision for toilets was very good yet the thought behind how a wheelchair person uses a toilet and the problems involved was sadly lacking. In many cases the access for a wheelchair was very restricted. As a result of these problems the headmaster had the toilets repositioned giving greater access, which in turn would hopefully offer the children greater independence.
The centre of the school was laid out in an open plan with small rooms leading off wide corridors to specialist rooms such as a library, physiotherapists room, assessment room and workshop. Within the open plan area there were room dividers to achieve private areas for various classes. In one area an inside wall had been removed by a teacher as his teaching area was far too small and access being difficult for those children in wheelchairs.

One area that had been totally remodelled was the kitchen. A store room had been removed to offer greater access and more flexibility for staff and children. The kitchen was gradually being adapted with low level cooking hobs and work surfaces. The ability to change the height of a work surface was seen to be very cumbersome and very much a make do arrangement, see Plates 1 and 2. Storage was also seen as a major problem as the wheelchair users reach and height were greatly reduced in comparison to an ambulant person.

Following the comprehensive tour of the school by the headmaster I continued my study after dinner by talking to individual teachers about their approach to their teaching linked to the school environment. One of the most evident points that all the teachers made was that each child has to be regarded as special, different, unique in relation to other children in the school. The level of disability is seemingly apparent from a physical view point but very much more complicated when you analyse more closely each childs capabilities. The range of disability is wide with children who at first glance appear to be perfectly normal to children who are obviously disabled by being in a wheelchair or walking with the aid of calipers.

It is this wide range of individuality with children showing varying degrees of physical and psychological damage that creates the need for very close supervision and consequently a physical environment that will enhance easier supervision and at the same time offer an atmosphere that can hopefully stimulate the child.
In the initial designing of this school the architect had obviously taken into account the need for easy access through doors, along corridors and within rooms, but it appeared that little thought had been put to the use of furniture in rooms and generally around the school. Much of the furniture in the school consisted of tables and chairs, tables which came in a variety of static heights and were stackable and chairs that were of a standard size.

A problem that was expressed by teachers was the flexibility of much of the furniture in use, especially tables, see Plate 3. There was an obvious need for a wide range of table heights as children of all sizes were either in wheelchairs or ambulant. Tables had to be moved about by teachers if the height needed to be changed for a particular child, this as expected was deemed to be a waste of valuable time by the teachers and in many cases children simply had to work at tables that were obviously the wrong height.

There was equipment that could be adjusted in the school, but because of the nature of its design and operation it was impractical to use. There were adjustable tables which involved using an Allen key to adjust each leg individually, an operation that was impossible for a wheelchaired person to do and in some cases impossible for an ambulant person, as a result these pieces of equipment were hardly ever used.

The headmaster had identified the problem and had made a positive effort to design and build a piece of equipment that the children could use by themselves, adjusting a work surface to their own preferred height. The headmaster had the design made by a local joiner, it was crude but effective. The operation involved sliding a split work surface into runners an operation that could be easily carried out by a child in a wheelchair, see Plate 4.

An important need for adjustable surfaces was seen when children were using typewriters controlled by Possum keyboards.
These children usually have speech and limb defects and need this equipment for communication. The problem was in positioning the typewriter and keyboard so that the user could see the text he was typing and also operate the keyboard comfortably. The headmaster showed me an adaptation that they had carried out which had involved cutting a work surface in half to enable a typewriter to be positioned lower so that the user could see the typewriter carriage and the text he was typing. This idea worked but it involved a lot of thought and extra work for the headmaster who developed and built the final idea.

The same problems were expressed by the teacher in charge of the workshop. There were three conventional work benches one of which had had its legs shortened. The problem again was accessibility to a work bench of the right height and also the problem of carrying out various operations from a wheelchair provided it was possible to get near a bench.

These problems created a conflict with the main aim of the school, which is to engender greater independence in the children and at the same time create confidence in as varied a choice of activities as possible. If the furniture that these children were using inhibits their progress to a greater and easier independence and the fulfilment of more activities, then there is a definite need for improvements to be made.

As a result of my discussions with the staff at the school I was able to identify specific design problems which needed solutions. In conjunction with the fulfilment of solutions for these design problems I discussed with the headmaster various important features that had to be kept in mind. In the course of our discussion he expressed a desire to see the solutions made in such a way that unskilled labour could produce the designed pieces. The headmaster's hope for the future was to set up a sheltered workshop for the disabled where such pieces could be made using simple industrial techniques.
8.3 Second Visit

The second visit in my overall investigation or provision for the physically disabled took me to Clatterbridge General Hospital, South Wirral and their rehabilitation department on the 20th January 1982. The department had the title "Younger Disabled Unit", although this title did not apply to the age range of patients in the unit.

This unit was opened in 1979 and is identical to another unit in the region which was opened in 1977. I visited this second unit at Fazakerley Hospital, Liverpool on the 18th February 1982 in order to make a comparison between the running, philosophy and fabric of the two units.

The present units resulted from the adaptation of newly-built 26 bedded units originally planned as long-stay "Younger Chronic Sick Units". These units had originally been built on the assumption that there was a need to cater for a growing number of younger disabled people many of whom would be severely incapacitated.

The change from the early planned concept with its passive approach to the problems of those with severe disability to the present dynamic rehabilitative approach has brought about greater independence for the disabled as they are encouraged to be cared for in the community or in the family home.

The units aim at providing assessment, treatment and support services for seriously physically disabled adults aged 16-55 years. Patients with a disabling degree of psychiatric illness are specifically excluded.

Two consultants in rheumatology and rehabilitation with supporting staff provide medical cover. The consultants also coordinate the activities of the rehabilitation team (trained nursing staff of 10, 11 auxiliaries, a senior physiotherapist and senior occupational therapist, each assisted by a basic grade therapist, and social worker). These form the full-time team but others such as speech therapists, psychologists, DHSS technical officer, disablement resettlement officer attend when needed.
The nursing sister as she guided me around the unit outlined in some detail the various types of nursing and supportive care that was given.

The units provided three descending levels of care. Following admission, a weekly case conference is held to discuss the patients' problems with members of the rehabilitation team so that a programme can be coordinated for the most appropriate pattern of care for each individual.

The first level of care concerns the long-stay patients (more than 3 months) who in the opinion of the consultant and the unit staff are maximally dependent and require the continuous medical, nursing and laboratory support of a district hospital. Although few in number, they are highly demanding in terms of trained personnel and facilities. Very few will return home, most having rapidly progressive disease, or with lives precariously balanced and lacking reserve to deal with even a minor medical complication.

The second level of care provided is for those who though severely disabled, have considerable rehabilitative potential requiring in-patient care so that they can receive an intensive programme of rehabilitation. Supportive treatment is gradually withdrawn over a period of up to 3 months, by which time most are discharged and can be maintained satisfactorily on an outpatient basis. Prior to final discharge many spend trial periods at home with regular reviews of resulting problems.

Finally, there are those who are admitted for short-term assessment (less than one month) with the intention of optimizing their independence and organising necessary supportive care at home. Frequently this involves a course of instruction in nursing methods or techniques designed to improve mobility. Occasionally a relative will be accommodated in the unit for a few days to learn how to cope with some aspect of a disabled relative's care. Aids and equipment are provided when needed and only when a clear advantage is recognised in their use.
Continuing surveillance of those discharged is maintained with re-assessment by members of the unit staff visiting the patients in their homes or on re-attendance as out-patients. The nursing sister expressed the view that the differing levels of care was a valuable means of training staff as they rotated through the unit so giving them an overall picture of the complex problems of severe disability.

The types of disability that are treated at the two units are wide. Despite the units being referred to as units for the young disabled the disabilities that are treated are largely associated with adults or are disabilities that have increased in severity since childhood. It has been realised at these units that the young severely disabled are a highly specialised group and that 90% of the young disabled referred to the units are incapacitated because of neurological disease or accidents. This means that the younger disabled patient is more likely to require the facilities of a Neurology and Neurosurgical Department. The younger disabled do not need facilities of these rehabilitation units to the degree that was imagined so now a wider spectrum of disability and age is catered for in the rehabilitation units.

The disabilities on the whole in the units are of a progressive nature with Multiple Sclerosis forming the largest aetiological group. The percentage of people treated in one unit and their related disabilities is as follows:

<table>
<thead>
<tr>
<th>Major Syndromes of Patients Admitted 1976-1978</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple joint disability</td>
</tr>
<tr>
<td>Hemiplegia</td>
</tr>
<tr>
<td>Paraplegia</td>
</tr>
<tr>
<td>Multiple Sclerosis</td>
</tr>
<tr>
<td>Progressive muscular disease</td>
</tr>
<tr>
<td>Miscellaneous disability</td>
</tr>
</tbody>
</table>
The rehabilitation in the two units is as related, organised on three levels, but within these levels of rehabilitation lie the individual specialists areas ranging from nursing, occupational therapy, physiotherapy to the links outside with the disablement resettlement officer and social worker.

The units have to take each case on its own merits although much of the rehabilitation will employ well understood patterns of care. The prime function of the rehabilitation is to achieve as much independence as possible and at the same time generate a will for improvement. One of the most important areas in the units where physical independence was encouraged was in the physiotherapy department. This part of the rehabilitation programme was regarded very much as the "make or break" time when a patient would progress to the point where he could be discharged or regress as he found independence too difficult to come to terms with.

The physiotherapist organised programmes of exercises for individuals but found that the space she had available for implementing the exercises very restrictive. The units as already stated were not built to cater for a wide range of age and disability so a large physiotherapy area was not provided. In one unit the physiotherapy area spilled over into the main foyer while at the other unit the physiotherapists took over one of the four bedded wards as an extension to their own work area. At both units the equipment used was very basic consisting of parallel bars, a selection of benches, various mats and one or two specialist machines for exercising muscles. Much of the physiotherapy work was concerned with improving patients walking gait, achieving and improving balance and increasing sensory awareness to damaged or paralysed limbs.

Coupled with this programme of improving physical and mental agility was the work being done by the Occupational Therapist whose job it is to advance the progress made by linking physical and mental capabilities to a living or working environment outside the protection of the hospital ward.
The Occupational Therapist in consultation with the Physiotherapist is soon able to determine what the future capabilities of the patient will be as regards living independently and returning to a working environment.

One of the focal points where the occupational therapists determine someone's capabilities is in the kitchen. By carrying out various tasks, tasks which many able-bodied people take for granted the patient can relate his progress to what he was capable of before disablement, and likewise the occupational therapist can determine a patient's ability to look after himself.

At this point the therapist and the patient become aware of the various problems that will be encountered in the home and at work from the use of various everyday tools, like knives and forks to furniture such as tables and chairs.

When the various deficiencies of the patient have been determined attempts can be made to try to improve a problem or compensate for it with the use of an aid. With or without the use of an aid a patient's motor skills can be further developed by carrying out various bench operations which can include light craft work, from weaving to woodwork.

Both the rehabilitation units had adjustable benches where patients who were predominantly in wheelchairs would work at light woodwork projects, weaving, painting and basketry. It was pointed out to me that these crafts were not carried out for their own sake but were found to be the most effective way of encouraging "lazy limbs" to work again and also in many cases helped to elevate the boring routine of the hospital day. The pace of work as appreciated was very slow but many patients achieved a pleasing end to their painstaking work.

The rehabilitation of the patient in the hospital will continue to the point where no further medical supervision can improve the patient's condition. The final hurdle lies in the transfer from the protective environment of the hospital to the
outside world. It is hoped that at the point of discharge that the patient will not have to return to the unit, and that the unit has enabled the newly disabled person to approach his or her new circumstances with some self confidence.

Links with the unit are not severed altogether as the occupational therapist and social worker make sure that the disabled person can cope with his new situation away from the hospital. The process of rehabilitation although finished as far as the unit is concerned still goes on as the disabled person has to adapt to possibly a new way of life.

The next step in the provision for physically disabled people can lead to one of three alternatives. The first are the residential homes for the severely disabled catering for those who need constant supervision and care in a protective environment. The second are day centres for the physically disabled where supervision can be given on a daily or weekly basis. The third and arguably the best alternative is being cared for at home within the family. Whichever alternative is followed to some degree the process of rehabilitation is still an ongoing process.

8.4 Third Visit

The third visit followed on from the rehabilitation unit to a residential home for the severely disabled. Dorin Court and homes like it, care for the disabled in circumstances which would be impossible for the family to cope with.

The visit took place on the 19th January 1982 and was conducted on an informal level with a guided tour of the home given by the Officer in Charge. During the tour the officer in charge gave a critical assessment of the workings of the building and how the residents fitted into the purpose-built environment.
The plan of the building was square with the living quarters lying on the periphery of a square patioed garden. Access to the rooms could be gained from the central corridor or from an outside door. The building offers accommodation comprising of single bed/sitting rooms, including provision for married couples along with a variety of communal areas centred around the patioed garden. The home has 30 beds, 24 of which are allocated for long-stay residents, and 6 which are used for periods of short-stay, usually averaging two weeks. The short-stay residents are residents that usually reside at home but they come to this home if for example other members of their family wish to go on holiday.

The home caters for residents from school leaving age up to 55 years of age for long-stay and 65 for short-stay. The residents at present in the home were nearly all middle-aged or older. Virtually all of the residents were wheelchair bound so the home had to provide plenty of space in communal areas and in corridors.

The officer in charge expressed the opinion that most of the residents were completely reliant on the routine, the environment of the home and the staff, and to a certain degree this created residents who were dependent and who were not willing to make the effort to become independent as they could always rely on someone assisting them however trivial the need.

Because of this overprotective environment the officer in charge expressed the opinion that if she did not force the residents to be more self reliant they became self-indulgent and dwelled on their own deficiencies to the point where it made them ill. For this reason the home was not run like a hospital environment despite the fact that a certain amount of nursing care was carried out.
Residents were encouraged to go out as much as possible either on their own or with supervised help so that they did not become isolated from the outside world by staying in the home all the time, only one resident was able to do a full time job in the town.

The officer in charge explained how easy it was for the residents to become very dependent on the routine and the staff of the home despite efforts at encouraging self reliance. On my arrival at the home I was met by about ten residents in the foyer, as the officer in charge put it later, "they were either waiting for a new face to walk through the door or be served their coffee, whichever came first".

The initial impression that I gained from my visit and the comments made by the officer in charge was that the residents lead unfulfilling lives. It was not until I had spoken to some of the residents that I became more aware of their day to day situation and their outlook on life in relation to their disabilities.

I soon discovered that despite the severity of some of their disabilities they had personal interests that occupied their minds throughout the day. The residents' rooms were very much an expression of their own identity as they were decorated and in some cases furnished to their own preferences. One resident that I spoke with was a very enthusiastic swimmer and had won many trophies and shields, she went every other day to the local swimming baths. Another resident did some gardening in the patio area and was trying to clean up the greenhouse.

I soon realised after talking to many of the residents how difficult it was for many of them to carry out simple physical manipulations and how dependent they were on other people. Coupled with this dependence was the realisation in many cases that individuals had disabilities that would get progressively worse.
The question of rehabilitation was not recognised in the home in the normally accepted sense of the word. There was a room specially set aside, which was included in the original plans of the home, where residents could exercise on parallel bars, an exercise machine and use light weights, but this room was hardly ever used by the residents.

Rehabilitation to the officer in charge did not mean programme of physical exercise although she felt that exercise was very important. To the home, rehabilitation meant coping with physical disability in a way that made it an inconvenience not an insurmountable problem. This stance was accepted because of the severity of disability that some of the residents were confronted with. Rehabilitation in practical terms meant an ability to dress yourself, feed yourself, deal with your own toilet and propel your wheelchair. The ability to carry out these basic tasks creates greater independence and dignity for the residents and at the same time helps keep personal morale high.

The officer in charge pointed out that many of the residents had disabilities that would get progressively worse, so on a personal level the residents had to be supported both physically and psychologically by the staff as and when needed. This of course did not mean that the residents would be allowed to become dejected, as every effort would be made to keep their morale as high as possible.

Despite what at first glance could be seen as a depressing life for most of the residents where there is an inevitability about the worsening of most residents disabilities, the home did not show any sign of impending sorrow, on the contrary the atmosphere was very buoyant and at times noisy. This in the main was due to the attitude of the staff and also the residents who were resigned to living their lives to the fullest extent despite their various problems.
8.5 Fourth Visit

An Adult Day Centre for the Physically Disabled was the next visit that I made. I visited the Poole Centre at Ellesmere Port, South Wirral on the 21st January 1982 and on other occasions. The function of this type of centre has been defined by the Ministry of Health as "to provide facilities for disabled people to leave their home environment so as to engage communally in activities and improve their contribution to society. The activities may be industrial, rehabilitative, diversional or social."

These centres are seen by local authorities as all-purpose and are a relatively recent development in Britain. It is not easy to describe exactly what a day centre is because its make-up varies from county to county depending on the support facilities needed for disabled people in a particular area. The centres do not serve any clearly defined necessity in the provision of social services, as a result the centres provide a wide range of differing facilities and services for a body of people who differ in age, circumstance and disability.

The centre that I visited opened its doors at ten o'clock. The clients were brought to the door of the centre by a social services bus which had picked each individual up from his or her respective home. As the clients came in the first act of the day was to pay for their dinner. The provision of a hot meal was one of the reasons why a large number of the older disabled people came to the centre.

The clients very quickly filtered into the fabric of the building, all appeared to know where they were going and how they would be spending their time.

The building was purpose built with ramps leading into the building with the corridors and doors being wide enough to accommodate wheelchairs. The main reception area doubled up as a dining room and was the main access for getting to other parts of the centre.
The centre provided a kitchen for the preparation of meals for the clients, a small shop providing sweets, laundry facilities, a general work room; a small library, an assessment kitchen, a small printing press and a large workshop.

Because of the wide range of the facilities and the diversity of the client group, the centre was full of a variety of activities with ladies knitting and weaving in the general work room, two ladies were taking library books around the centre, one man was doing his washing in the laundry, a few people were simply sitting and talking, while a large proportion of people were working on projects in the workshop.

This diversity in the client group and the facilities available has evolved, as pointed out to me by the officer in charge, from an assortment of services traditionally managed by voluntary organisations; like the old people's club, the institute for the blind and the social club for the physically handicapped. The centres now offer training facilities for the every day skills of living such as being able to cook a meal safely despite disability. The centres have links with medical rehabilitation services so they can act very much in a supportive role helping people to live with disability.

Coupled with medical and social support the centres are also seen as catering for arts, crafts and vocational activities linked with education, and by having workshop facilities they are also seen as having connections with open industry.

One of the main drawbacks today with having links with open industry is the economic climate. An important role for these centres was the occupational opportunities that could be offered where the disabled people at the centres had the chance to supplement their income. Unfortunately industry is not willing or is not able to offer the right kind of paid work when orders are difficult to get and unemployment is so high.
It has to be said that what work is available is not very fulfilling as it usually entails a job such as sticking tops on plastic bottles or cutting plastic parts from injection moulds. This type of work can be viewed as rehabilitative in the physical sense but it will not aid any one on their way to open or sheltered employment.

Despite the national employment problems there will of course be regional differences in occupational opportunities. The occupational role of the day centre is determined by the structure of related employment services in a given area. If a disabled person is unable to work in sheltered employment, where he must be capable of managing a full five-day week he may want to look to the day centre for diversionary employment. The young disabled may be interested in the day centre as they would if capable be working in offices or factories, or managing a home and family. Their need is not merely for activities which pass the time of day but for constructive and productive cash earning work.

The disabled people using the day centres are usually dependent on financial help from the Department of Social Security, and consequently the amount that they can earn as extra is limited. While this may be a disincentive to productivity it is not a good cause for constraining any employment opportunities. Although the resources of people attending day centres, in terms of physical ability, energy and concentration, may be limited, they ought not to be underestimated, as from personal experience and observation I have become very aware that disabled people are able to work extremely well provided that the right facilities and allowances are made available.

It has to be said that many of the clients in the centre that I visited were long term visitors either because they were not capable or suitable for any type of employment or because no job opportunities were available. There were two men in the
centre who had sustained industrial injuries, who had been at the rehabilitation unit and who were now spending two days a week back at work on light duties and spending one day at the centre. These men would eventually return to full time open employment as they were not long term disabled.

The two men who were able to be rehabilitated back into their jobs were very lucky but in contrast the employment of permanently disabled people either at the centre or outside looks bleak. Because of the curtailment of cash earning work for the disabled their outlook and attitudes have changed towards their situation. Many of them are resigned to the fact that they will never work in a situation where they can earn enough money to support themselves and their families.

Despite the bleak employment opportunities the workshop is fully utilised with the disabled people carrying out a variety of craft skills. With the guidance of a full-time demonstrator the clients are able to paint in acrylic paints, make wool rugs, weave, do basketry and small upholstery work, small printing jobs like invitation cards and a variety of woodwork jobs such as pyrography and fret work are carried out.

The clients are able to do virtually anything they like within reason, so some of the more enthusiastic people were taking orders for a particular project they were interested in such as pyrographic pictures, which they sold in order to supplement their income. Other clients were making picture frames to order or for the pictures that had been painted by other clients. It is fair to say that nobody was without an activity and yet nobody had been press ganged into doing something they did not want to do, see Plates 5 and 6.

The workshop was not in my opinion very well organised for the easy use of tools and equipment. The workshop was cluttered with tables and chairs and projects that people were working on and as a result access into the workshop and around
it was restrictive at times. There was virtually no storage in the workshop so some of the available work area was taken up with half finished projects and materials. The storage of tools was very disorganised with their accessibility being awkward, see Plate 7.

The predominate problem in this workshop as with the school for the physically disabled was the working height of the tables and benches. All the work benches were far too high for a wheelchaired person to use and consequently many craft activities were not possible. One of the clients expressed a wish to be more adventurous in his work but he found that he did not have the right sort of equipment to aid him or the right type of bench and vice to hold work.

It became clear to me that the workshop was not able to offer all the opportunities that the disabled people would like, simply because of the problems of not being able to carry out many simple operations from a bench.

This deficiency was recognised by the disabled clients and by the demonstrator, but they were not in a position to do very much about it. The designer of the building had not recognised the problem as is evident by the total disregard of comfortable working heights.

The deficiency that exists in the workshop bears comparison with the layout of the assessment kitchen, where clients can be assessed for their ability to cook for themselves safely. The appliances like the stove, fridge, toaster and storage were laid out along the walls of a square room. The heights of the appliances and the work surfaces had been set at a level that could be reached if sitting in a wheelchair.

The curious feature in this room was the heavy duty tracking that had been slung from the ceiling. The track ran in line with the work surfaces and was similar to the type used to hang meat from in a butchers. At first glance
I was bemused as to the significance of this apparatus but was told by the officer in charge that the idea was to place a sling from the track so that a disabled person could push or pull himself around the kitchen. The sling would be set at the appropriate height for the disabled person, see Plate 8.

In principle the device seemed a good idea but in practice it was a complete waste of time as all manner of problems were encountered in its use. Firstly, the problem of getting into the sling especially if legs are paralysed or weak, secondly how could anyone move themselves along the track if weak or paralysed, and thirdly it was impossible for the sling to rotate on its axis which would be necessary to enable proper mobility around the kitchen. If the device had been motorised and not self-manoeuvring then in principle it would have worked, but still the device would have been cumbersome, awkward to operate and also expensive to buy and install.

The locating of this device in the assessment kitchen shows that the designer has identified a problem, a problem that he feels he must try to solve. Unfortunately he has approached the problem in a thoughtless manner and has demonstrated that he has no understanding of the physical and practical problems that would be encountered by the disabled person when using the sling device. Because of the impracticality of this device and its crudity of construction and operation not forgetting its cumbersome appearance the device was never used.

I have deliberately discussed the sling device in the assessment kitchen not as a means to describe a specifically bad piece of design but in order to illustrate a designers approach to a problem, his comprehension of the problem and his answer to a problem. The example of the sling device is I am afraid typical of many of the attempts at designing for the disabled.
This statement is reinforced by the Design Councils sponsored exhibition, Designing for Disability 1981. In setting up the exhibition the Council was hoping to encourage new ideas and designs but it soon discovered that this was not the case. The Council was obliged to reject two-thirds of the products offered, this despite some relaxation of the Council's normally exacting standards in recognition of the special problems involved.

With a few notable exceptions, the designs were institutional in character, "Heath Robinson" in operation and downright ugly. There is an almost punitive attitude about, it seems, able-bodied consumers are to be tempted with aesthetically pleasing gadgets while the disabled should be grateful for whatever "aids" they can get.

There are reasons, not all of them good, why design for disability has been so poor. Many aids have simply evolved with no real design input, as in the case of the sling device, others were originally created for institutions and consequently come in regulation blue, chrome and are chunky.

The visit to the Centre for the Physically Disabled reinforced my opinion about the lack of certain specific aids for the disabled after detailed discussions with various wheelchair bound people. The disabled are the people who need to be involved in the initial design concept and ideas, they are best placed to decide whether a design is workable and whether it is an aid or a hinderance. The designer needs to discard his "I know best attitude" so that sensible argument and problem-solving can be achieved for the long term benefit of the disabled.
Conclusions

As already stated the visits to the various links in the chain of provision for the physically disabled were initiated so that I could experience at first hand the working environments of the various centres, the attitudes of the different staff and most important the opinions of the disabled people in the various centres.

The visits that I have outlined were carried out in establishments that cater for a variety of disability, deal with varying degrees of disability and who on the whole have the same philosophy towards the reality of disability. The common denominator which links all the establishments in the philosophy towards disability is that of independence whereby the disabled are encouraged to help themselves in all that they do not only in physical terms but also in the organisation of their own lives.

It has to be said that the approach towards the goal of greater independence whether related to physical problems, independence in society or independence in the environment is treated in differing ways and with differing emphasis in the various establishments. There was no question about the dedication of the staff in these centres. They were committed to the belief that personal independence and to varying degrees that autonomy were the best forms of rehabilitation for a person with a physical disability. Not only was the policy for encouraging greater physical confidence and mobility but also psychologically this policy increased confidence in personal abilities, a necessity if the disabled person was to function in a society which makes very few allowances for people who don't conform.

Physical conformity is still expected in our society and anyone who deviates from the expected norm is placed at an immediate disadvantage both environmentally and personally. It is this disadvantage that the centres I visited were endeavouring to prepare newly disabled people for.
With a personal confidence in and an awareness of your own capabilities, coupled with a self determination that you are as good or better than anyone else, it is possible to walk down a crowded street or push yourself in a wheelchair without feeling that you have two heads and are consequently different from everyone else. It is in an rehabilitation role, education role and supportive role that these various centres can mould a confident and to varying degrees a self-reliant person.

The school for the physically disabled was educating children who because of birth defects, disease, or accident have been placed at a disadvantage in respect to other "normal" children. Despite this, the school did not recognise that disability was an excuse for not trying to achieve good results in all school activities.

The school's aim was to educate a child in a way that would bring about a strong will and character and also most important help the child to come to terms with his or her circumstances in relation to other people. An understanding of your own capabilities does of course not make it any easier to accept disability and children can still become bitter and their inability to do what their able-bodied counterparts take for granted. A carefully structured education is therefore extremely important so that a disabled child has the same chance to succeed as any other child.

It was apparant to the teachers in the school and to myself that disability need not be as daunting a prospect as it seems provided that the person concerned has the will to succeed and the appropriate help in terms of psychological and physical support.

The psychological support is easy to supply as there is no shortage of willing people to offer encouragement, but physical support in terms of aids and adaptations to meet specific or every day needs is lacking.
When it comes to aids for the disabled the aids have to be just as specific in their use as the specific requirements of the user. This may seem an obvious statement to make, but one only has to look at the various pieces of specially designed equipment to aid the disabled to discover that many specific needs have not been fully catered for or a specific need has not been recognised.

The lack of simply designed, simple to operate equipment for the children in the school was made evident by the teachers and children's comments on the problems they experienced in their everyday activities in the classroom.

I have already outlined some specific everyday problems as regards equipment, like working surface heights. The difficulties encountered by disabled people can be further emphasised as seen in this extract from "Integrating the Disabled", evidence to the Snowden Working Party(2). "Unless you are in a wheelchair which can be wheeled up to a table, you cannot sit on a chair to the table in the normal manner. If you are stiff, you flop onto a chair, and the table has to be lifted over your legs until it is near you. Even then, if you are eating drippy food off a fork or spoon, you cannot lean forward over your plate, and you are apt to drop it down your chest. A normal dining table is too heavy and awkward to be dragged over to you. For this reason we had a dining table especially made, with a swivel out piece at one end. It is swivelled right out, my chair is put sideways to the table, I sit down, and the little flap, is pulled back over my lap. Its not big enough for my hobbies or sewing though. For this, my husband bought me a cantilever table, about 18 in. square. This is still inclined to be too small and unsteady for heavy objects, so he designed a stronger, larger cantilever table from angle iron, chipboard and formica. It is still not big enough to cut out on and to do this, although it is rather narrow, I have a pasting table dragged over me."
This extract outlines a personal account of a problem that exists for a wheelchair bound person. She has been able to overcome the problem to some degree with her husband making certain simple adaptations, yet she still finds that she cannot carry out some of the activities she wants to do, simply because there is no standard piece of furniture or an aid to assist her.

Many people react with "well she will simply have to put up with it, she should count her blessings, things could be worse." Comments like this assume that either the disabled person is making a fuss over nothing or should have the fortitude to overcome the problem.

One of the fundamental problems in viewing the needs of the disabled is that people who don't need help, the able-bodied, tend to forget or even recognise how dependent we all are on each other. The able-bodied and disabled, young and old, male and female all these combinations of human circumstance are dependent on aids of one sort or another, depending on our environment, education and social upbringing. At various times in our lives we have all been dependent on our environment and the support of others.

As human beings our most vulnerable time is in infancy. We are all dependent on our mothers and fathers for nutriment, shelter and the all important psychological bonding. If we compare ourselves with other animals we do not begin to show signs of personal independence with survival instincts until well into our childhood, we are completely helpless as babies. Many animals have to begin to walk within minutes of birth to avoid being seen as food by a predator or being left behind by the herd, we do not have this raw survival instinct at such an early age and consequently if we were abandoned we would not survive.

The roots of human survival are unconsciously felt but man from his very development from Homo Erectus to the Homo Sapien has needed the support and development of his tools to progress.
Somewhere inside him there was a potential to advance in his survival. "It released the environmental break." Bronowski.

The human babies of today are aided into the world by technology and in some cases are given technological support through incubators, ventilators and sophisticated drugs. This is the survival instinct of a modern world at its most basic, yet man still displays his need to survive through his luxury goods i.e. a food mixer as compared with a primitive twig for stirring; a washing machine with the beating of clothes on rocks at the side of a river. With these advances we still work to survive.

What has Man's advances in technology done for the disabled? The first basic fact that has to be recognised is that a very large proportion of the disabled population would not be alive if it were not for science and technology. Man has prolonged life to the point where the maxim "its the survival of the fittest" does not really apply anymore. All human life from the weakest to the strongest, the disabled to the able-bodied can now survive with greatly increased spans of life.

The issue of whether we as human beings should be more selective about allowing damaged babies to survive, to be supported later by the community, is an issue fraught with political, moral and religious argument. Very few people have taken it upon themselves to counter the generally held belief that all life outside the womb is worth prolonging. In many respects technology has taken over, we have the means to prolong and save life so therefore it follows that in a modern world the responsibility lies with technology to continue the support in whatever way deemed necessary.

I would raise the question, that if life is to be prolonged for people who are severely incapacitated then we have a duty, moral or practical to provide the necessary benefits and aids to support that person. It should be remembered that society makes the decision to prolong life it is only right that society realises that a disabled person deserves as full a life as possible.
We do not have the right to make advances in medical science to save people from a physical death only to face virtual death by living unnecessarily useless and disabling lives in a society that is well-equipped but ill-organised to help them.

"A total care system is the ultimate objective. Facilities are only a means to this end." Hermann Field. This is the ideal that should be paramount in the minds of the designers, the designers of social thinking, designers of the physical environment and the designers of new technology.

There are vast human and social gains to be made by providing a well planned care system for the disabled. Human gains may include the feelings of well-being and satisfaction, the improved ability for independence in self-care and the capacity for more numerous relationships with other people that accrue to the disabled and their family members as a result of the provision of a coordinated care system. The cumulative effects of human gains become social gains for society as a whole.

The presence of a comprehensive system of support for the disabled may also provide social gains which are present without regard to the disabled. Their availability may assure all members of society of the possibility of re-entering active life should disability occur. In this sense greater support and facilities for the disabled can be seen as "not only removing the pains of the sick but also the fears of the healthy."

An understanding of the total problem is difficult to convey especially if you are biased. You may be disabled and of course are the subject of discussion, you may care for a disabled person professionally or as a member of a family, you may be a designer of facilities for the disabled, you may be responsible for the economics of the social services in a particular area, whatever your bias in terms of personal commitment and influence the goal must be the betterment of conditions, opportunities, facilities and aids for the disabled.
8.6.1 A Part to Play

What do we mean by personal independence and self-reliance in a modern society? To the able-bodied it means going to school and learning about life, progressing to the world of work and holding down a job that provides economic benefits, and all important being able to spend your free time as you wish.

These activities are accepted as the basic components that go to make up a body of experience in a modern society. If therefore the disabled are not able to participate in these experiences, are they losing out and simply existing as the "deprived", "disadvantaged" or "retarded" members of society?

Self-reliance is closely linked to self-respect. This has become very evident in the recent recession where able-bodied men who are made redundant express their lack of self-esteem as unemployed members of society. The inability to work for whatever reason is seen as an admission of failure at a personal level.

Work, since the Industrial Revolution, has been viewed as fundamental to any life style, so the imposition of this style upon disabled people by society would seem to be quite natural. If we reduce the motivation behind life to quite basic proportions, we discover that we work to enable us as individuals to live by the product of our work. It is an entirely economic philosophy. Of course we have the ability to opt out if we do not accept this philosophy and we can try to survive by other means. Most modern social states see that we survive in any circumstances, this applies to both the able-bodied and the disabled.

For the disabled the opportunity to opt out of work might seem an easy course to take but we should remember that we are concerned with people whose productivity, in general terms, will be one-third or even substantially less than that of his able-bodied counterpart.
What does work mean to us? Only as individuals can we answer that question; but we can analyse the underlying purpose of work, by asking, how much of an act is the work in which we engage and how much satisfaction do we derive from striving for an end product which will seldom disclose the degree of effort that we have put into its production?

To most of us, work is seen as an external measure of achievement and one directly related to capacity and effort. The greater the achievement the greater becomes the status of the achiever. For the disabled to whom work of any kind is a material challenge, the opportunity to work and by so doing achieve at least part of that sense of status within the community is seen as essential and the financial return is almost certainly of less significance than the ability to make some constructive contribution to society and to be seen making that contribution.

Of course, going to work is part of normal living, a contrast to that other part of our lives spent at home in a domestic environment where we are free from the discipline and the urgency of a factory or office. Work is regarded as a normal experience where new contacts, new friendships and a variety of physical and mental stimulation can be experienced outside the protection of the home environment. The work setting engenders elements of survival, independence and mutual help with other people, it offers a variety of experiences that can be viewed as an important part of the human make-up.

The questions that now arise, are, do we offer the same experiences to the disabled on an equal footing with the able-bodied? Is there a state of equality in which the disabled and able-bodied have equal opportunities to make important day to day decisions and opportunities of choice, a choice of where to go and how to get there, of who to visit and who to invite? Do we offer the contract of equality yet fail to implement the small print, which allows "integration with the community" at all levels of its operation.
The three essential elements of many peoples committed time are periods spent sleeping, working and carrying out the important functions of daily living. Ideally a complete contrast to working for a living can be viewed in the pursuit of leisure, it has been referred to as the negative of work, as a time that is spent with no exertion mental or physical with no real objective or end product.

The negative image of leisure is gradually changing due in many respects to the influence of economic and social change. Leisure today can be passive or active, it may generate mental stimulation or it may involve physical exertion, whatever type of leisure that is undertaken everyone has their own views on what they regard as work and leisure.

At the passive level television is a good example as it is probably the most widely used leisure implement, it is readily available and accessible to all people. It offers a variety of experience without making any real demands on the viewers, it serves as a window on the world and offers an interaction with other people without the problems of actually being physically there, it offers atmosphere and a better than spectators view of sports events and places.

The television is an example that offers the disabled and the able-bodied passive leisure and entertainment, but what happens when either party wants more active leisure pursuits? For the able-bodied the problem lies in chasing the activity and then generating enough enthusiasm to pursue it. For the disabled the problem is far greater. The first hurdle is in deciding what the disabled person can do despite the restrictions of a disability, also coupled with this is the acceptance of the able-bodied that the disabled person can or should carry out a particular leisure pursuit.

For many people the important underlying pursuit of leisure lies in the sense of freedom gained from everyday pressures, yet
what freedom is available for many disabled people who wish to pursue a desired leisure activity?

The pursuit of a leisure activity can, and is viewed by the able-bodied as a way of "passing the time", but to the disabled it can be much more than an excuse to waste time, it can offer a therapeutic freedom from an enforced idleness and offer physical and mental regeneration rather than "vegetation".

Leisure cannot supply all the fulfilment that may be afforded in work, yet both work and leisure offer the individual, whether able-bodied or disabled a solidity to the structure we call life. It is clear that to achieve a purposeful life, work and leisure must play their part.

The disabled because of their circumstances have in many cases been excluded from the everyday world of work and leisure, and this has usually been seen on the one hand as the fault of the disabled for not trying hard enough to pursue a goal, or on the other hand the fault of the able-bodied for creating obstacles in order to protect themselves from all that is physically deficient in a human being.

The level of participation in many human activities relies on the ability of the individual to partake on a social, physical and intellectual level. These are the intrinsic tools that all people need in order that they may have a part in the structured workings of human society. The disabled are only deficient on a physical level, yet this has exempted them from many important and fundamental human activities.

The human race regards itself as a very select entity, it has placed itself on a pedestal as the most important life form on this planet, yet despite all human achievement we still cannot come to terms with our own deficiencies in physical, intellectual, ideological and spiritual concerns.
Those of us who have indentifiable deficiencies are in many respects seen as a "minority group", yet we all have deficiencies many of which are undetectable. Is it only human frailty that will not allow us to show ourselves for what we are, "warts and all", and therefore only identify human deficiency with what the eye sees and the ear hears, not with what the truth of character or personality may expound?

The truth of the matter is that in the identification of a deficiency we more often than not will not recognise it, we will deny that it has substance, and therefore will not comprehend its consequences. This denial has brought about the present situation whereby in the eyes of some people disability is seen as an embarrassment, an embarrassment to their own untainted image of what a human should look like or how that human being should behave.

Homo Sapiens is the one of all God's creatures most given to thinking, and the more he thinks the less happy he is with himself and his capabilities. Man differs from other animals in his ability to change things, and he has lost no time in putting this ability to work. Not only has he changed his environment, but he has also through constant criticism of himself begun to realise that all humans should have a part to play in the wide spectrum of life. It is to be hoped that such an ideal remains as a worthwhile quest and that human deficiency in terms of prejudice and ignorance will not deflect the course of worthwhile social change.
Part Nine

Practical Solutions
9.1 An Understanding

The philosophy today concerning the disabled is to accept them as human beings, as individuals with the same rights as other citizens, having access to adequate medical treatment, education, training etc. The disabled have a right to normal living conditions, which means a right to live in the same way as other citizens at a certain time and place.

The ideology that endeavours to fulfill these goals has been generally termed as "normalisation", a concept of encouraging personal confidence and training so that disabled people can pursue their interests and desires on equal terms or compatible terms with the able-bodied.

There are several methods of reaching this goal and many ways in which various interested people will approach it. One important person is the designer as he can easily spoil everything or on the other hand can be the one who can achieve the best for the disabled in terms of providing better living environments or ideas for the treatment of conditions.

During recent years designers have become more involved in the special requirements of the disabled. This involvement has lead to the greater understanding of specific design problems and the general requirements for the disabled with specific conditions.

The involvement of the designer in the circumstances of the disabled has made new demands on his philosophy of design, it has meant a more detailed understanding of the needs of the people concerned, which up to now in certain areas has been a hitherto unexplored criteria for design.

An inadequate approach to design may not be commonly observed, because, in designing for the able-bodied the designer usually has sufficient empathy to enable him to satisfy minimum needs intuitively or from his own experience. Linked to this is the knowledge that
able-bodied people can adapt to ill-fitting environments and aids and do not always recognise that a problem has been solved or compounded. Most design problems are not really new as prior solutions have evolved as acceptable being continually reproduced without repeated research into the basic problem. Careful attention must therefore be given to the design process.

An understanding of the problem must be given to the designer. This communication should take the form of a written analysis of the problem showing the needs, function and aims of a solution. It should be emphasised here that design problems cannot be comprehensively stated as design problems are so often full of uncertainties both about the objectives and their relative priorities. It is likely that both objectives and priorities are quite likely to change during the design process as various implications concerning the solution begin to emerge.

Design problems and design solutions show the negative and positive approach to a conclusion, therefore it would seem pointless to study solutions without reference to problems and visa versa. In this light the understanding of design problems and the information needed to solve them depends to a certain extent upon our ideas for solving them, yet what may seem important to one user, observer or designer may not seem so to others, therefore we cannot expect an entirely objective assessment of a design problem.

Because of the "human factor" in a design problem and a design solution invariably the design process means compromise. Compromise may have to be geared to stated objectives some of which may be in direct conflict with each other, as when the traveller demands vehicles to get him from A to B faster yet does not want to pay for the increase in fuel consumption. With so many aspects of a problem or solution demanding inclusion in an overall consideration design solutions can never be perfect and are often more easily critised than created. Designers have to accept that they will almost certainly appear wrong in some way to some people.
One of the problems in designing for a homogeneous group of people, if there is such a thing, is that within a particular group there are personal differences in perception, taste, physical and mental aptitude, in other words the members of a group are categorised for convenience as i.e. children, women, men, old people, disabled etc. As the potential user of a particular design is to be found within a defined category it has through necessity been the designers brief to develop his solutions for a broad aspect of acceptance.

The necessity for designing for as wide a user population as possible is closely linked to the manufacturers costs in design, development, production and marketing. Systematic study of the "normal" population allows nearly all of us to be fitted from stock with shoes, clothes and furniture for work and leisure at prices we can afford. So the designer is more likely to design for the requirements and whims of a majority where there is a profitable market rather than the special needs of the few which may offer no profit at all.

This is one of the most important reasons for making the production of equipment for the disabled an abnormal commercial undertaking and why there are so few aids and devices that are available for individual needs at reasonable cost.

The provision of adequate equipment for the disabled is beset with difficulties that make it hard to fit into the normal industrial pattern as the specific requirements for a solution to a problem are not always easy to state in relation to the needs given by the disabled person or the needs seen by medical staff. In this context the conflict is between the designer and the potential user who may have definite opinions and criticism. The designer who works for industry yet is serving the requirements of the users, is constricted by the pressure of a solution from the potential user and the pressure from industry to produce a cost effective answer that will ultimately sell.
This dilemma has convinced many designers that in the words of R. Buckminster Fuller "you have to make up your mind either to make sense or to make money, if you want to be a designer."

So the real situation is that many designers are not willing to commit their skills, or industry willing to manufacture the solutions, because the rewards are not great enough in terms of commercial profit and recognition.

If the direct development and manufacture of some aids for the disabled does not appeal to manufacturers for the reasons stated then there is plenty of scope for industry to adapt or incorporate in their products a greater flexibility of design so that the disabled could have a greater selection of products available with an increased chance that a standard manufactured product could help a disabled person with his specific needs.

As an example, the motor industry is making more standard production cars available with options suitable for disabled drivers, such as special seats, wider doors and a variety of control systems for the individual drivers requirements. This new trend for the adaptation of standard cars has been encouraged by the phasing out of the invalid three-wheeler, a government sponsored car that received much criticism for its bad body shell design and safety record.

Correspondingly, in the electronics industry the ever increasing speed of development with micro-electronics, in terms of micro-processors, computers, calculators and speech synthesis equipment has by the intrinsically simple operation of these aids increased the options for communication by the disabled. Much if not all of the developments made were linked to industrial needs yet these advances can now and are, being used to help the disabled, as industry has already got the background development and experience to warrant the adaptation of some of their standard products.
There is much today that is well designed, a far greater number of things that are badly designed and an even greater number of things that are never designed at all. The reason why this uneven state of affairs exists is not only because of commercial pressure, where the manufacturer wants to find himself a market that will afford him greatest profit, but also designers and manufacturers tend not to design because they anticipate a better technology will be on the way.

The better technology in terms of help for the disabled would be seen as the eventual elimination of crippling diseases, or the eradication of the worst forms of handicap. This would mean in the eyes of manufacturers and designers that the heavy expense of manufacturing aids would in the long term be a waste of time. This belief of course is a cruel fallacy. It is true that ultimately medical science will eliminate or bring under control some crippling diseases, like polio which has virtually been obliterated in the western world with the use of vaccine, but there will always be people who are disabled as one disease is checked another will take its place either as a mystery virus or as a man-made accident like the Thalidomide drug prescribed in the late 1950's, its side effects causing severe physical deformity at birth.

Each one of us may become disabled physically, whether from disease, by accident or by infirmity due to old age. We would expect in that event, to continue our emotional, intellectual and cultural life, to earn our living so far as possible in the same way as before, but at any rate by employing our remaining faculties to the full and to undertake for ourselves as many as possible of the physical tasks fundamental to an ordinary life such as self-sufficiency in personal hygiene, feeding, getting about for work and pleasure. To this end aids are needed by all humans whatever the physical or mental ability, social or cultural background.

To the able-bodied an aid is a tool which can extend physical or mental capabilities, it can complement the refinement of human
action or even eliminate human intervention in a particular task. Correspondingly the use of an aid by a disabled person has the same fundamental purpose, that of extending human capabilities or supplementing human action completely, yet one fundamental fact determines the use and significance of aids by both the able-bodied and disabled.

If there is no aid then the able-bodied more often than not can adapt to overcome a problem. For the disabled this is not easy as certain actions may be totally reliant on the help given by an aid, for example, if an able-bodied person is confronted by a broken lift in a building, he will simply resort to walking up the stairs, a person in a wheelchair on the other hand is helpless in this situation.

The underlying importance of an aid is not only the purpose for which it is designed or used, but psychologically the effect of offering self determination in physical and mental action, and being able to say "I'm alright, I can do it myself."

For the able-bodied, giving or receiving help is not a problem. Help is a good thing, reflecting mutual concern and interdependence. For the disabled person it can be a threat. It is not simply an act which may be useful or not, but an expression of social relationships which is likely to be disparaging, the disabled person being perceived as inferior. If the help offered is not necessary, the interpretation is that the helper judges the disabled person to be more helpless than he is, so devaluing his status. On other occasions the help appears to be offered by a person who merely wishes to boost his own ego. And on further occasions, for the disabled person most unpleasantly, the help offered is motivated by pity. The right aids available in the right place at the right time can alleviate the necessity of reliance on someone else for the smallest or greatest of tasks, and consequently not place the disabled person in the position of expecting or hoping for help at a particular moment in time.
It should be pointed out that aids can take a specific and unique form or be of general and everyday use. The distinction here is that not every disabled person needs specific aids for a particular disability, but is capable of carrying on a normal life provided the environment and furnishings are no hinderance. It would be fair to say that in many respects the problems of the disabled are caused by design problems that already exist.

The need for a particular device or the improvement of an already existing design can be achieved in the most haphazard way, by discussion with a disabled person, or member of the medical profession or through the general design analysis of a problem taking into account the question, "Now how would a disabled person use this piece of equipment?".

Again we are confronted with a problem of definition. What sort of disability? For the purpose of this study I have confined my attention to the specific problems of a wheelchair user, a wheelchair user who has good or adequate use of his upper limbs. In using the circumstances of a wheelchaired person as a standard for the design of environments or aids a new approach has to be formulated by the designer.

A subtle way of looking at life from the wheelchaired persons eyes in relation to the man-made environment has been shown by Victor Finklestein who says, "say everyone was in wheelchairs and where the material and social organisation of society was designed according to their needs. It is easy to imagine that in a community where everyone uses wheelchairs and determines their own social environment that the architecture would soon reflect the character of the residents. Door and ceiling heights, for example, could be lowered substantially. If now, able-bodied people were to live in this community they would soon find that they would be constantly knocking their heads against door lintels! Apart from bruises the able-bodied would inevitably find themselves prevented from using the wheelchair - user - designed environment and aids. They would lack jobs and become impoverished - they would become disabled."
It can be said that this is a far fetched view yet it is an interesting hypothesis that it is a total reverse of what is accepted as normal human circumstances i.e. being able-bodied, and therefore an interesting reflection in terms of our attitudes towards the environment we design and the aids we design in that environment.

If the designer can imagine himself in such a scenario as a permanent wheelchair person then it can help him appreciate the permanent problems that affect the wheelchair disabled. If he is able to focus his new insight then the needs of the wheelchair disabled become self-evident and not mysterious.

9.2 Theory and Practice

How after all this discussion do we apply the evidence of a study? The next step if we intend to fulfill the ideas and evidence gathered is to put into effect the practice of design.

During my visits to various establishments catering for the disabled my attention was drawn by the disabled and the staff to various problems. The problem that became predominantly evident throughout my discussions, was that of the heights for work surfaces in the domestic and workshop environment.

Because this problem was linked to the everyday comfort and ease of existence of the wheelchair user, as many of their activities required good access to, and the correct height of a work surface, I felt that it was a problem worthy of investigation. It was at this point that I defined the exact problem I was to design for and at the same time made as my guide a list of criteria to which the final solution should apply.

This guide was set out not for rigid consideration, yet all its parts were there in order to help me fulfill a satisfactory final solution, leading possibly to full manufacture.
The criteria were as follows:

Safety -
Any product should be safe when used. This is especially important for the disabled, who in many cases, do not have the adaptability or range of movement of the general population.

Ease of Use -
An aid or piece of equipment should not demand great strength or over exertion to use nor should it be difficult to use by the people who need such devices.

Fitness for purpose -
The product should do the job that it is intended to do, efficiently and effectively.

Robustness -
An aid or piece of equipment should be able to withstand fairly hard use and occasional misuse.

Reliability -
An aid should not be subject to breakdown during a normal use over its designed life period.

Good Value -
Any product whilst not necessarily being cheap should be good value for money.

The guide at first glance could be seen as a hinderance to the designers ability to find a solution, yet in fact it helps the designer to formulate the problem he has to solve and with it the specifications that the equipment has to meet.

Vital to the success of any design is the need for specifications that accurately detail requirements in terms of the size of potential users, and the functions of the potential solution.

In the case of the general problems that were identified on my visits to the school for the disabled, I was able to translate the general need into a specific requirement.
9.2.1 Workstation

There was a specific need for a workstation that could be used by children, some were wheelchair users, some were able-bodied, but all fell into a wide range of size, age and physical ability.

It is important to be aware at this point that working heights in any situation are critical to the users comfort and performance at work. If the worksurface is too high the shoulders must frequently be lifted up to compensate, which may lead to painful cramps at the level of the shoulder blades, and in the neck and shoulders. For people in wheelchairs the need to compensate to reach a high work surface can cause extra discomfort and pain.

If the work surface is too low the back must be excessively bowed, which again causes backache. So the work surface must be of such a height that it suits the height of the user, whether standing or sitting at his work. Ergonomically speaking, therefore, it is often desirable to be able to adjust the working height to suit the individual, so that whatever type of work is carried out, be it precise, light or heavy work the individual can adjust the working height to suit his own comfort.

An important consideration to meet with a workstation to be used by a wide range of children is that the adjustable surface must have the feature of offering the child quick, simple and safe operation without help from anyone else.

Despite the fact that I knew the device to adjust the height must be simple to operate it became very easy to design complicated devices which would work on paper but which in reality would suffer from wear or faults because of too many moving parts, or become too heavy and consequently difficult to operate.

Because simplicity had to be the watch word in terms of physical operation and also in manufacture it became clear that a solution would have to be found with no or as few moving parts as possible.
The solution that was finally achieved has I feel complied with the criteria that was laid down as a guide. In terms of manufacture it has achieved an economy in materials and a simplicity in assembly. In use it has achieved ease of adjustment, strength for safety in use and is light in weight and appearance. In the classroom it has offered flexibility in use with an ability for easy storage. The teacher or pupil can adapt the unit to fit many classroom activities from everyday class work to practical lessons in biology, physics etc. The work surface can adjust to take various pieces of equipment or a specialist work surface can be fitted to the frame of the unit. The work station is shown in plates 9 and 10.

Another work station is shown in plates 11 and 12. The only significant difference between this unit and the first is the method for adjusting the work surface. This work surface is adjusted by depressing two levers either side of the work top, supporting the weight and then levelling the work top to the required height and releasing the levers. The main constructional differences between the two units is the way the work surface is supported on the frame. The first unit has no moving parts and is supported by gripping knotted sections positioned on the frame. The second unit is supported using retractable levers which rest on cross pieces positioned in the frame.

The constructional differences mean that the work surface on the first unit has to be twisted in the frame when removed, while the work surface in the second unit can be removed on the level by simply retracting the levers, see figures 12, 13 and 14.

As already stated the two methods of adjusting working heights offer greater flexibility and comfort in use for the individual yet these two methods of adjusting working heights do not have to be confined to single units or free-standing units. There is wide scope for these adjustable mechanisms to be used as wall units which can be easily fixed, and stored in situ when not in use. The adjustable surfaces can be used on permanent
No moving parts
Sprung Lever

Adjustable Device
Adjusting the Working Height
stanchions in the middle of rooms and simple units can be made collapsible and portable. The various design options that can be used are illustrated in figures 15 and 16.

The work stations already illustrated are very adaptable multi-purpose pieces of furniture which can adapt to many specific needs in the workplace, school classroom and domestic environment. The same type of work station can be developed into a work bench, see Plates 13 and 14. The work bench uses the same adjustable method as illustrated by the first work station.

9.2.2 Work Bench

The need for this unit was again influenced by a need that was identified in the sphere of disability. On my visit to the Adult Day Centre for the Disabled, it became clear after discussions with the technician in charge and various disabled people that difficulty was experienced in carrying out various woodwork and metalwork processes. The problem of carrying out these processes usually resulted in the disabled person not being able to make a particular project because operations such as planing, sawing and drilling were too difficult. The problem stems from the inability of these people to find a work bench that is the right height, accessible in terms of allowing a wheelchair close enough, and also offering a vice that will hold articles safety and efficiently.

The question of the right equipment to aid practical work was important to these disabled people as many of them spent much of their time pursuing practical skills such as model making, pyrography, woodwork, enamelling, painting, etc.

The question of "how will I spend my time" is an important one for many disabled people. The term leisure usually means "free time" which is in direct contrast to "committed time", yet there is a dilemma here as many disabled people who cannot work in the accepted sense of the word have no "committed time" and so have more than enough leisure or "free time".
Design Options for Workstations

- Drawing Broad Attachment
- Interchangeable Work Tops
- Plastic Top
- Laminated Top
Three elements of committed time are periods spent in sleep, work and functions of daily living. Ideally, leisure may be seen as providing an antithesis to working for a living and should be pleasant in prospect and in retrospect, but if this is true leisure, the problem of the disabled is serious.

The person who leaves work, through retirement or ill-health, loses not only financially but socially in that he or she is deprived of vital contacts with the "real world" and has nothing concrete against which to compare his or her leisure. Leisure cannot supply all the pleasure that the absence of work or a committed social role denies.

For many of the people in the centre their committed time was to their visits to the centre and within that visit the activities that were made available. A Table of activities shows how the centre goers use their time, the survey was carried out by A.I. Harris et al in a general survey concerning the Handicapped and Impaired in Great Britain (28).

<table>
<thead>
<tr>
<th>Activity engaged in at centre</th>
<th>Centre-goers %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handicrafts</td>
<td>47</td>
</tr>
<tr>
<td>General social activities (drinking tea, talking, playing games)</td>
<td>34</td>
</tr>
<tr>
<td>Entertainment/outings</td>
<td>20</td>
</tr>
<tr>
<td>Paid light work</td>
<td>17</td>
</tr>
<tr>
<td>Have meals (not just a cup of tea)</td>
<td>7</td>
</tr>
<tr>
<td>Domestic work</td>
<td>5</td>
</tr>
<tr>
<td>Other activities</td>
<td>17</td>
</tr>
<tr>
<td>No. on which % based</td>
<td>174</td>
</tr>
</tbody>
</table>

The Table clearly shows that a large proportion of the centre goers are involved in practical activities during their visits.

It is obvious that the practical activities undertaken offer many important experiences which cannot be acquired from
an everyday routine. The practical work is seen by many disabled people not as a time filler but as a time for concerted work, where they can commit themselves to an interest without distraction. It is a time where they can work and where possible sell what they make. It is a time that can offer psychological, physical, intellectual and therapeutic satisfaction culminating in an overall experience that gives purpose to an hour, a day or a whole life.

The need for the right equipment to carry out these practical skills is therefore very important as the satisfaction to be gained from practical work can only be achieved when the facilities are beneficial in relation to difficulties experienced by the disabled.

The work bench illustrated in Plates 13 and 14 was designed as a direct result of the need for better equipment to aid not hinder the disabled in their practical activities. The work bench is free standing and is adjustable to any required height. It enables a person who is sitting either on a chair, stool or wheelchair to get above the work he is doing and so benefit from better physical access and visibility, so enabling greater freedom of movement around the work.

The work bench has been constructed in tubular square sectioned steel for strength and lightness, and is completely demountable. As with the work station for the classroom this work bench can be free standing or can be attached to a wall or stanchions with the option of removing the work surface for storage.

The bench illustrated in Plate 13 has been designed and constructed for workwork use, yet any number of different types of bench top can be fitted to a free standing or static frame, tops for general work, metal work, jewellery work, ceramics, etc. The flexibility and adjustability of the work tops offer a wide range of options available for personal preference, see figure 17.
General Workbench - Wall Mounted

Free standing Jewellery Bench

Various Workbench Surfaces
The particular bench illustrated has a hydraulic vice fitted, as it offers many benefits over the conventional screw thread vice. For the purpose of this prototype bench the hydraulic system is an ordinary car jack placed on its side. The first jaw of the vice is attached to the ram on the jack and gives a movement of about 100 millimetres. This movement is more than adequate as the second jaw is adjustable along the length of the bench and is held in place by a pin which goes through the work top into the steel frame structure. The device is similar in principle to that of a sash cramp.

The first jaw is pumped into position using the extending lever. To release the work a second lever is depressed and the jaw will return to rest. The first jaw is able to move back to rest as two compression springs are fitted to the guides along side the ram, see figure 18.

The benefits that are to be found with a hydraulic vice are linked to the ease with which a large pressure can be applied with little effort being exerted by the user. In the case of the disabled this is a definite advantage as access to the hydraulic vice is easier than a screw threaded vice. In order to operate the hydraulic vice the extending lever is moved in a horizontal plane which is easily accessible and easy to operate. Correspondingly, on a screw threaded vice the action is a $360^\circ$ rotation of a tommy bar which takes up a wide sweep requiring dexterity and strength to operate. For a person in a wheelchair or seated position the screw threaded vice can be very difficult to operate as the tommy bar is liable to hit the wheelchair, seat or operator.

The hydraulic vice can be operated in a number of other ways. The pumping mechanism does not have to be attached to the bench as extension hydraulic pipes can be attached to the jack so that the vice can be operated by foot, hand or finger pressure. This could mean adaptability to suit an individuals needs.
The vice has been positioned on the left hand side so that a wheelchair operator can sit sideways to the bench with the right hand being dominant in this position. The vice can be operated by the left hand with the work being held by the right hand. As in many cases a compromise is made with the assumption that most people are right handed and that left handed people would rather use the bench with the vice on the right hand side. If this were the case a version for left handed people would not be difficult to produce, it would simply be a complete reversal of the bench for right handed people.

The overall picture of the bench does allow easy access for a wheelchair under and at the side of the bench, it is light in construction and compact in size. Like the smaller work stations, the bench is completely adjustable from a work surface 710 millimetres high to the highest level of 920 millimetres, this gives an adjustable distance of 210 millimetres, and means that a wheelchair user can get a work surface the right height as well as an ambulant person who may wish to stand at the bench.

The extra adjustability available in the bench gives the wheelchair user greater flexibility in being able to exert force down on the work. Operations such as planing can be achieved as the arms do not have to be held up in a tiring position, but can be used at a comfortable level. Overall the work is much closer as the wheelchair can be placed right under the work bench where plenty of clearance has been given to the footrests on the wheelchair. In certain situations the armrests of the wheelchair can be removed for greater accessibility to the work.

Carrying on the theme of the adjustable work surface I decided to design a more compact and portable solution to the problem. Noting that the focal point on any work bench is the vice, clamp or holdfast I decided to design a method for adjusting the vice rather than the whole work surface. With the capability of being able to adjust the vice I could also make the vice portable.
The solution is seen in Plates 15 and 16. The adjustable vice comes in two parts, one the vice assembly and two, the clamp-on boom. The vice is cylindrical and can be attached and locked to the boom in any position, it will rotate through $360^\circ$. The jaws are cylindrical except for a flat edge 110 millimetres across the circumference of the jaws. Hardened jaws are fixed on these two edges. The jaws will extend 60 millimetres apart.

The clamp-on boom is the adjustable part of the vice. The boom can be clamped onto any table or workbench securing with three M10 bolts. The boom is 190 millimetres long from its axis to the vice attachment stud, and can be positioned in five different positions. By retracting a spring loaded pin the boom can be positioned 100 millimetres above or below the axis of the boom, see figure 19. This gives an overall movement of 200 millimetres, so the vice can be positioned in the lap of the user or at chest level.

This piece of equipment offers a portable means of securing work and can be attached to any firm table, stanchion or solid feature in a room or workshop. If a work surface of the right height is not available the portable vice can be adjusted to compensate so that light work can be carried out. The vice can be used on its own if 15 millimetre diameter studs are secured to a wall or stanchion enabling adjustability, see figure 20.

9.2.3 Storage

Related to the problem of comfort at work and the accessibility of equipment being used is the question of storage for that equipment.

To store means to put out of the way and also to have on hand. Storage is consequently an action with differing purposes: in some cases, the object being stored is of limited immediate value (in sense of use) that it must be placed out of the way - in storage. In other cases, however, the object stored is frequently used. While it must be frequently placed out of the way, it may be needed several times a day or several times a month.
Adjustable Vice Scale 1:2
El Solid bench mount

Wall bracket mount

Solid bench mount

Mounting stud for Vice

Stanchion mount

Options for use, Adjustable Vice
For disabled people, the actions of storing and retrieving objects are complicated by the physical limitations of the particular disability. That might range from an inability to use high or deep storage places to an inability to use almost any kind of storage without assistance.

Access to storage will control the amount of independence possible; usable items that are out of reach or demand assistance to be properly located cannot contribute to practical independence. Storage units therefore need to be easily accessible possibly open, with open shelves and work surfaces arranged so that equipment or supplies can be easily grasped and used, this will increase the number of tasks that can be undertaken without assistance.

It is important to recognise that disabled people who do not have the ability to directly utilise storage facilities still need and prefer to maintain control over storage areas. There are many ways of accomplishing storage requirements for the individual; open shelving that are visible from a wheelchair, coded storage that can be readily described, transparent storage containers and "wheel in" store rooms are a few possibilities.

Wherever the situation or whoever the potential user, storage must comply with certain basic criteria:
1) Storage should be related to work centres, priority being decided on frequency of use.
2) Storage should be sufficiently adjustable to allow for contents have a wide range of sizes.
3) Stored items should be visible.
4) Where necessary there should be physical segregation between contents to allow for access.
5) Storage must be within the functional anthropometric reach distances of its users.

Therefore to arrive at a valid conclusion, the following questions should be asked:
1) What are the actual storage requirements?
2) How are present storage requirements met?
In answer to these questions and in the context of the school situation the actual storage requirements were multifarious. Storage was needed for books, writing equipment, art equipment (brushes, paints, paper, etc), practical equipment for chemistry, biology, etc and many other items in the school classroom.

The items that needed storage were extensive and yet selective. Much of the materials and equipment were stored at random in obscure boxes and cupboards, totally inaccessible to many of the disabled children.

Because there were many different requirements for storage I decided to structure my ideas on a universal solution. I linked my ideas to the important features that should be observed in the criteria already listed.

The first feature to incorporate was portability so that the unit could be used anywhere in a room or workshop. It had to be light, accessible and have flexibility for the many different types of storage it would need to accommodate. The unit designed is shown in Plates 17 and 18.

The unit, as seen, is set on casters which makes it easy to move about by able and disabled people. Incorporated on the unit are two adjustable work surfaces, constructed in exactly the same manner as the first workstation. This unit can be used in the classroom by two wheelchair users while at the same time offering the teacher a central work top to supervise from. The two work surfaces fold away when not in use.

The central worktop opens to expose two separate storage stands. These stands can be placed next to individual people and can be used for storage and as work units. The shelves and storage box on the stands are completely adjustable to an individuals requirements.
Many items can be stored on the stands or stored within the unit instead of the stands. With some adaptability the unit could store items such as library books, tools and materials, and collapsible work desks for use in the classroom. The unit can also be used as a portable laboratory housing a gas bottle and related chemistry or biology equipment. The unit would be ideal as a centre piece from which demonstrations could be taught.

The adaptability of this unit makes it universally suited to many different work and classroom environments, it is specifically designed to aid the wheelchair disabled yet would be beneficial to both disabled and able-bodied.

9.3. Conclusion

The important underlying feature of all the practical work described; work station, work bench, adjustable vice and storage unit is the help towards independence it can give an individual in a particular situation.

The disabled are dependent to varying degrees, but with the use of different aids or carefully designed and organised environments the significance of that dependence changes.

With the right equipment in the right situation the need for help can be found, the need for physical intervention by another human being does not become necessary. The significance of this is that in practical terms there is no need to ask, demand or cry for help if disabled, and no need if able-bodied to anticipate that request.

It should be realised that for all people, whether disabled or not, independence is only a transient state. Even among able-bodied people it is illusory, for the conditions imposed by modern technology in a mechanised society increasingly mean that human beings are interdependent rather than independent.
The essence of this situation means that the disabled have to recognise in relation to their own circumstances that neither absolute independence nor absolute dependence is an acceptable objective to strive for, and that there needs to be a healthy balance between the two.

Dependence has a value, and in personal relationships it is often essential, but that dependence can be the cause of frustration on both sides. The frustration of relying on someone else for significant or insignificant activities has to be experienced to be fully understood, it can cause physical and psychological friction as the disabled person always seems to be demanding, and the helper never available when needed.

At this juncture it would be of value to pose a philosophy that all people are valuable, whether capable of operating independently or not. The consequence of such a belief could be extensive in terms of practical environmental provision.

The fact that, throughout this thesis, so much attention has been given to the needs of the disabled who may not be able to function independently is not to devalue the practical and psychological benefits of self-sufficiency. If a disabled person is to learn to manage his disability he needs to reject help to become independent in order to discover how to do things for himself.

One of the objectives in carrying out selective design projects was to demonstrate that with careful and thoughtful design in furniture, aids and artefacts self help becomes more desirable and physically possible.

Generally the design philosophy of today exists in the interests of time saving, money saving and diagrammatic neatness. It demonstrates abstract theory and design with the ultimate purpose of it all, the fulfilment of the individual, yet that purpose is squashed in the conflict of deciding what individuals are worth designing for.
Surely in a modern wealthy society such as ours, the designers could be more selective in their problem solving, and the public more sympathetic to the real practical problems of the disabled. Instead many disabled people are condemned to helplessness because of insufficient interest by society and directly, insufficient interest by designers.

Surely the resources are available and the impetus at hand for social, personal and practical change because "no man can justly censure or condemn another, because indeed no man truly knows another". Sir Thomas Browne, 1605-1682.
Working Drawings and Specifications
MATERIALS USED

<table>
<thead>
<tr>
<th>Mild Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 x 19</td>
</tr>
<tr>
<td>25 x 12</td>
</tr>
<tr>
<td>15 x 6</td>
</tr>
<tr>
<td>12 Dia</td>
</tr>
</tbody>
</table>

FINISH

Stove Enamel.

WORKSTATION Scale 1:10
MATERIALS USED

- 38 x 19 1000 MM
- 25 x 12 5200 MM

- 12 Dia 2000 MM
- 8 Dia 2500 MM

670 x 390 Plywood 12 MM

FINISH

Stove Enamel.

Workstation Scale 1:10
MATERIALS USED

- 38 x 19 9500 MM
- 34 x 34 1100 MM
- 19 Dia 1500 MM

Mild Steel

Beech Top

FINISH

Stove Enamel

Workbench Scale 1:10
Move to release jaw

Move to horizontal

Pump lever to move jaw

Removable jaw

Workbench / Vice
MATERIALS USED

- 38x19  2720 MM
- 25x12  11000 MM
- 15x6   5000 MM
- 12 Dia  2500 MM

Mild Steel

Plywood Top

FINISH

Stove Enamel

Storage Unit  Scale 1:10  Fig. 28
Plywood Work Top

Adjustable Shelves

Free Standing Unit

Storage Unit
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APPENDIX

The specific problems illustrated in this thesis were identified after lengthy discussion with the disabled and a variety of people who were concerned with helping the disabled overcome practical problems.

When a specific problem had been identified observations were taken to see how extensive the difficulties were and how they affected the disabled in their daily routine.

These observations were recorded in note form, and were supplemented by photographs which gave a permanent record of events.

Many different ideas for solutions to problems were developed on paper, in model form and in full-size or scale mock-ups. The full-size mock-ups were tested in practical situations to explore their reliability and ease of operation.

It was considered impractical within this thesis to show the many development drawings and mock-ups leading to the final solutions, and of far greater practical value if the final solutions were finished so they could be used by the disabled people concerned.

The final solutions were completed, as seen in Plates 9 to 12 and are now being used by disabled people.