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INTRODUCTION

It is our sense of sight, more than any of our other senses that assures us of contact with the world. Our ability to see the shape, size and colour of things around us and to determine our relationship to them, is a gift of nature we often take for granted. As well as being the sense upon which we rely most, it is also the sense which seems to fail us most. When it does, we have a remedy in the form of spectacles or other corrective optical instruments. However, perhaps the use of the word 'fail' in this context is inappropriate, as the eyes of most people who have to wear spectacles have not failed, in as much as the error was usually present anyway. Similarly most if not all eyeglasses are corrective rather than therapeutic.

Present opthalmic medicine is highly advanced and precise, as it should be when dealing with an organ of such a complex and delicate nature. However this has not always been the case ; during the middle ages it was possible to purchase spectacles and eyeglasses from street pedlars (Fig.2 - 3). The deciding factor as to which were the appropriate spectacles, was age. The development of lens technology and optical practice has an interesting history and one which is intertwined with many other sciences, most notably biology and astronomy.

Being items which one wears on one's face, spectacles and eye glasses make more of an impact than is justified by their size. As a result of this the attitude of both wearers and non-wearers, towards spectacles, has always been an ambivalent one. This is demonstrated when one looks at the history of eyewear in

Fig No. 2 A Spectacle Pedlar. Etching by Dietrich, 1741.

Fig No. 3 Spectacle Pedlar. 18th century etching after a painting by P. Cramer.

terms of fashion. It is also demonstrated when one looks at the role, in the modern day, of sunglasses. The strength of the visual impact of spectacles has often been used by modern day celebrities, as a part of their image and when they do so, the spectacles, in a sense, quite often take over.

Currently there are great advances being made in the design and manufacture of spectacles, with an incredibly wide and varied range being available and with a style to suit every face. The quite recent invention of contact lenses is an interesting feature of the story of eyewear, both in terms of its impact on the user and the industry. In this field too, great technological advances are currently being made. How the industry can cope with these advances in optical technology, as well as with the overall technological revolution, is just one more aspect for discussion in this dissertation on spectacles and eyewear .

CHAPTER ONE

THE HUMAN FACE AND SPECTACLES

The human face is a remarkably interesting and important feature of the human anatomy. The face is the residence of the emotions. At least it is in the face that the emotions can be said to manifest themselves strongest. It has been said that :- 'if it were the fashion to go naked, the face would hardly be noticed ' , Lady Mary Wortley Montagu. However nothing (1) could be further from the truth. The body in general could never distract from the intricacies and subtleties of motion and emotion manifested in the face. Indeed among many of the races uncontaminated by western culture, where nakedness is the norm, proof of the importance of, and interest in the face can be found. Malinowski tells us of the Trobrianders who wore a minimum of clothing and often put far more energy into the elaboration of the face, than into elaboration of any other part of the body.

The reason why such importance is attached to the face is, as has already been said, that it is the residence of the emotions. The human face has an incredible range of expression which we all use everyday almost without knowing it. This wide range of facial expressions is made possible by our complex facial musculature. There are more than one hundred different muscles lying just below the surface of the face. The way in which these muscles are arranged, criss-crossing in hundreds of different directions and inter-acting with one another, make an enormous variety of subtle, complex and beautiful movements possible.

An important fact about the human face is the

individuality of each and every one. Although details of individual faces may be quite similar, it is not the details of our features so much as the overall patterns created by the inter-relationships of all our features taken together, that forms a recognizable individual face. The detail is subordinate to the overall pattern. Similarly our judgements of other people are usually based more on these facial patterns than on individual details of nose, eyes and other features.

Our knowledge of a persons character and of their emotional state at any particular moment, is something we read in the set of the face and in the expression upon the face. Many peoples of the ' primitive ' races believe that the soul resides behind the face; in the head, or more particularly behind the eyes .

The importance of the face to the human race in general, is demonstrated by the widespread and prolific use of masks. Masks are extremely versatile objects and have been used by various cultures and races for religious, magical and healing purposes. In his book The Human Face , John Liggett refers to recent discovery of an interesting and hitherto unsuspected property of the mask ; somehow it seems to alter the personality of the wearer at least temporarily. The wearer of a mask often makes facial movements appropriate to the character represented on the mask. It is not hard to understand why certain cultures believed the mask to have magical properties, since they have the power to change the behaviour of the wearer.

There is no more convincing proof of the hold of the face over man's mind than the variety and ubiquity of folk legend involving the face. Most of these legendary faces deviate from

the norm in one way or another. Often they are in the form of creatures with one all seeing eye, as the cyclops had, or , in the case of some Irish tales, eyes which had three or even seven pupils. Since our eyes are one of our main sensory organs, extra eyes were believed to confer extra powers of perception and consequently, extra spiritual powers on a being. To have more than the usual compliment of two eyes, meant having a greater capacity for visual perception and hence, a greater capacity for the gain of knowledge and power. Often eyes have appeared in unusual parts of the body - ' Heterotopic eyes ' - and such eyes were believed to confer extra perception, spiritual insight and power on that particular bodily part.

Another fact demonstrating man's curious obsession with the facial image is the fact that under conditions where vision is impaired and where the mind is likely to generate images, the facial image seems to take precedence over all others. Artists and designers too, even architects might be surprised by the frequency with which the facial image, albeit abstract, occurs in their work (Fig. 4). They seem to be impelled in their work by the hidden image of the face. Or perhaps it is the observers of the work of such artists and designers, who are impelled in their observation to see the facial image. Certainly seemingly ' abstract ' decorations often contain strong facial patterns. Whether the appearance of these facial images occurs on the part of the creator, or the viewer, or both is unimportant. Their appearance is all that is necessary to demonstrate man's obsession with the facial image.

The images evoked by automobiles vary depending in which part of the car you examine. Surely the front of the car is facelike, which is why automobile designers routinely reffered

Fig No. 4 1960 Ford Thunderbird showing facial imagery.

Fig No. 3 Kenyan wood-carving providing evidence of the confusion between the imagery of the face and the torso.

to the radiator as the mouth and chrome uprights in the radiator as teeth. Throughout the early 1950s, the faces towards hostility and defensiveness, especially on big cars, but also on chevrolets and plymouths. (2)

Exactly why the facial image should prove so strong and so great a part of our unconscious mind is an unanswered question. There is the possibility that the obsession comes from the fact that one of the first patterns we have to learn is, the face of our mother. There is also the possibility that the face represents for us something which is biologically of supreme importance in the perpetuation of the species ; the human body itself. There is a wide range of evidence to support this theory. Much African artwork contains examples of the confusion between and ambiguity of facial and bodily imagery (Fig. 5). In female figures, breast eyes and vulva mouths, and in male, figures penis noses and tongues, mark the curious association in our minds, between the geometry of the face and the geometry of the torso. The confusions come as no surprise to psychoanalysts of the Gestalt school who have long been convinced of the sexual significance of nose, eyes, mouth and tongue. It is not only African artists who have noticed the congruence between face and torso. Recent European artists such as Magritte have not hesitated to show us these parallels in paintings such as ' The Rape '(Fig. 6).

I have already said that the face is where our emotions are most obviously manifest. How these emotions manifest themselves and how we read them are subjects of great complexity and interest. Many of our more extreme forms of expression are brought about by basic innate mechanisms of the body. Some of the most striking evidence that this is so, comes

Fig No. 6 The Rape, Rene Magritte.

from studies of children born blind and of deaf children. In her book What is Art for ? , Ellen Dissanayake makes reference to research carried out by T.L. Pitcairn and I. Eibl-Eibesfeldt in 1976 from which they concluded :-

> Although blind children have never seen faces that show pleasure, displeasure, anger or shame and embarrassment they themselves smile, cry, frown and blush. Deaf children cry and laugh even though they have never heard others do so . (3)

This demonstrates the genetic basis of fundamental social communicative abilities. The innate nature of the expression of such emotions can make them difficult, sometimes impossible to conceal . However, as well as much of our emotional expression being innate to our nature, much of our expression, particularly the subtleties of degree and of mixed expression have to be learned. This learning process starts the moment we are born and by the time we are six, we have learned to use our face to express almost every emotion we will use throughout our lifetime.

In our own perception of the face the eyes achieve a special significance, as it is through our eyes, more so than any organ, that we perceive the world around us. The eyes are the means by which we experience each other and they also play an extremely subtle and complex role in our emotional expression. We are all highly skilled at using our eye movements to communicate various emotions with one another. One of the easiest ways to experience the subtlety of eye movements is during a conversation, to watch the way the eye movements regulate and maintain the stability and continuity of the conversation. When for example , X is talking, they may tend not to look directly into Y's eyes . Only when they are coming to the end of what they

have to say, do they look at Y again and so, unwittingly, give the signal that they are finishing and that the time has come for Y to begin talking. Eye movements also play an extremely important part in controlling the level of intimacy between two people. If at any particular moment the level of intimacy between two people seems to be getting to great, then eye contact is voluntarily renounced.

The physical surroundings in which we experience a person also influence and affect our conclusions about a person. The correct recognition of emotion often depends on knowing the physical context. It is easy to imagine how much more influential,the more intimate framework provided by hair, dress and ornament, for example spectacles, prove in the judgement of emotions and character.

The process of character assessment is a longer one, but one which we carry out in a similar way. Time is important in the assessment of character, temperament and personality, time to observe the whole sequence of behaviour : movements, gestures and above all speech. However patience being a virtue which is sometimes lacking in all of us, we tend not to take the time to observe and assess a persons character fully. We are often tempted to 'jump the gun' and form a 'first impression'. By doing this we are usually over-impressed by unimportant and trivial detail, usually visual detail. The dominant gesture or the dominant feature of a persons face may bias our character assessment. Such errors are made in our attempts to simplify the process of character assessment. Another way in which we attempt to simplify this process is through the formation of stereotypes. As well as having society's stereotypes imposed on us, each of us

form our own stereotypes according to our experiences. Stereotypes lead to grave errors in judgement of character. For example, the stereotypical wearer of spectacles, brought to its extreme, can be a feeble and inept bookworm.

I have demonstrated the importance of the face in man's mind, now I wish to examine how the wearing of spectacles can alter both the wearer's perception of themselves and our perception of the wearer. We all know and perhaps to some extent believe the myths surrounding spectacle wearers.

One such myth - that of spectacle wearers being more learned and intelligent - does have some historical basis, in that before and for some time after the invention of printing and in times when there were high rates of illiteracy, it was only those who were literate and therefore educated, who found any use for spectacles. Being literate in such times, meant being better educated, and to those who are not educated, the educated always seem more intelligent. The fact that the only spectacles available for many centuries were those which corrected longsightedness, contributed to this myth, since their primary application was in reading. However in the modern world where spectacles are available which correct both hyperopia, presbyopia (longsighted) and myopia (shortsighted) and where rates of illiteracy are extremely low, comparatively speaking, there is no longer any truth to such a belief . Yet the myth persists and is perpetuated.

Spectacles are also associated with old age. Here there is no myth, as it is in fact true that most elderly people do wear spectacles at least occasionally. Consequently spectacles often make people look older and - particularly among

young people - make them appear more mature than their colleagues and friends of the same age. This look of maturity caused by the wearing of spectacles, reinforces the myth that the wearer is learned and wise .

The above are the rational explanations to these myths. However there may be more subtle subconscious associations, which serve to create or reinforce these myths. I have already mentioned humanoid creatures with extra eyes or heterotopic eyes. Such creatures were believed to have greater powers of insight by virtue of their greater powers of sight. We all know too that wearers of spectacles are often nick - named 'four-eyes'. If the wearers of spectacles have four eyes they will therefore have greater powers of insight and wisdom. Both these qualities are often things that the 'normal' human develops as a result of education and maturity. Thus we can see there is a subconscious foundation to the myth.

To this myth, we must add the barrier both real and imaginary, created by spectacles. As I have said the soul lies behind the face and the eyes are the windows of the soul. Spectacles come between us and the wearer, in that they are a barrier between us and the wearer's soul. In this way spectacles act as a symbolic barrier. However they also come between us and the wearer in a very real sense, in that the eyes are distorted (due to the magnifying or reducing power of the lenses) and are often difficult to see because of reflections. This prevents us from receiving many of the emotive signals which manifest themselves in the eyes. The overall combined effect of myth and fact if taken to its extreme, can be to produce a mature wise and inscrutable countenance ; an all seeing creature that cannot

be divined.

It is not surprising therefore, that many people dislike wearing spectacles. They are quite familiar with the popular myths and misconceptions and do not wish to see these being applied to themselves. Yet spectacle wearers can use their spectacles and the myths surrounding them to their advantage in many cases, particularly where continuous use is not required. They have an extremely effective barrier at their disposal, which they can erect or take down, by putting on or removing their spectacles .

1. John Liggett. The Human face. 1974.
2. Thomas Hine. Populuxe. 1987.
3. Ellen Dissanayake. What is art for? 1988.

Fig No. 7 Sunglasses.

glasses in terms of the hysteria of the medical profession concerning ultra-violet radiation, is no doubt based on fact and no doubt the medical profession's reactions, did influence the acceptance of sunglasses. However it is certain that there were other factors involved, of at least equal importance. For instance, the wearing of dark glasses by members of the organised crime worlds, in order not to be recognised was quite common. This then spread to the cinema screen ; when actors were to play the part of such criminals, they too wore dark glasses. Actors often wore dark glasses off screen as well, for the same reason as the criminals ; in order not to be recognised (Plate 1).

* * * * * *

Those spectacle wearers who manage to overcome the myths surrounding spectacles and their wearers, and who have no problem wearing their spectacles, often become extremely attached to their spectacles. Many learn to use their spectacles to their own advantage.

Spectacle wearers often speak of feeling naked without their glasses and indeed they often appear so to us when they remove their spectacles. Woody Allen for instance, need only remove his spectacles to appear quite naked, but could never look totally naked, unless he removed them (Fig. 8). Woody Allen is a good example of the way in which the spectacles of famous people, have become integrated into and indeed sometimes assume their very character and how very often their spectacles become their trademark. Woody Allen uses his spectacles to magnify his image of the inept and fumbling, intellectual wimp.

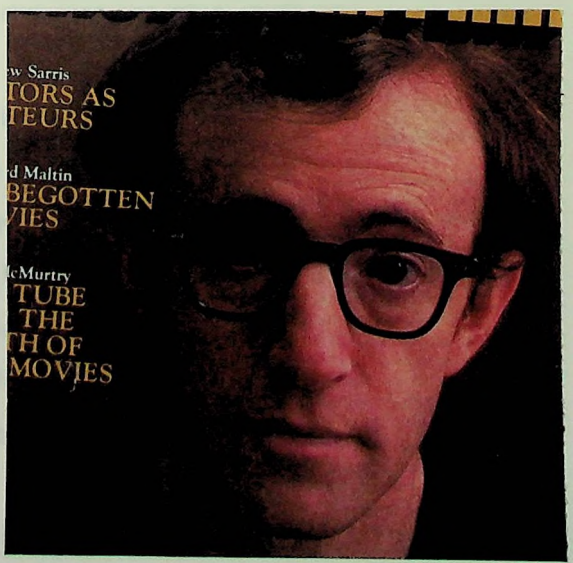


Fig No. 8 Woody Allen

Wearers can also learn to use their spectacles in many other ways, one of which can only be described as coquettish. Removing and replacing one's spectacles and playing with them both while on and off the face, can add a new range of vocabulary to the spectacle wearer's body language. One personality who has used his spectacles in such a manner is Larry Grayson. Larry Grayson wears his half glasses only intermittently, otherwise they hang at his stomach from the chain around his neck or they are flourished in a flamboyant gesture. His use of half glasses encourages him to look out over the top of the glasses with the head tipped forwards, glance raised above the rims and widely arched eyebrows which give a mischievously inquisitive air. His use of glasses, is an important element in his character of flamboyant and eccentric aristocracy.

A celebrity of a similarly flamboyant nature is the character of Dame Edna Everage. These aspects of her character are reinforced by her use of glasses, although she uses them in a completely different way to the way in which Larry Grayson uses his. It is the actual design of the glasses, rather than the way in which she handles them, which is important in our perception of her character. The frames which she uses are of a gaudy and elaborate design.

A spectacle wearer who has used his disfiguring spectacles to create and magnify an image to his own advantage and who has done so in quite a unique way, is Stephen Patrick Morrissey (Fig. 9), more commonly known as simply Morrissey, formerly of the pop group the Smiths. Morrissey's N.H.S. framed glasses magnify his image of awkwardness, depression, frailty and sensitivity. They do not actually create the image but when one

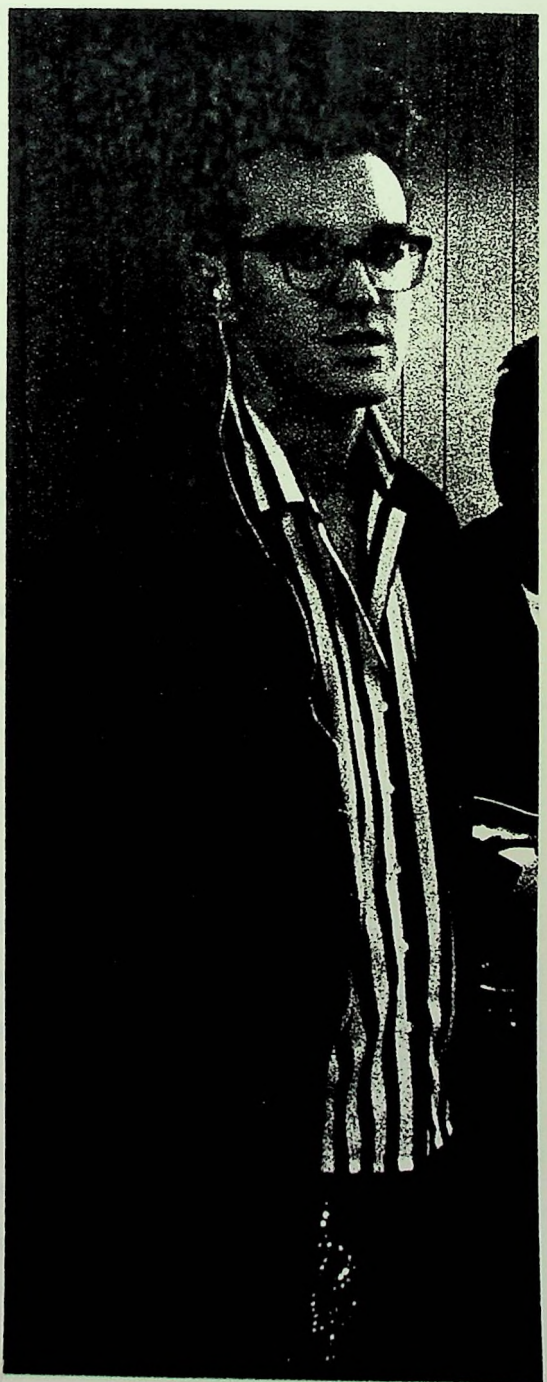


Fig No. 9 Morrissey wearing spectacles.

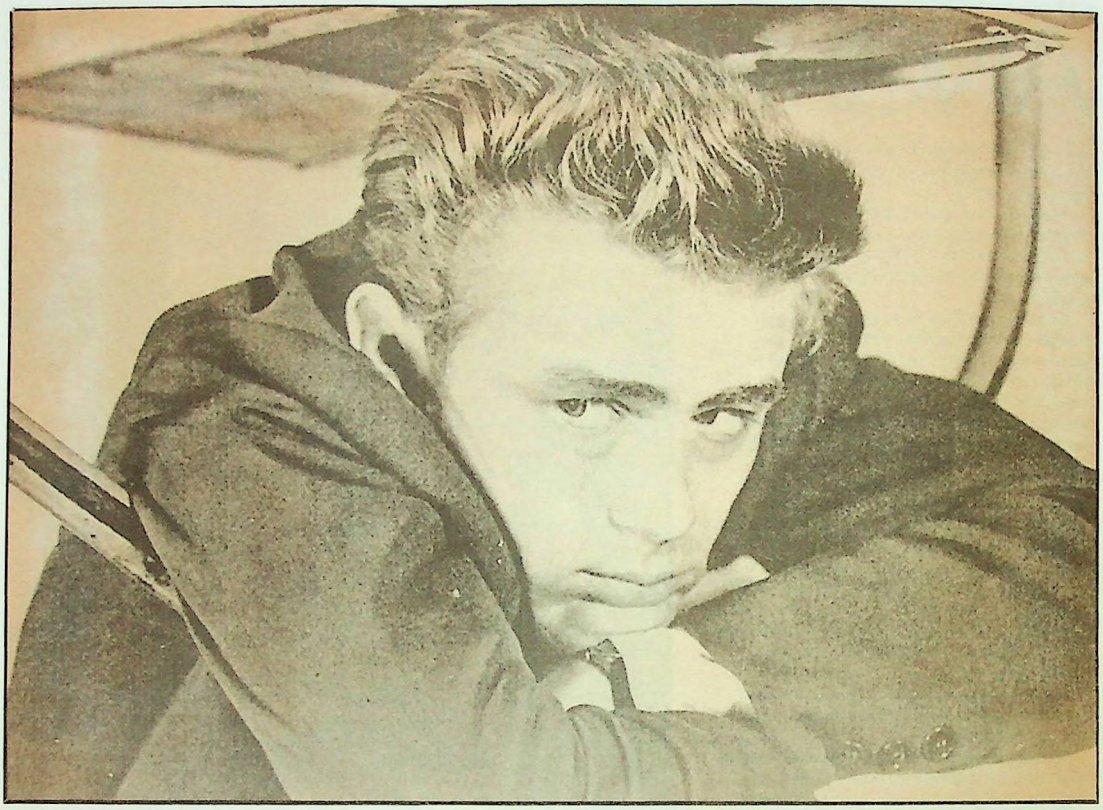
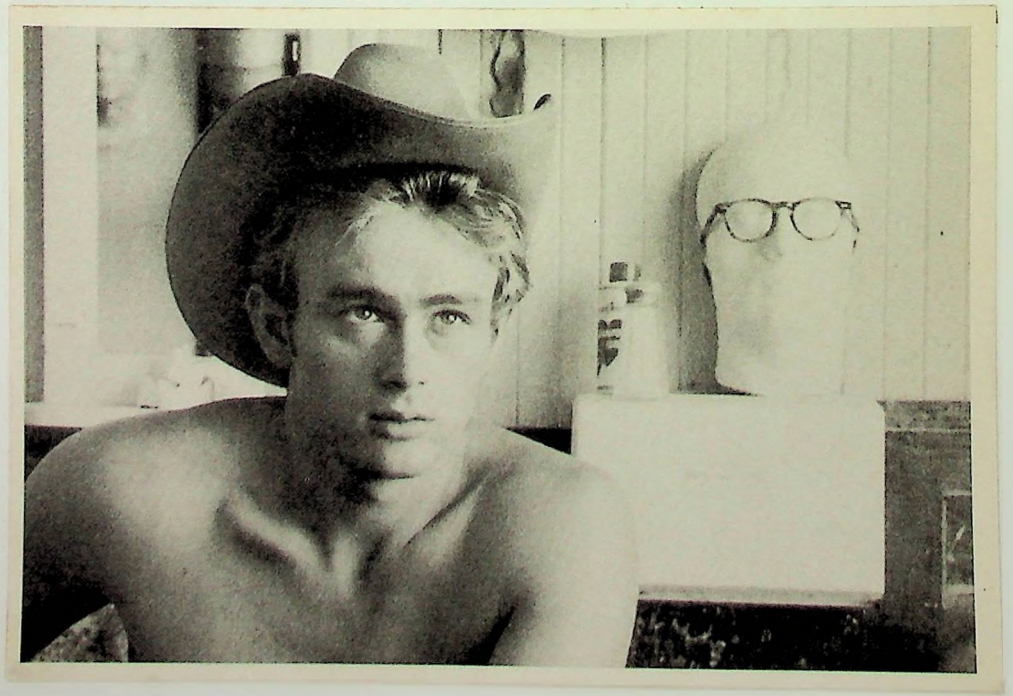


Fig No. 10 James Dean



knows of these elements of his persona, the glasses appear to suit the persona and reinforce it. His wearing of these N.H.S. frames, along with his wearing of a hearing aid and several other visual stamps, have become part of Morrissey's overall trademark.

Morrissey is one of the teenage idols of the 80's but one of Morrissey's idols also wore glasses. James Dean was one of the 20th century's greatest teen idols and he too used spectacles to aid him in creating a widely accepted image (Fig. 10). A young actor who died prematurely in the 1950's, James Dean had undoubted acting talent and had a particularly great appeal among the youth. Being an actor who often played young male parts he had a notable appeal among girls. He became a sex symbol for many teenage girls. However he also holds the distinction of being one of the few sex symbols of the 20th century, who seems almost equally attractive to both sexes. Spectacles can be said to have aided him in achieving this. Men could identify with many of the characters portrayed by James Dean, as they could with many other actors, however his role as a sex symbol among teenage girls, may have tended to trivialise his image among males. His use of spectacles in a limited way off screen helped prevent the triviaising of his image, as it gave him a mature and contemplative aspect.

Another famous personality from the music world who wore glasses was Buddy Holly (Fig. 12). Buddy Holly is more an example of someone overcoming their disfigurement and being accepted by the public in spite of their spectacles, rather than of someone who uses their spectacles in a positive way to magnify some particular aspect of their personality. However once accepted by the public, they will always be recognisable by their

Fig No. 11 Elvis Costello.

Fig No. 12 Buddy Holly.

spectacles and their spectacles become part of their image.

In a previous chapter I described some of the misconceptions surrounding spectacles and their wearers. One such misconception had to do with the age of the wearer and resulted from the fact that as we get older we are more likely to need glasses. The wearing of spectacles by young people sometimes tends to exaggerate their youth through the juxtaposition of a device associated with old age on a young face.

Although spectacles may be regarded by many people, in some cases justifiably so, as a disfigurement, they are by no means debilitating. Indeed the opposite is the case, as they offer the wearer who is prepared to learn, a whole new language which is often the envy of the non wearer.

1. Aldous Huxley. The Art of seeing. 1974.
2. Ibid.

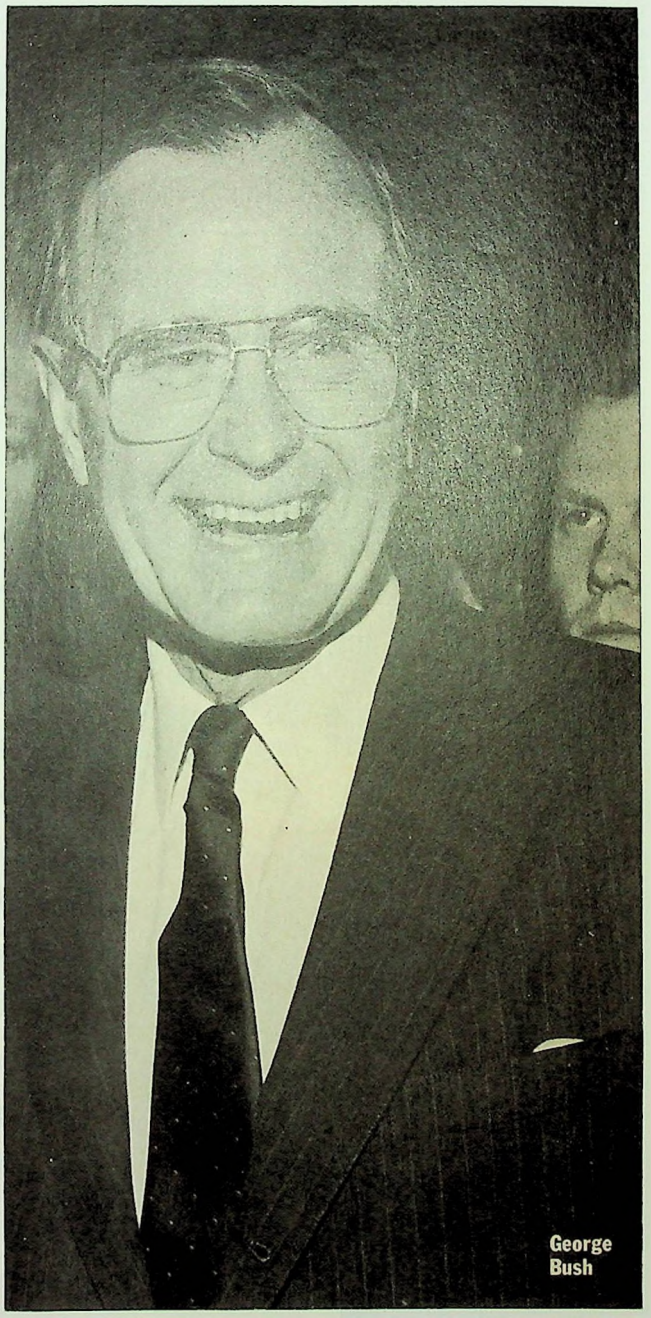


Fig No. 13 George Bush.

CHAPTER THREE

AN HISTORICAL EXAMINATION OF THE TECHNOLOGY OF SPECTACLES AND EYEWEAR TO THE 19TH CENTURY

A precise date cannot be put upon the invention of spectacles, nor any of the very earliest devices to aid vision. However having said that, it is possible to say also, that the first person in the western world to draw attention to the practical usefulness of glasses was Robert Grosseste, Bishop of Lincoln, early in the 13th century. It is also known that the optical properties of glass spheres filled with water, were known to the Greeks in ancient times. Ptolemy elucidated the optical properties of such water filled spheres in the second century A.D. Another later reference to lenses can be found from Arabia in the 11th century : Ibn Al - haitham (Alhazen) mentions plano-convex lenses in his Opticae Thesaurus, which he wrote as a result of his experimental work. However the lenses to which he refers in his work, had a thickness greater than the radius and would have been unsuitable for reading.

The first recorded reference to lenses which could be used to aid vision, comes from an English philosopher and a student of Robert Grosseste's ; Roger Bacon who wrote in his Opus Majus in 1268 :-

> If anyone examine letters or other minute objects through the medium of crystal or glass or other transparent substance, if it be shaped like the lesser segment of a sphere, with the convex side towards the eye, he will see the letters far better and they will seem larger to him . . . . .
> and to those with weak eyes, for they can see any letter however small if magnified enough. (1)

The first reference to actual spectacles, appears in a

manuscript written in 1289 by Sandro Di Popozo :-

I am so debilitated with age that without the glasses known as spectacles, I would no longer be able to read or write. These have recently been developed for the benefit of poor old people whose sight has become weak. (2)

Another piece of recorded evidence that helps to date the invention of spectacles, is to be found in a Pisan monastery where, in 1306, a dominican monk, Friar Giordano of Pisa delivered a sermon one February morning :-

It is not yet twenty years since there has been found the art of making spectacles which make for good vision, one of the best arts and most necessary that the world has. So short a time is it since there was invented a new art that never existed (before), I have seen the man who first invented and created it and I have talked to him. (3)

Although Friar Giordano does not say who the inventor and creator of these spectacles was, his statement does make it possible to date the invention somewhere between 1286 and 1289.

At the same time as the first appearance of spectacles in Italy, Marco Polo stated that elderly people in China used lenses for reading. According to the historian Rassmussen the use of these was well established at this time and he points out that their invention would have to have come at least a few decades earlier. The Chinese claimed that the eyeglasses came to China from Arabia two centuries before Marco Polo observed them. This claim places their arrival from Arabia in Alhazen's time, but since Alhazen made no reference to the possibility of using lenses for reading purposes, the truth of this claim is thrown into doubt.

The invention of spectacles or eyeglasses at the end of the 13th century, was not heralded as a remarkable achievement by the general public. In these dark ages few could read or write and since only convex lenses were produced at first - and

their primary application was in reading or writing - it was only the very well educated, such as scholars and monks, who found them to be of any major benefit. At this time glasses were often and justifiably associated with persons of learning, influence and importance. The attitude of the church too, was at first unhelpful, in allowing the new invention to gain acceptance. Their belief was that afflictions were sent from God and were meant to be endured in silence for the good of one's soul and that any mechanical devices which relieved such afflictions were the work of the devil.

Physicians and the medical profession in general, did nothing to aid the acceptance of eyeglasses and only recommended them as a last resort. Instead they put their faith in strange lotions and incantations such as those described by John of Arden in 1377, in his Manuscript De Cura Occulorum :-

> For watery eyes if the patient be aged and decrepit, this ointment provides the best cure (many times I have proved this) which is thus made ; use a basin of brass, well greased with fresh butter, and let it stand over night ; in the morning let the basin be inverted upon a pot or dish in which is the sour urine of a man, warmed that it may receive the most urine ; let the butter be melted and when cool take down the basin and thus let it stand for a whole day ; afterward let the butter be scraped out (it will appear green) and mix it with a little fat of a capon liquefied by the sun's heat or a fire and store it up in a waxed vessel. Let the eyelids be well anointed. Do not let it run down into the eyes ; the eyes should be bandaged and thus let him lie all night. Of a surety let it be dissolved in the morning, but not washed, then it will be healthy . . . . (4)

The earliest spectacles were simply made of two single eyeglasses riveted together. The problem with them was obvious straight away and was one of keeping them in position on the nose. This was a problem which took a few centuries of trial and error to resolve and one which yielded many ingenious and bizarre designs as a result.

Although it can be said with some certainty that spectacles were not invented in Venice, it soon became the centre for their production being already the site of a major glass industry. The first reference in the Venetian Guild by - laws to 'vitreos ab oculis ad legendum' - eyeglasses for reading occurs in 1301. The Venetians were offered no competition until France became a major centre for glasses production later in the 14th century. The Germans did not begin producing glasses on a similar scale until early in the 16th century.

The use of spectacles and eyeglasses remained quite limited for at least two centuries following on their invention because of the attitudes of the church and of physicians, and because of the lack of literate who would find a use for glasses. The invention of printing in the 15th century proved to be a major catalyst in the acceptance and general use of spectacles. At first spectacles and eyeglasses were applied only to the correction of presbyopia and hyperopia, through the use of convex lenses and it was to be more than a century after their invention before concave lenses were used to correct myopia ; the first reference to such use, appears in the mid 15th century from Nicholas of Cusa.

At this stage in the development of lens technology there were three major problem areas. The first was simply a matter of poor craftsmanship, which resulted in flaws in the glass and lenses, which were often uneven in shape and poorly polished. This problem was not insurmountable and was overcome by scientists like Huygens and Leeuwenhoek in the early 18th century. These men were manufacturing lenses for their own purposes and used methods which were craft based rather than

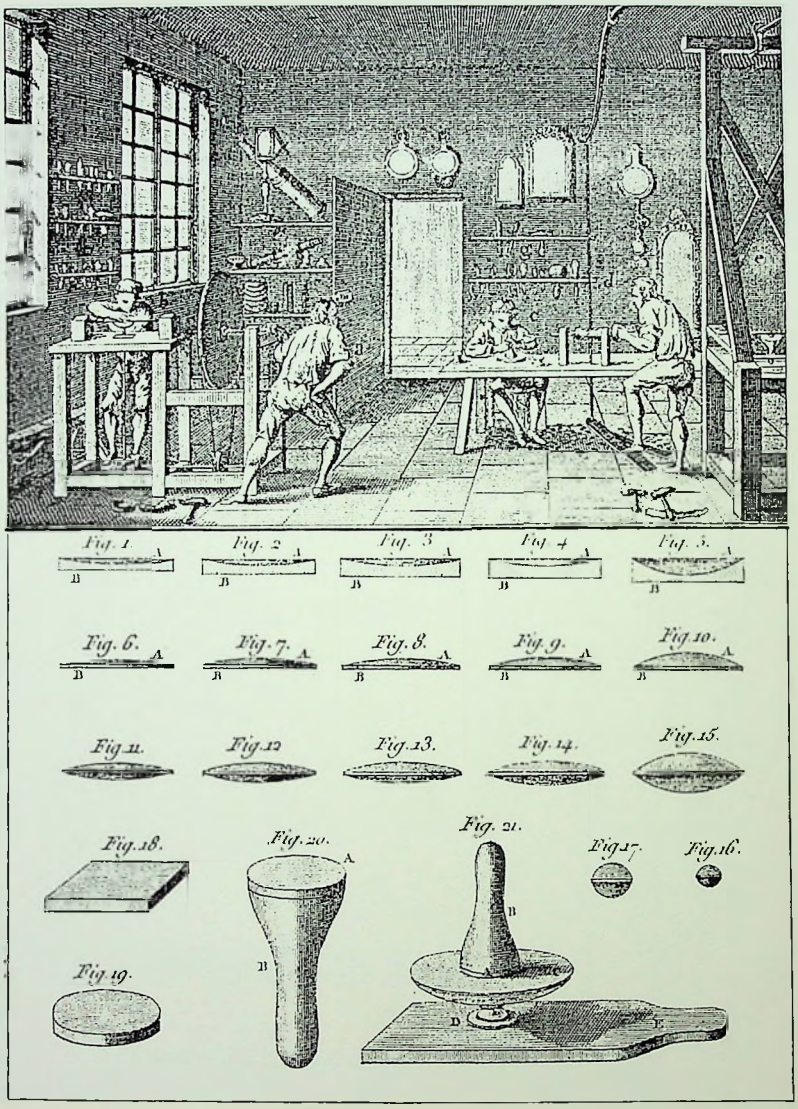


Fig No. 14 Lunetier. Spectacle makers' workshop, lenses and tools. From Diderot's Encyclopedie, 1772.

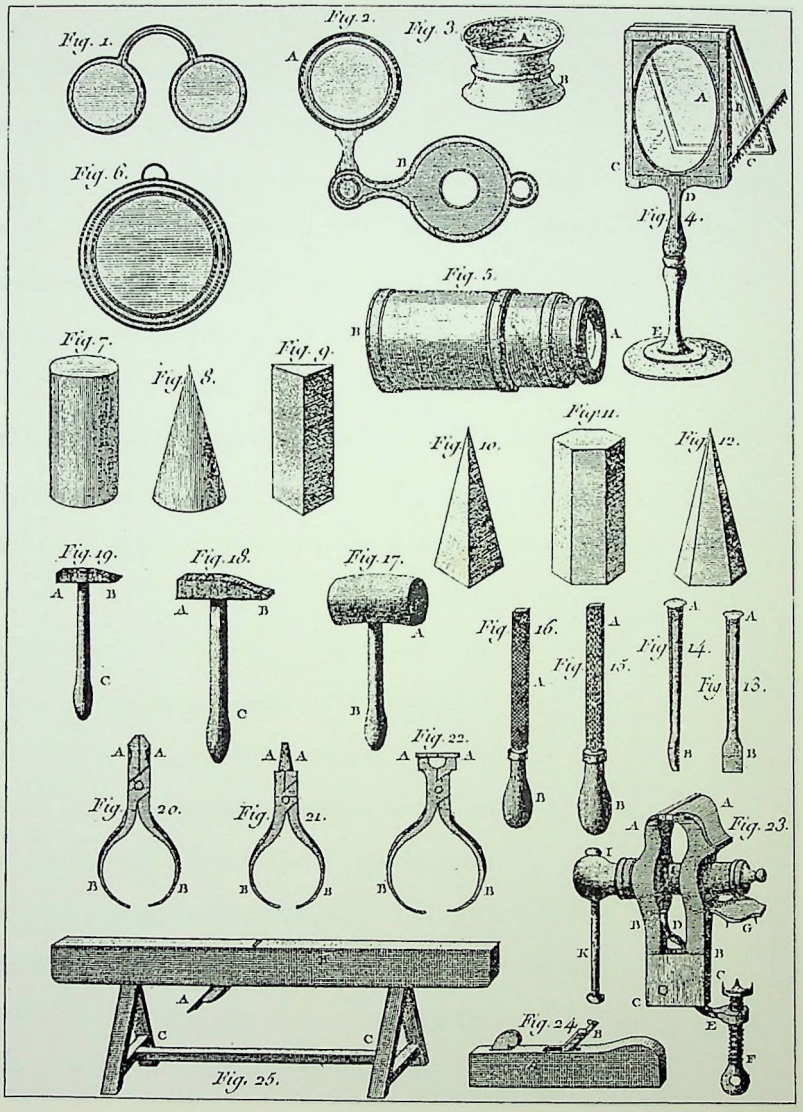


Fig No. 15 Lunetier. Eyeglasses, mirrors and spectacle makers' tools. From Diderot's Encyclopedie, 1772.

industry based, to do so. There was to be little improvement in mass produced lenses or their methods of production, until later in the 18th century.

The second problem arose from the fact that lenses were cut from chunks of spherical glass and from the fact that it is inherently impossible for a spherical lens to bring the light incident upon it to a point focus. This is a phenomenon known as spherical aberration. The third problem was chromatic aberration. The effect chromatic aberration had on the wearer, was to distort the colours on the edge of an object viewed through the lens.

The solutions to the problems mentioned above were mostly corrected during the development of lenses for more complicated and sensitive optical instruments, such as microscopes and telescopes. These instruments were far more delicate in nature and therefore any flaws became more pronounced, as well as more of a hindrance.

Remedy for the problem of spherical aberration was discovered in 1637 by Descartes. He discovered that the only way to refract light to a point focus, was to give the lens a parabolic or hyperbolic curve. Although this conclusion was not so difficult to arrive at, manufacture of such a lens was to prove virtually impossible, at least commercially. In practice therefore lenses continued to be ground as portions of spheres.

The problem of chromatic aberration was explained by Newton in 1671. He showed that a lens or any refractive medium does not refract light of different colours by the same amount, and therefore a lens cannot form a single image, except in monochromatic light. Although Newton discovered the cause of

chromatic aberration, he could not see a solution and concluded that chromatic aberration could not be remedied.

However studies conducted by Chester Moor Hall (an ameteur) on the human eye, led him to believe that a solution was possible and he discovered that the problem could be solved by combining concave and convex lenses of suitable refractive indices. Chester Moor Hall produced the first achromatic lens in 1755. The first man to manufacture achromatic lenses commercially was an instrument maker, John Dollond.

Once the problem of chromatic aberration had been resolved by cementing concave lenses of crown glass to concave lenses of flint glass, scientists and glass makers turned their attention to the production of higher quality glass. Since the demand for high quality optical glass had until this point been low, there had not been much development of the latter.

Early lenses were made from soda - lime - silica glass and show a slight cloudiness due to devitrification. This devitrification occurred as a result of excess sodium oxide in the glass, which is formed when soda is introduced to the mixture to reduce its temperature of fusion. Medieval glass makers introduced various substances into the glass mixture in order to lower its melting point, as they had difficulty in attaining extremely high temperatures. As a result of this, much of the glass they produced is relatively unstable. The biggest breakthrough in the manufacture of high quality optical glass came from a Swiss, Pierre Louis Guinand in the late 18th century. Guinand applied his knowledge of methods of obtaining greater homogeneity in metals, to glass production methods. Guinand's idea was that the homogeneity of glass could be improved by

stirring it while it is still in the molten state. While in the molten state much settling of the denser elements of the glass mixture occurs and this can lead to the development of straie which upset and unbalance the refractive power of the glass. Stirring the molten mixture discourages this settling from occurring and ensures a greater homogeneity of composition and therefore of refractive power. Stirring also helped to remove bubbles from the mixture. Following the discovery of the stirring method, many new materials could be introduced into the composition and therefore a greater range of glasses could be produced. Thus the range and standard of optical glasses was greatly increased.

1. Richard Corson. Fashion in eyeglasses. 1980. p.19
2. Ibid.
3. Ibid. p.20
4. Ibid. p.27

CHAPTER FOUR

AN HISTORY OF THE FASHION OF EYEWEAR

Much of the history of the fashion of eyewear centres around the problem of keeping the lenses in place on the face. Technology has also influenced fashion ; with developments in optical and other technologies, came corresponding developments in the range of possibilities in the construction of eyewear. It is necessary before starting on this chapter to define spectacles as separate from other forms of eyewear, particularly eyeglasses. Spectacles can be said to be eyewear in the form of two separate single lenses, one for each eye, which can either be attached to the face or held in front of the face in order to improve vision. Eyeglass is the term used in reference to a single lens which is used independently to aid the vision in one eye (Fig. 16 + 17).

The very earliest spectacles came in the form of two single eyeglasses. These double eyeglasses with the handles riveted together first appeared in Italy in 1352 (Fig. 18). These first spectacles had to be held in front of the eyes by the wearer and therefore they could not be worn continuously. Since the only purpose spectacles served at first, was as an aid to reading and other close work and they were therefore not needed continuously, there was little incentive to produce spectacles which could be worn continuously.

The first attempts at solving the problem of continuous wear involved introducing flexibility into the spectacle frames so that the glasses would cling to the nose. One of the earliest attempts dates from 1490 and can be seen in

Fig No. 16 a. Perspective glass with silver mounting. These were fashionable throughout the century.
b. Brass magnifying glass used in the 17th century in England.

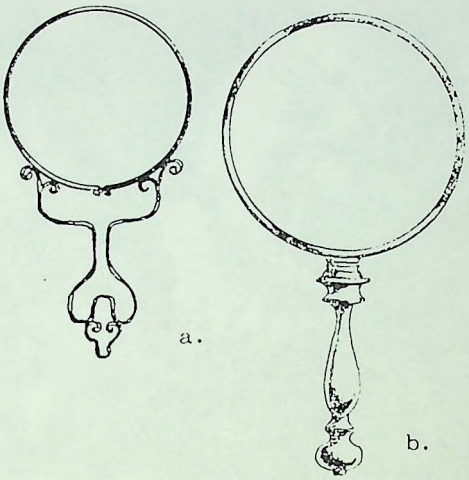


Fig No. 17 Gentleman with perspective glass. Early 17th century engraving by Piazetta.

Fig no. 18 1352 Italian riveted eyeglasses of horn this is the earliest type known.

Fig No. 19 The slightly flexible extension helps to clasp the glasses firmly on the nose. c 1490.

Fig no. 18

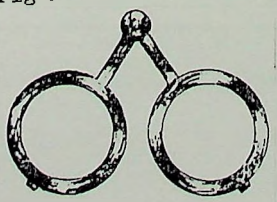
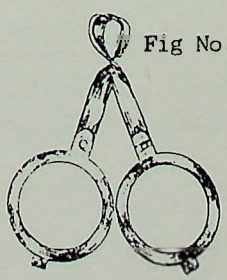


Fig No. 19



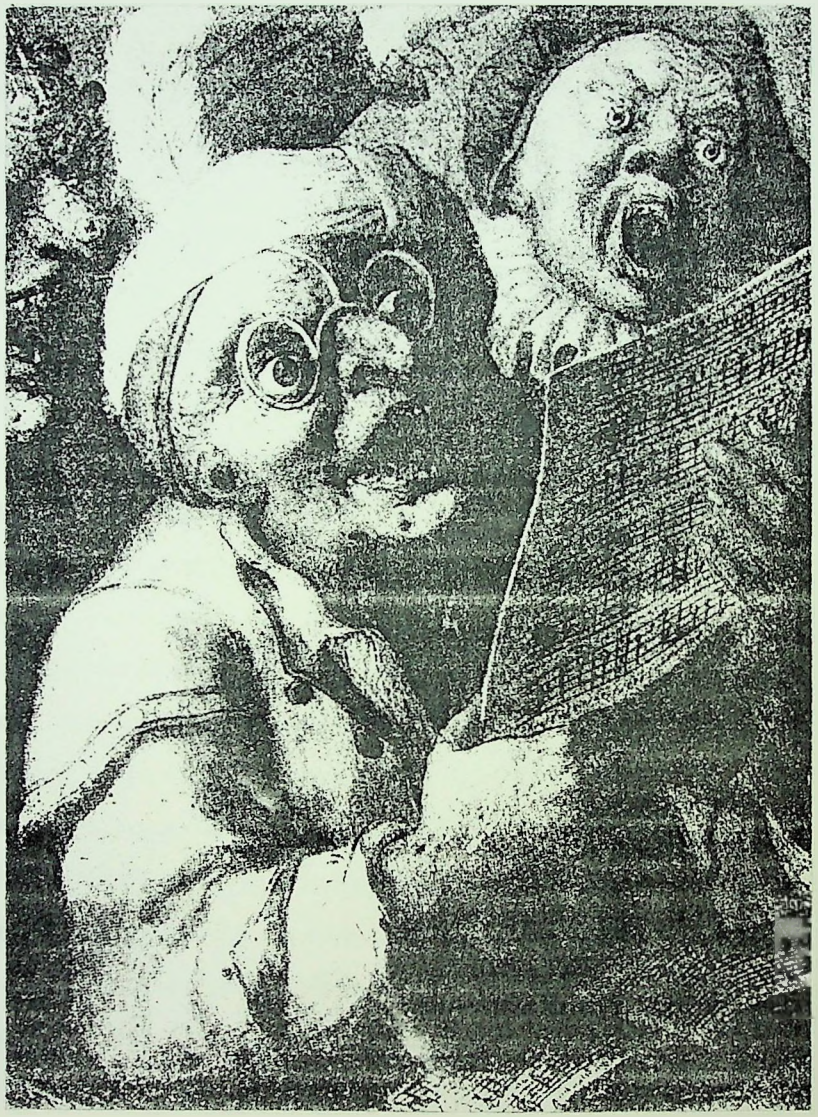


Fig No. 20 Un Trio Convaincu. Detail from an 18th century gouache showing spectacles with frontal bow.

Fig. 19. However many of these early attempts were unsuccessful. Another endeavour at solving this problem involved suspending the spectacles from a hook on a cap or with the aid of a vertical extension over the forehead (Fig. 20 + 21). The frames on these early spectacles were made from quite a variety of materials including brass, iron, leather, bone, gold, horn, nickel and silver.

Up until the 16th century lenses were always circular but the invention of convex lenses in the 16th century prompted the production of oval lenses from the need to look over the lenses to see objects in the distance.

The invention of printing and of concave lenses both combined to greatly increase the demand for eyewear. The use of eyewear was no longer confined to the rich and well educated and as an inevitable result class distinctions arose between styles. In general the lower classes wore spectacles and the upper classes wore eyeglasses. Increased use also increased the urgency of finding some efficient means of attaching spectacles to allow continuous wear.

The earliest examples of these date from the 16th century and can be seen in Fig. 22. The lenses in these spectacles are set in leather or horn with leather straps attached, which were tied around the head. Another slightly later method of attachment was through the use of loops which fitted around the ears (Fig. 23). This was regarded as most unsightly in most European countries and was only used in Spain where tastes were not affected by the rest of Europe and to some extent in Italy. This method of attachment was introduced to China by the Spanish, and the Chinese too found it acceptable and came up with

Fig No. 21 Anna Dorothea Therbusch. Self portrait c 1780.

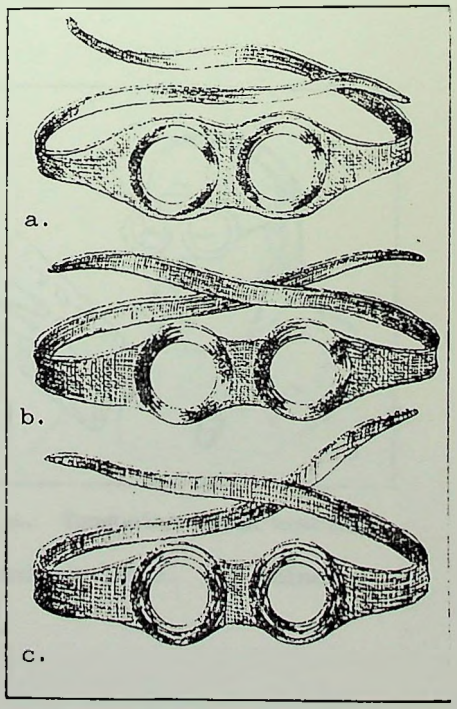


Fig No. 22

a. 1583 German (Dresden) leather and horn.

b. c 1600 German. Leather. From a manuscript in Nurnberg.

c. c 1600 German. Leather. From a manuscript in Nurnberg.

Fig No. 23 Girolamo Cappavaccio, Paduan professor of philosophy and medicine. Engraving after a painting by J. Rouyer c 1580.

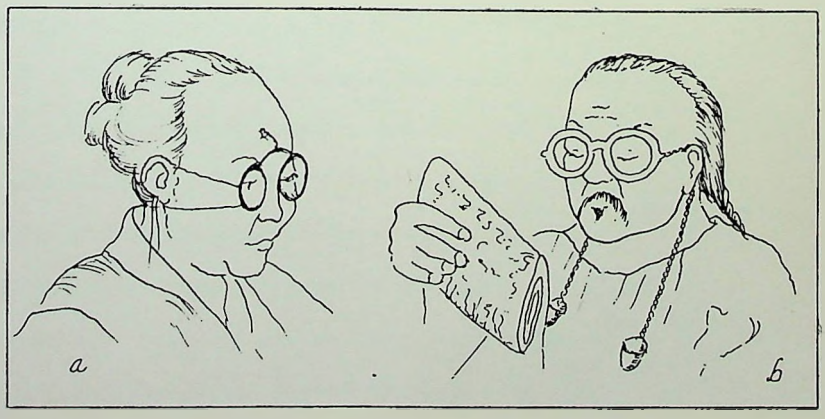


Fig No. 24 Chinese eyeglasses a. Tungusian woman wearing spectacles with forehead rests and ear loops. b. Chinese eyeglasses with weighted chords.

their own variations based on this method (Fig. 24).

The 17th century saw the first real attempts at numbering lenses and making rules on their selection. Up until this point glasses were either selected by he customer or they were prescribed according to the age of the patient. In choosing glasses people tended to pick the lenses which gave greatest magnification, rather than the lenses which brought their sight back to normal. The adoption of eyeglasses over spectacles by the rich and fashionable persisted and ensured that spectacles were unfashionable until the 20th century. However their practical value was appreciated and they were worn in private by the upper classes as well as the lower classes. This private use of a utilitarian nature, ensured some development in the design of spectacles.

The 18th century saw another practical development in the attachment of spectacles. Nearly 350 years after the invention of spectacles, what were known as temple spectacles were invented by Edward Scarlett, a London optician between 1727 and 1730 (Fig. 25 - 28). These temple spectacles were the first spectacles to approach the modern typeform and differed only in the fact that, instead of turning down behind the ears, they relied on pressing against the side of the head in order to remain firmly in place. The present typeform did not evolve fully until the 20th century. However some isolated early examples can be found which attached themselves behind the ears (Fig. 29).

The construction of temple spectacles consisted of round lenses in metal frames and hinged side pieces terminating in large rings, which pressed against the side of the head. One of the advantages of these spectacles, was that they allowed the

Fig No. 25 Daniel Chodoweicki (1726 -1801) with temple spectacles.

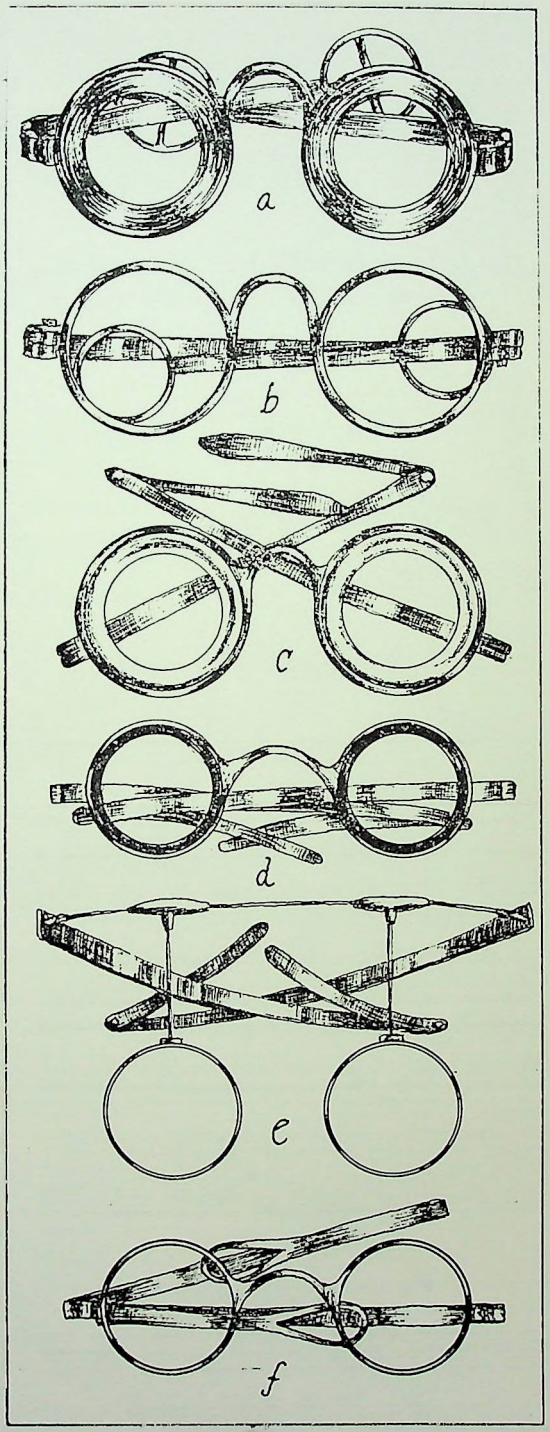


Fig No. 26 a. iron frames with inner rims of horn. The wheel like ends of the temples pressed against the head to hold the frames in place.

b. c 1750. Steel frames with short temples and C - shaped nose piece. (Science Museum London)

c. c 1770. Iron frames with inner frames of wood. Turnpin temples. (Science Museum London)

d. 1770, English. Benjamin Martin's visual glasses. Steel frames with turnpin temples. (Science Museum London)

e. 1797, English. Dudley Adam's patent spectacles, 'designed to relieve the temples and nose from pressure and also to provide several adjustments to the lens holders.' (Science Museum London)

f. Silver frames with folding side pieces.

Fig No. 28 a. Steel frames with inner rims of horn.

b. c 1790, English. Frames of heavy steel.

c. Steel frames with inner rims horn.

d. Steel frames with inner rims horn.

e. Swedish. Steel frames manufactured 1790-1825 in Stockholm. (Nordiska Museet Stockholm)

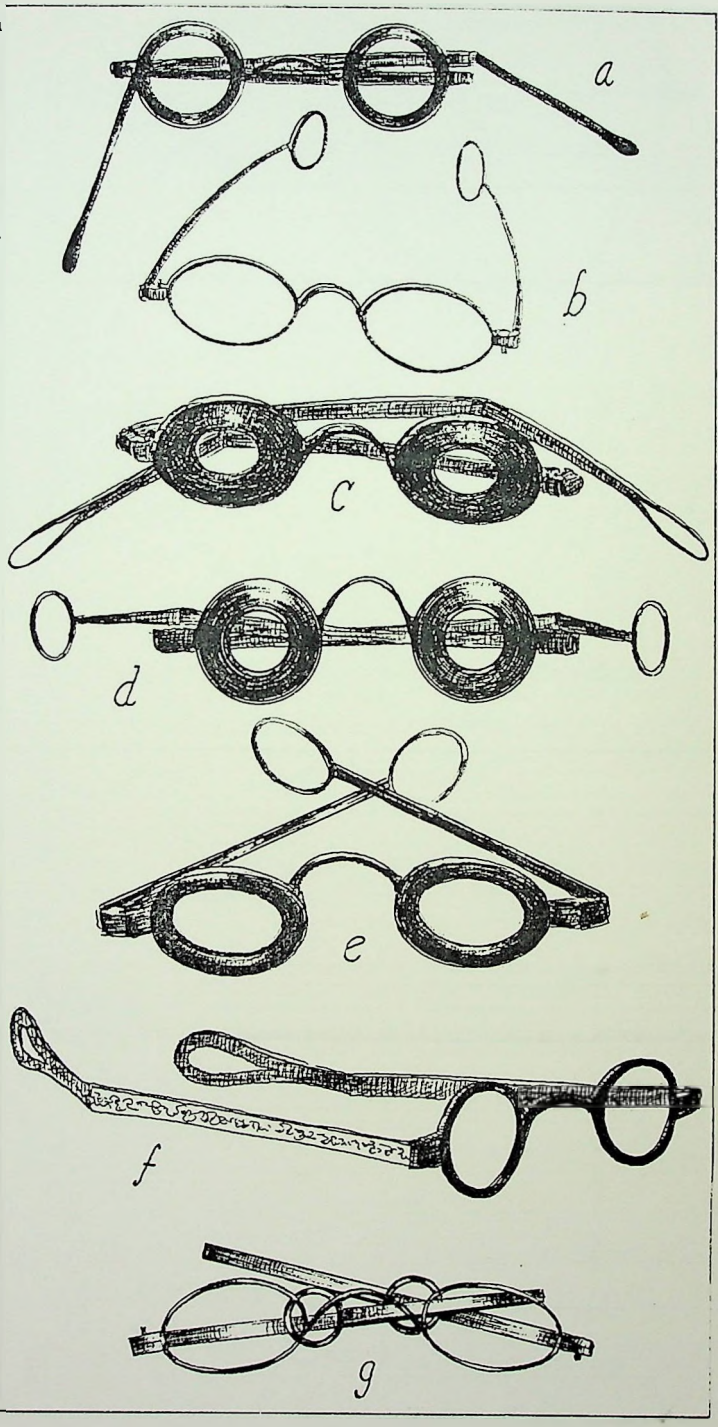
f. American. Worn by George Washington at his inauguration.

g. c 1775, American. (New York HIstorical Society)

Fig No. 29 a. 1895 probably French. Nickel. W-shaped nosepiece. (Nordiska Museet Stockholm)

b. 1857 Taken to Utah from England (Pioneer Museum Salt Lake City)

c. French, steel rims, X-nosepiece. (Nordiska Museet Stockholm)



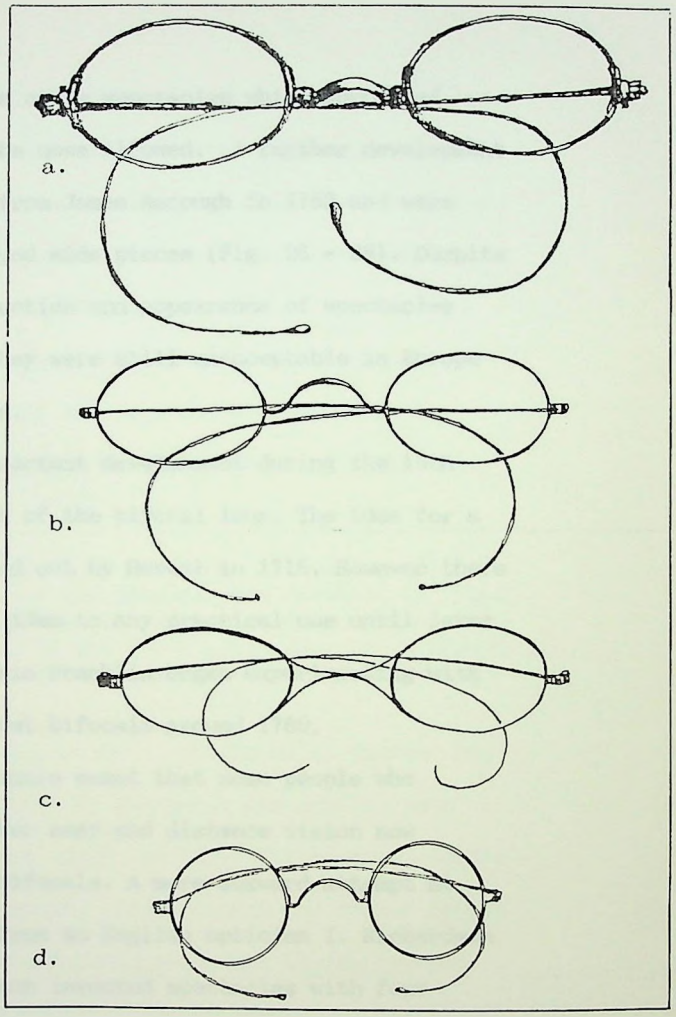


Fig No. 29 a. 1895 probably French. Nickel. W-shaped nosepiece. (Nordiska Museet Stockholm)

b. 1857 Taken to Utah from England (Pioneer Museum Salt Lake City)

c. French, steel rims, X-nosepiece. (Nordiska Museet Stockholm)

d. 1895, American. bicycle and driving spectacles.

user to breathe easier than other spectacles which supported themselves completely on the nose allowed. A further development in temple spectacles came from James Ascough in 1752 and were spectacles with double hinged side pieces (Fig. 26 - 28). Despite improvements in the construction and appearance of spectacles during the 18th century, they were still unacceptable in Europe with the exception of Spain.

Yet another important development during the 18th century was the development of the bifocal lens. The idea for a split lens was first pointed out by Hertel in 1716. However there was no attempt to put this idea to any practical use until later in the century, when Benjamin Franklin began experimenting with lenses and produced the first bifocals around 1760.

Franklin's bifocals meant that some people who required different lenses for near and distance vision now required only one pair of bifocals. A more awkward attempt at solving this problem came from an English optician I. Richardson in 1797 (Fig. 30). Richardson invented spectacles with four lenses, two of which were hinged and could be swung away from the eyes. These were actually quite popular in the first half of the 19th century.

The 19th century saw a more grudging acceptance of spectacles. However men and women of fashion could not as yet afford to be seen wearing them in public. Fashion therefore did not apply much to spectacles. However there were percievable trends in the styles and construction of spectacles. At the beginning of the 19th century, large round lenses were popular. These gave way to small round lenses and later to rectangular, octagonal or oval lenses and silver was used for most frames.

Possibly one of the most unusual and novel designs in spectacles, comes from the 19th century and were entitled diaphragm spectacles (Fig. 31). There was but the smallest of holes through which to see and they were intended to correct squint. Needless to say they were not particularly popular.

In 1824 another pair of spectacles which were intended to replace the use of two separate distance and near vision spectacles was invented by Dr. Kitchener (a similar pair can be seen in Fig. 32):-

> I think the best thing would be spectacles with glasses to see in the distance and another pair fastened to them and movable through hinges. When the latter is dropped down the glasses combine and the pair is set for near ; when it is wished to see in the distance the latter are thrown up and lie on the forehead. (1)

A pair similar to Dr. Kitchener's design was invented later in the century by Bourgeois and can be seen in Fig. 33. Improvements were made on Dr. Kitchener's double spectacles in 1854 by Van Munden, who arranged the second lenses so that the release of a spring would send them flying upwards.

The first appearance of rimless spectacles was about the same time as Kitchener's double spectacles (Fig. 34). It is not certain by whom they were invented. Historian's argue as to whether Johann Friedrich Voigtlander or Waldenstein of Vienna should get credit for their invention. However by the mid 19th century they were quite popular.

The 19th century was also an extremely important era in the development of the bifocal spectacle and much of this development was owed to B.M. Hanna. Although much experimentation was done in the last twenty years of the 19th century, there were no significant achievements until after the turn of the century.

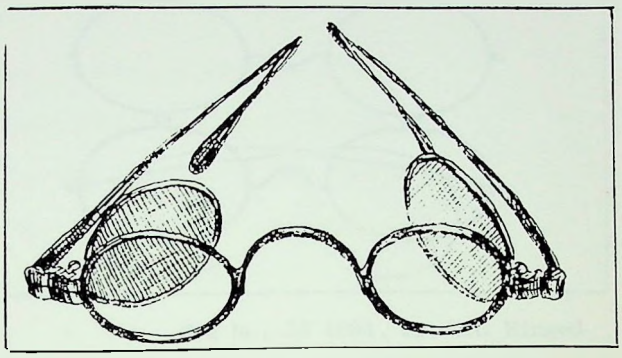


Fig No. 30 Double eyeglasses with hinged protective lenses. Manufactured in Sweden in 1860. English patent by I. Richardson 1797. (Nordiska Museet

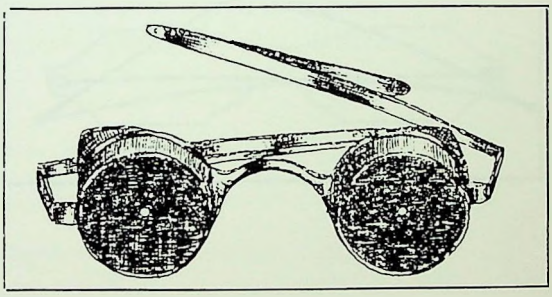


Fig No. 31 c 1800, English. Spectacles for squint. Steel frames with turnpin sides fitted with tortoise shell disks mounted in horn. (Science Museum London)

Fig No. 32 Jelderhuis, Dutch landscape painter. From a late 18th century portrait.

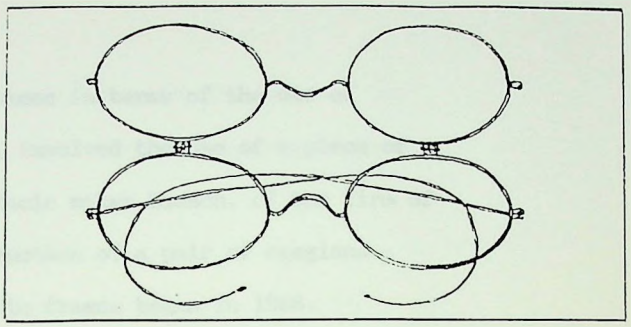


Fig No. 33 1894, French. Hinged double spectacles by Bourgeois.

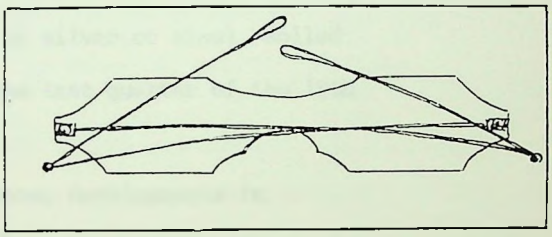


Fig No. 34 c 1825, Austrian. Early rimless spectacles made by voigtlander and son, Vienna. Turnpin sides of rolled gold. (Science Museum London)

Fig No. 35 Decorative American glasses, 1947.

One of the innovations in terms of the use of materials in the 19th century, involved the use of a piece of hard rubber, by American spectacle maker Bausch, of the firm of Bausch and Lomb, in the construction of a pair of eyeglass frames. Production of vulcanite frames began in 1866.

By the second half of the 19th century, the U.S. was the centre for much spectacle manufacture. Styles at the end of the century were for small elliptical eye-shapes and frames were of thin blue steel, with heavy rims of silver or steel. Rolled gold frames were also developed in the last quarter of the 19th century.

The 20th century saw greater developments in spectacles and eyewear in general, than their entire six - century history. It also saw the acceptance of spectacles into the world of fashion. The major factor in bringing about this acceptance was the use of the new 20th century materials ; plastic's.

At the beginning of the century there was little effort put into making spectacles less offensive in appearance, but there were great technical advances made, particularly in the field of bifocals. In 1908 John L. Borsch Jr. was granted a patent on a fused bifocal lens which overcame many of the problems associated with cemented bifocals.

Not until the 1920's was much thought given to the form of spectacles and giving them an improved appearance. However in the 1920's some of the great fashion designers in France and America began to consider the question of spectacles and made attempts at giving them a more acceptable appearance. There resulted from their endeavours an increase in sales and in

the level of satisfaction spectacle wearer's expressed on the appearance of their spectacles, according to a survey conducted by the American Optical Company in 1929.

The birth of the craze for sunglasses began towards the end of the 1930's. According to Popular Science Monthly of July 1939 ;-

> the craze for gaily coloured sunglasses that swept across the country last year and is booming again with even greater fervour as summer comes on again, has revived to full capacity one of the most remarkable and least known branches of the glass making industry. Although tens of thousands of the familiar 'smoked' and amber glasses, for beach and sporting wear, had been made and sold regularly each year, the new fad sent the demand skyrocketing to millions, while lens glass of half a dozen new tints and colours had to be created almost overnight. (2)

Just as the 1930's saw the growth in demand for both the quantity and the range of coloured lenses, the 1940's saw an increase in the range of spectacle frames available. The shapes of many of these spectacle frames were unusual as were the colours (Fig. 35). Business Week attributed the changes in lens' shapes to the;-

> teenage rebellion to the against the solemn, round owl-eyed type of hornrims'. The most popular innovation was the harlequin shape, a long lens with the upper and outer end slightly lifted. Since the note it added was decidedly cheerful, present designs are modifications of the harlequin. (3)

The summer of 1948 saw the introduction of mirrored sunglasses. These glasses completely obscured the eyes that lay behind them and were perfect for hiding behind. Mirrored sunglasses are still in use but their popularity is susceptible to fads.

The fashion during the 1960's was for sturdy, heavy, dark frames, particularly for men. However many wearers found these too sophisticated and intellectual and the most popular spectacles were those with plastic or aluminium temples and

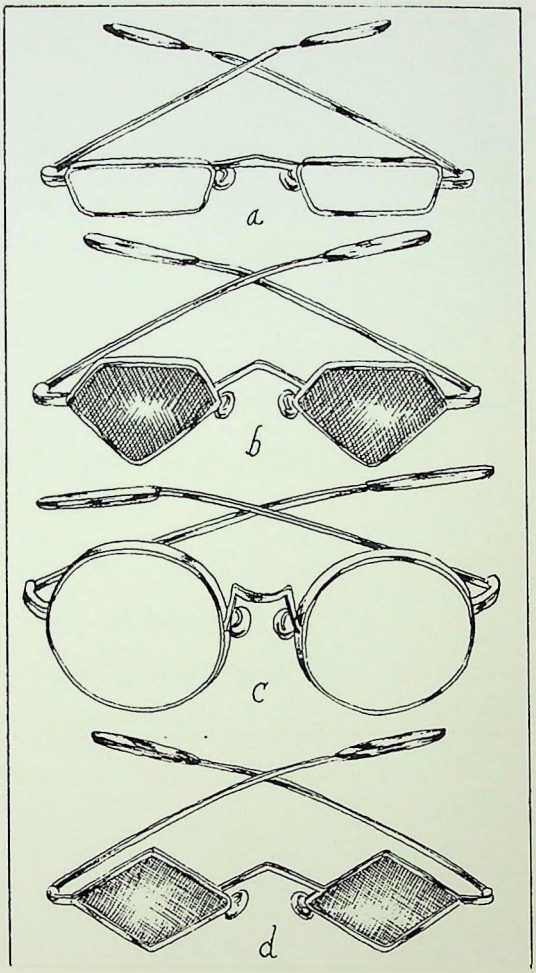


Fig No. 36 a-d. Granny glasses. Sunglasses available in a variety of colours - pink, yellow, blue, green, grey, brown. Metal frames. Less expensive models available in frames of coloured plastic.

rolled gold eyepieces.

As an inevitable result of the demand for new designs, the designers turned back in time and revived some old styles in contemporary materials (Fig. 36). The wheel of fashion had come full circle.

1. Richard Corson. Fashion in eyeglasses. 1980. p.128
2. Ibid. p.225
3. Ibid. p.229

CHAPTER FIVE

CONTACT LENSES - THE ALTERNATIVE

Any discussion of devices used in the correction of optical error would be incomplete without reference to the role of contact lenses. Contact lenses are ideal for those in need of corrective optical treatment who find the wearing of spectacles intolerable, either on the grounds of comfort or appearance. The original concept for contact lenses has, as with many other contemporary inventions, been credited to Leonardo Da Vinci. He is said to have stumbled on the idea on one occasion when he had his head stuck in a bath of water and noticed that he could see better. He then spent much time in efforts to devise ways of sticking small transparent buckets of water onto his eyes.

The basic optical principals involved in the design of a contact lens were worked out by Sir John Herschel, Astronomer Royal in 1845 but it was not until 42 years later that the first contact lens was made. This contact lens was made to protect a damaged eye rather than to aid vision and was made by the German artificial eye maker F.E. Muller. It was just a year later in 1888 that the first contact lenses designed to correct the visual defect, were made by a Swiss, Dr. Fick and another German, August Muller almost simultaneously. These early lenses were extremely painful and could be tolerated for no more than twenty to thirty minutes at a time, even when Cocaine was used to deaden the pain.

Contact lenses provide better optical correction than glasses in several ways. Firstly, they fit in a more natural

way resting directly on the tear layer of the eye to create a uniform optical system, rather like the natural tear layer - cornea - lens system with which we are all born. Glasses, because of the distance between them and the eye, produce a kind of triple optical system involving the lens, air, and the optics of the eye itself. In the case of shortsighted individuals, the triple optical system of glasses makes the object look smaller, implying distance since the further away the object is, the smaller it looks. Whether this reduction in size is caused by the distance from the eye, or the distortions of the glasses, the effect is the same : that of making the object appear distant. The reducing power of concave lenses effects the size of objects viewed from both sides of the glasses, so that the eye's of the wearers of glasses appear smaller to those looking at the wearer. Contact lenses have the advantage that they do not alter the size of objects from either aspect of view.

Another advantage of contact lenses is that they allow normal peripheral vision, whereas the frames of glasses can obstruct vision at the side. In addition to this many spectacles correct the wearer's vision only when objects are viewed through the optical centre of the lenses. If they look through an area towards the edge of the lens, their vision is impaired by prismatic distortion. It is for this reason that people who wear glasses must often move their heads in order to perceive clearly, objects which are not straight in front of them. Contact lens wearers can rotate their eyes in the normal way and see clearly in all directions. The central optical zone of contact lenses is proportionally only slightly larger, but it remains in front of the pupil at all times.

Contact lenses are excellent in the correction of astigmatism. The contact fits over the misshapen cornea and in effect acts as a cornea itself. Contacts correct astigmatism automatically whereas glasses require an astigmatic correction as part of their prescription. Changes in the astigmatism of the eye will necessitate a change in glasses, however with contact lenses a change is often unnecessary.

The predominant motivation for wearing contact lenses remains a cosmetic one, despite their numerous advantages over glasses. The choice of contact lenses over spectacles is seen as merely vanity and a costly indulgence. This view is especially unfortunate for men, who could improve both their appearance and their vision with contact lenses but are reluctant to do so, as they feel it is weak to succumb to vanity.

There are several different types of contact lenses available to suit different needs, but they can be broken up into two main types. The first type are made of glass or hard plastic, usually perspex, however the use of glass in contact lenses is now very uncommon. Scleral lenses are a form of hard lens which fit onto the white of the eye so that the optical part of the lens straddles but does not actually touch the cornea. Scleral lenses are the form of contact lens which was first used, however today they are used only in special applications where there is a risk of smaller lenses falling out, or in covering a disfigured eye. Corneal hard lenses are yet another form and these vary in size between 6mm and 12mm in diameter. These lenses cover only the cornea of the eye and are held in place by the surface tension of the tear layer. Such lenses last an average of seven years with reasonable care and are comparatively

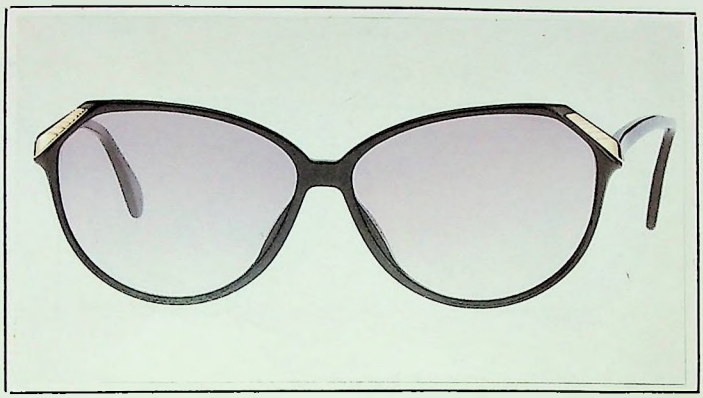
easy to take care of. They are intended for full time or regular wear, despite the fact that they do require a period for adaptation. Hard lenses generally give the best vision but there are problems associated with them, such as that of particles of dust floating underneath the lens, to become lodged and irritate the cornea. They can also become decentred.

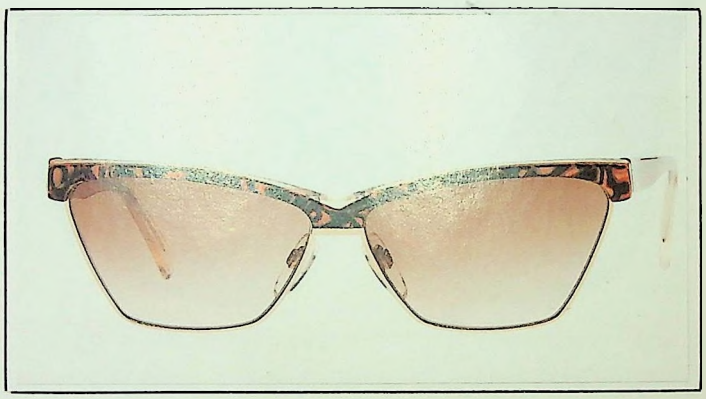
The second type of contact lens is made from a soft plastic which is capable of absorbing water and which has the consistency of a firm gelatine. In general, soft lenses tend to be larger than hard lenses and there are few people who cannot be fitted with a pair. The advantages soft lenses have over hard lenses is that they are more immediately comfortable, they are less likely to become decentred and are less prone to difficulties involving foreign bodies ; due to the fact that a larger area of the eye is covered and also because the flexible edge of the lens tends to adhere more closely to the tear layer. One of the disadvantages of soft contact lenses is that they are malleable and a slight bending occurs when one blinks. This bending can lead to a slight amount of optical distortion.

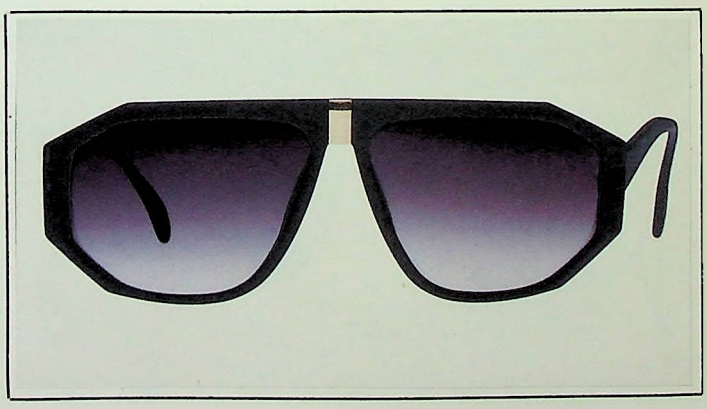
The role of the contact lens in optical medicine has only just begun and once the public has come to accept the advantages offered by contact lenses in optical, as well as cosmetic terms, their role is likely to increase.

Indeed this is a trend which has already begun according to Euromonitor - the Optical Goods Report which showed that the volume sales of contact lenses as a percentage of both contact lenses and spectacles, increased from 4.2% to 4.3% from 1984 to 1985 and which they forecast would increase to 5% by 1988.

Innovations are still being made in the area of contact lenses. One of the most recent innovations, introduced in 1988, was that of disposable contact lenses which are removed weekly and thrown away. This innovation does away with the need for the users involvement with fiddly cleaners and solutions and makes contact lenses more user friendly. This innovation will undoubtedly increase public acceptance of contact lenses.







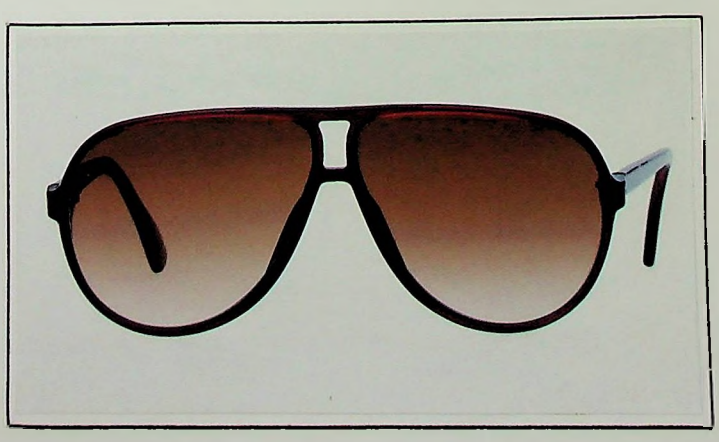


Plate.1 Sunglasses.

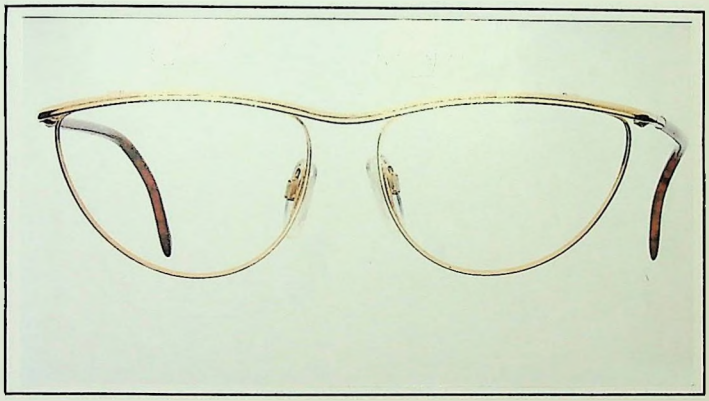


Plate .2 Ladies Metal Frames,

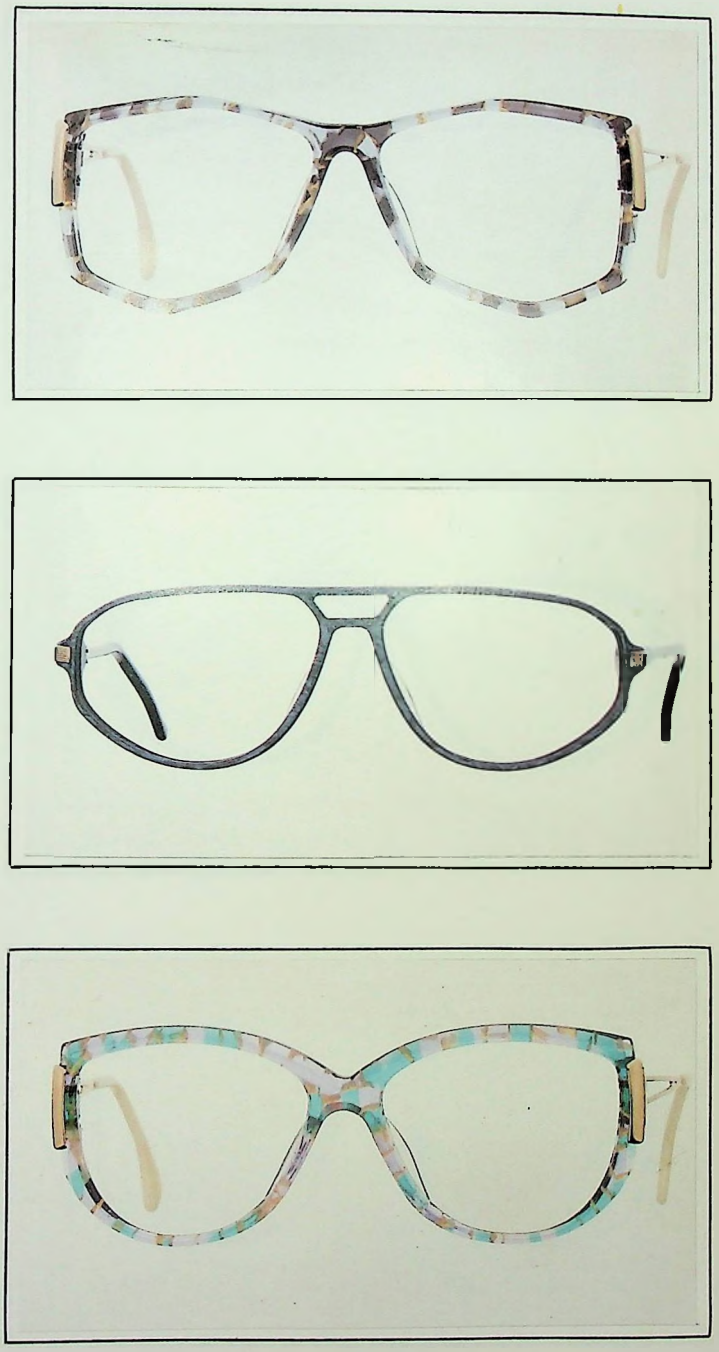
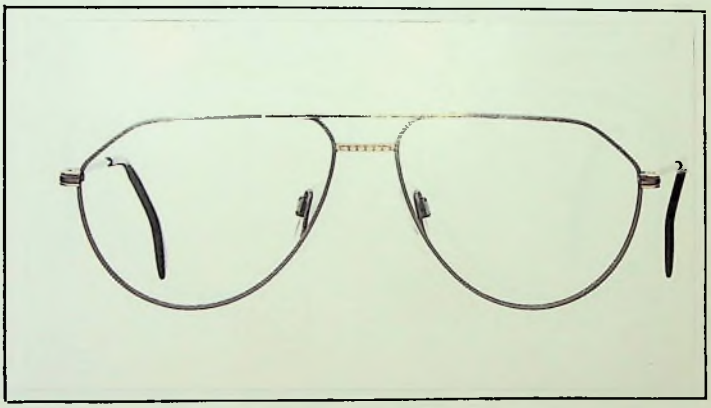


Plate.3 Ladies Acetate Frames.



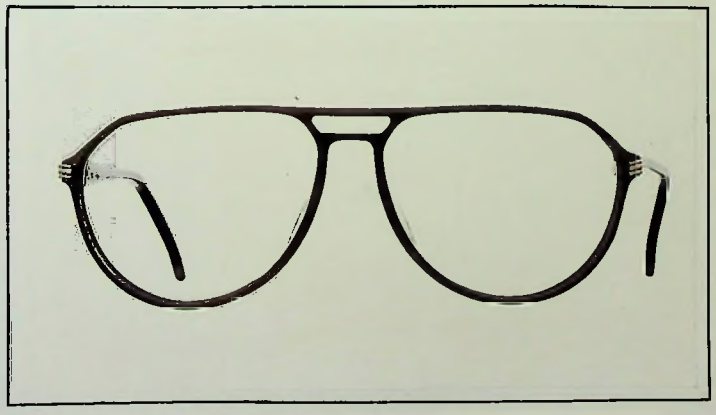
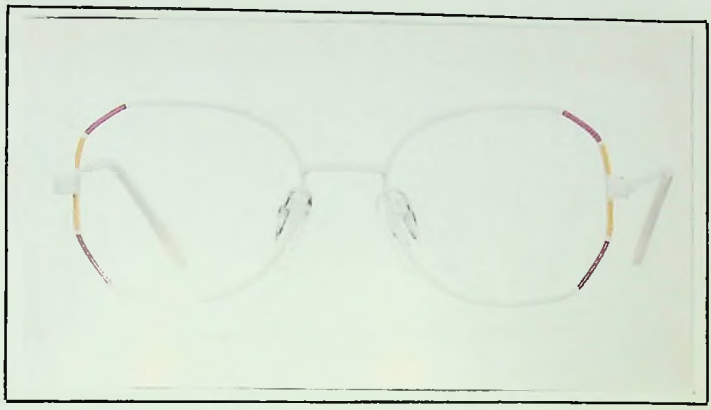
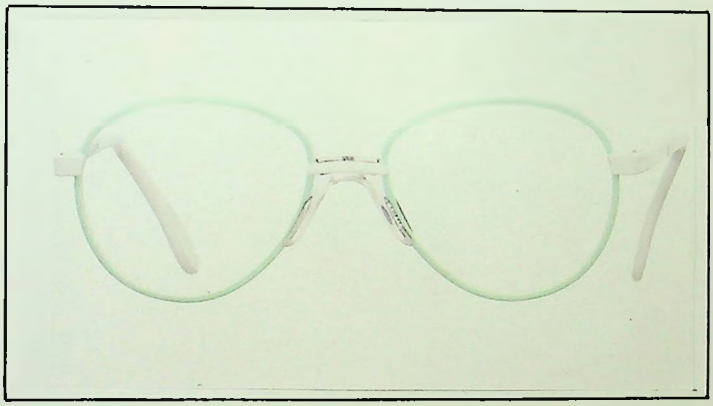


Plate 4. Mens Metal + Acetate Frames.





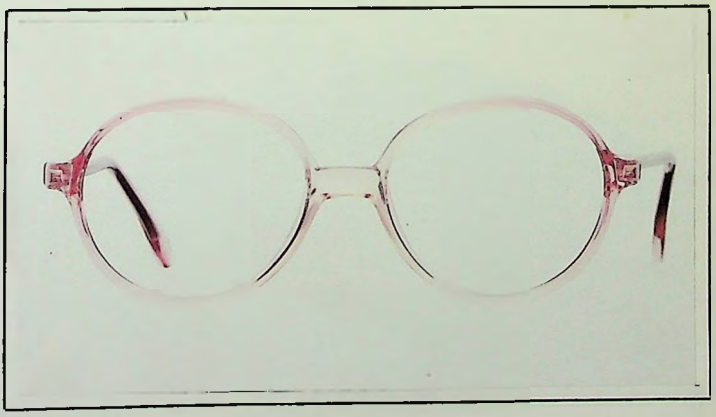


Plate.5 Childrens Frames.

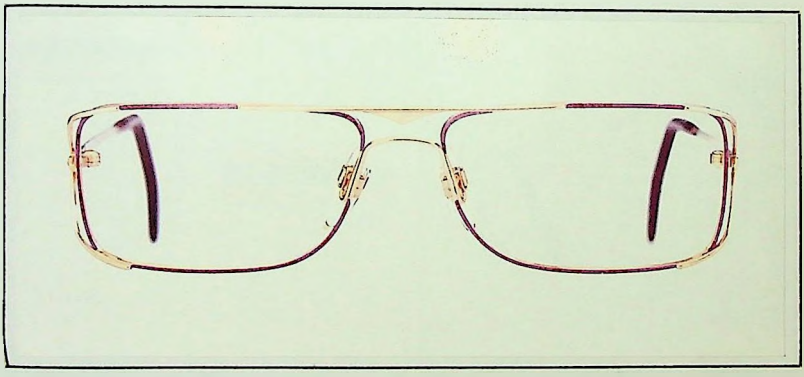
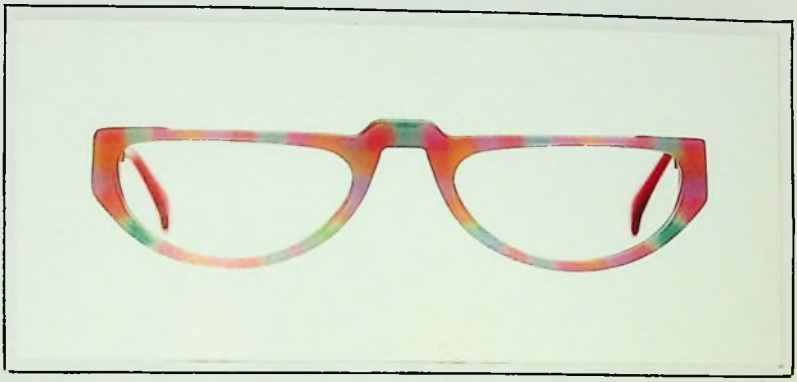


Plate 6. CIAO Fashion Frames.



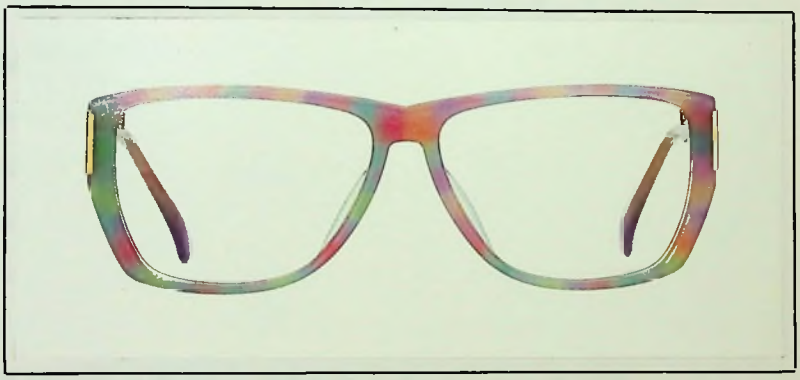


Plate 7. ATRIO Fashion Frames.

CONCLUSION

This dissertation has been concerned with the role and impact of spectacles on man. Beginning with a discussion of the human face and its importance to our psyche and moving on to discuss the implications of wearing spectacles for both wearers and non-wearers. Some of the myths surrounding spectacles are mentioned and attempts made at seeking their origin.

To demonstrate much of what is mentioned in Chapter One and also to show the power of the image of spectacles, reference has been made in Chapter Two, to celebrities, actors and other famous personalities who have worn spectacles. Chapter Two also mentions how the image given by spectacles is not always definite and that the image varies from spectacle to spectacle and from wearer to wearer. In this Chapter reaffirmation is made of the ambiguous nature of the relationship between spectacles and their wearers by reference to sunglasses.

The history of vision technology begins with the Greeks, but does not become applicable to spectacles or eyewear until the end of the 13th century. Explanation is made to how the progress and development of the spectacle has been influenced by the technologies and sciences of printing, astronomy and biology. The major problems experienced in the development of the industry as well as their solutions are referred to, along with mention of any important discoveries or landmarks in the history of eyewear.

In discussing the history of the fashion of eyewear it was necessary to confine the chapter to a discussion of spectacle fashion only. The subject of the fashion of eyewear is

to broad to be concerned with in a dissertation of this nature. It was shown how the style of the spectacle changed throughout the centuries and how and how its role remained of a purely utilitarian nature up until the 20th century when it entered into the fashion world. Spectacles are now quite firmly established as fashion accessories.

Chapter Five is a discussion of contact lenses as an alternative to spectacles. They have already made a substantial impact on the industry and as their development proceeds their role is likely to increase. Increased use of contact lenses is likely to occur as a result of a reduction in their cost as well as an increased awareness of their advantages over spectacles. Euromonitor - the Optical Goods Report, in 1985 reported on the continued expansion in the demand for contact lenses and states that among opticians:-

> formerly contact lenses were disliked as offering lower net margins than spectacle dispensing because of the increased labour involved in fitting and aftercare. The other side of the coin is that developments are making contact lenses more attractive to customers.

This report also mentions the prospect of growth in the field of extended wear lenses and tinted lenses and also in disposable 'blister pack' lenses. Although there is much market development to be done on the latter.

The spectacle industry is likely to suffer as a result of this changeover to contact lenses, but the industry will remain a sizeable one. Their role however is likely to become far more fashion orientated than at present and the more utilitarian designs likely to decrease in popularity. Spectacles are likely to become dependent on fickle fashion and it may be up to designers and advertisers to determine the type and extent of their market.

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