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**WATERFORD CRYSTAL:
PIONEERING THE FUTURE OF
CRAFTSMANSHIP IN IRELAND**

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INTRODUCTION

This thesis has arisen from my involvement with Waterford Crystal during the summer of 1995. I worked with them after winning a competition to design glassware with a "Riverdance" theme. As I worked there I was introduced to equipment and machinery I had not had the opportunity of using before. Through the use of this equipment I became interested in machine-made glass and its relationship with hand-made glass at Waterford Crystal. This thesis will attempt to debate the argument for and against the aforesaid.

In the first chapter I will suggest why Waterford Crystal is held in such high esteem all over the world. Discussing their reputation for quality hand-made crystal, I will go into some detail about the history of glass in Ireland, and the history of cut crystal in Waterford. I will discuss the history of the modern Crystal factory in Kilbarry, Waterford, investigating how Waterford Crystal got to be the success it is today.

The second chapter will examine the evolution of mass-production from the industrial revolution, explaining its effect on design and technology. Examining the role art played in the industrial revolution and in mass-production, I will then consider mass-production in the glass industry, examining the developments in machinery for blowing, sculpting, cutting and engraving glass from the past and present. I will analyse the advantages and disadvantages of the various equipment that has been tried and tested throughout the years at Waterford Crystal. Examining the methods that have improved the steady flow of glass in the production line, I will look at future developments in the glass industry, and how machines will be taking over some of the manual jobs. I will also compare the differences between hand-made and machine-made glass. I will give reference to an interview I conducted with Myroslav Havel

(one of the original designers at Waterford Crystal), throughout the course of this chapter, giving some of his opinions on machinery and mass-production.

The final chapter will focus on art glass in relation to the glass industry. What relation has art to industrial design? The connection artists have had with industry in other countries and in this country will be explored. This chapter will investigate, what Waterford Crystal is attempting to do to narrow the gap between art glass and the industry. I will finally, look at the future for Waterford Crystal and glass art.

CHAPTER ONE

WATERFORD CRYSTAL: PRESTIGE AND HISTORY

The world came only to speak of Waterford when the desire was to speak of beautiful things fashioned out of glass. Yet it is true that some people use a small "w" for Waterford, in this conjunction, just as one writes of a french window: the forgotten city supplying no more than an adjective for the dictionary of the discerning collector, and others not so discriminative. In a way it would be rewarding for Waterford people to realise that one of their industries became once so great and so universally acknowledged that it gave the world a new word.¹

There are few households in Ireland that do not have at least one piece of Irish crystal in use or on display. Even the most modest of homes has a trousseau piece of a vase or a bowl prominently displayed on a sideboard. My house was no exception. I remember my naivety as a child, being aware of some sort of aura that the crystal had, imagining that it must have been made from real diamonds! Although my appraisal was a bit far fetched. Waterford Crystal is often mentioned alongside elite brand names such as Yves Saint Laurent and Rolls Royce.

Waterford Crystal's reputation for quality has been echoed all over the world, from Australia, where their chandeliers embellish the ceilings of the Houses of Parliament in Queensland and Victoria (see Fig i), to America where souvenirs have been specially hand-made and donated to several Presidents in Washington over the years (see Fig ii). Closer to home, Harrods of London, in the past, commissioned Waterford to make the largest crystal fountain in the world. Westminster Abbey received 16 chandeliers that were commissioned by the Guinness family to commemorate their 900th anniversary.



Fig 1: Examples of chandeliers. Top left: Old Waterford Chandelier, City Hall, Waterford. Top right: Showroom at Kilbarry plant. Bottom: Members room at the City Hall, Dublin.

Many great sporting trophies, especially for golf and tennis, have been made at Waterford Crystal. One very special trophy was made when I was there this Summer, the Hockenheim German Grand Prix trophy. It was specially designed and hand sculpted by Fred Curtis (the head of sculpture). He designed a Pegasus flying over rocks. The piece was carved from a block of glass using cutting wheels and additional equipment which he invented himself. It was a very skilful job one small slip of the hand and it could have all gone drastically wrong.

Such is the perfection at Waterford Crystal that each piece is checked and double checked at quality control before it will be boxed for selling. Flaws, such as cord in the glass (almost invisible threads of overlapping) are undesirable, and will be covered up, if possible, by disguising them when applying the cut pattern over them. If the cords are still visible the piece will be disposed of. Other defects such as dirt or furnace brick encased in the glass are deemed useless, and will be used for practising samples on, or thrown out. There are no seconds at Waterford.

Over the years Waterford Crystal have updated their equipment to try to reduce the high amount of wastages that occur from using their unique compound of 33% lead oxide crystal, more than half the mixture is white silica sand, and the rest is made up with potash and cullet (broken glass). Other crystal companies found this compound very difficult to work with and have reduced the amount of lead to 24%. Significantly, none have a sparkle that compares with Waterford Crystal.



Fig ii: President John F. Kennedy being presented with a Waterford Crystal bowl, by the Lord Mayor of Dublin Ben Briscoe, in 1961.

Although glass making was first discovered accidentally by the Egyptians when lighting fires on the sand, it was not until many years later that the Romans invented the art of glass-blowing. Centuries later it was the Italians who were in the vanguard of glass making in Venice. They have passed their skills on through the generations, who in turn have passed it on to craftsmen in other countries

In Ireland, archaeologists have discovered pieces of millifiori (thousand flowers) glass dating back as far as the 6th Century A.D. It is thought that these pieces must have originated in Italy. The famous Tara Brooch and the Ardagh Chalice both have good examples of glass inlay.

When the Normans came to Ireland they made glass making a business rather than an art; their methods and skills spread extensively throughout Ireland. The earliest record of a glass maker in Ireland dates back to 1258 to a William the Glass maker, in the Dublin Journal of this time, unfortunately there are no examples of his glass remaining.

For three centuries glass appears to have been more or less dormant in Ireland. Then late in the 15th Century, an Englishman called George Longe set up a glass house in Dungarvan, Waterford, called Curryglass. This is the first known glass house in Waterford. Waterford Crystal continue to have a subsidiary factory near there today. Again, no glass has survived from this period.

In 1615 an act forbidding the use of wood in glass furnaces was imposed in England. Although the act was not decreed in Ireland until 1642, it did impede the growth of the glass industry there for

many years. There were a number of Englishmen who worked in Ireland at this time, but they were not registered on any documents. The first Irishman to start a glass business was mentioned in the Dublin Journal of 1729. His name was John Head Esqr, he was from Waterford and managed a glass house which made flint glass. The factory, situated at Gurteens, survived for eight years until his death in 1736, the factory dying with him.

By this time the English parliament had heard of factories opening up again in Ireland, and were perturbed by the possibility of Irish glass becoming more popular than their own glassware. They consequently set up a new Excise Act:

. . . No glass of any kind, except glass of Great Britain, be imported into Ireland . . . No glass of any kind is to be exported from Ireland under a penalty of 10 Shillings for every pound so exported.²

Ireland, having a poor economy, did not have the domestic market for the luxury of high-class glass. So again glass making slept for a number of years.

A parliament action in 1780 opened up new opportunities for business in Ireland. In 1783, the Anglo-Irish family of, George and William Penrose started a new appreciation for cut crystal by opening up a cut glass crystal factory at number 7 Anne Street, Waterford. It is rumoured that the glass made here was the old cut flint glass that has been found all over England and Ireland to this day.

The factory employed 50-60 workers who made fine quality, useful and ornamental glass (see Figs iii-vi), as good as any in Europe from



Fig iii: Four goblets, Waterford, about 1830.

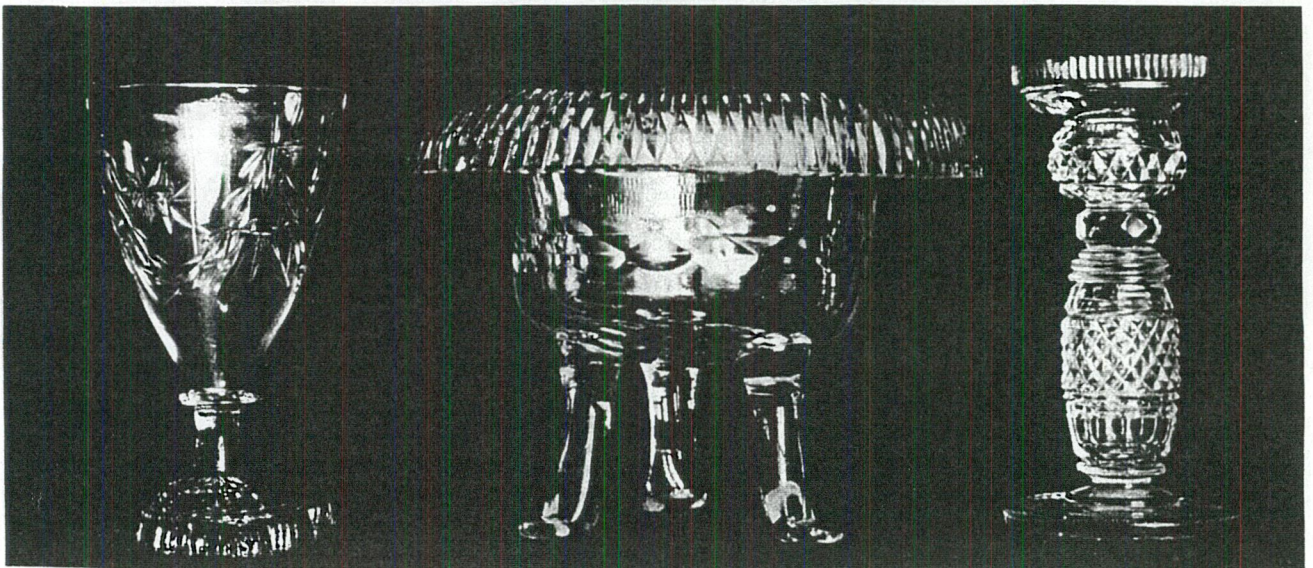


Fig iv: Goblet, early 19th century, tripod bowl, late 18th century, and candlestick, about 1820, all probably Waterford, collection of the National Museum.

that time. The Dublin Chronicle of August 21, 1783 mentioned that the Penroses had sent over a "service of glass" to Milford in England for "their Majesties to use, and, by their orders forwarded it to Cheltenham, where it has been much admired and does great credit to the manufacturers of this country."³

After William Penrose's death in 1796, the business was carried on by the family. Then in 1799, they sold to a partnership: Ramsey, Gatchell and Barcroft. This cooperative carried on managing the factory together for a further eleven years until the partnership disintegrated. The Gatchell family bought over the shares and continued running the business through several generations.

By 1826 they had introduced steam engines to drive the cutting wheels. This improved production immensely, and they went on to make everything from cut glass chandeliers and candelabra to goblets and butter dishes. It is reputed that when tapped, their crystal had a sweeter ring than any glass of this era. It was also believed to have a much softer, warmer touch than any other; paradoxically, it was tougher and more durable.

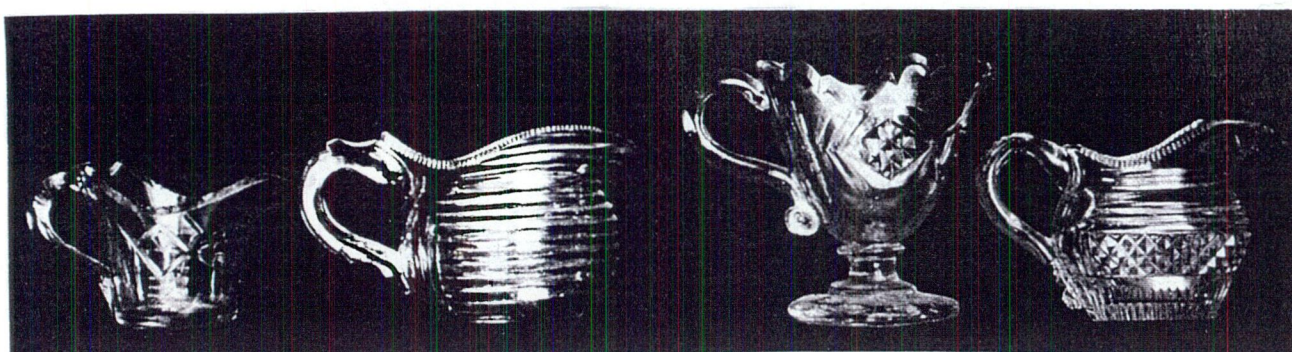
Due to lack of capital, the Waterford glass house saw its demise in 1851. The last recorded letter referring to the glassworks was from a George Saunders, (who was related to the Gatchells) dated April 18, 1857, in which he writes:

...the old glass works are yet standing and have never been taken since George Gatchell forsook his old establishment where thousands were made in times gone by ...⁴



Fig v: (above) Large cut goblet, Waterford, 1820.

Fig vi: Four cream ewers, Waterford, about 1830.



It is often mentioned that Waterford Glass in this era had a 'bluish' tint, according to Dudley Westropp, this is a myth because the: ". . . glass is much whiter than that of any other of the old Irish glass houses;" he goes further to say: "I have never seen a marked Waterford piece with the blue tint"⁵ Old flint glass was 36% lead, so if the lead was of a poor quality this could have affected the colour; as a new batch of glass was made each day this may possibly account for differences in tints of old glass. Whether it was blue, grey or clear there is no doubt that the glass from the old Waterford glass house had an immeasurable effect on the history of Irish glass. I could even go so far as to say that it was the foundation stone of the Irish glass industry we know today.

By the end of the 19th Century the glass houses in Ireland were nearly extinct. But the name lived on in places around the world where the Irish had emigrated. Especially in the United States where they regarded anything made of glass as "Waterford". The legend of the old glass house refused to die.

A wealthy Dublin jeweller and silversmith named Bernard Fitzpatrick, who was interested in old Waterford glass, had made several trips to European glass factories before the Second World War. He had met Charles Bacik who owned three factories in Czechoslovakia. They spoke of the old "Waterford" and about a revival.

When the war was over Bacik, faced with Communist takeover in Czechoslovakia, decided to emigrate to Ireland with his wife and children. With the help of Fitzpatrick, Bacik set about the establishing of a glass factory. They were originally going to set it up in Carlow, because the place in which Bacik had a factory, in

Czechoslovakia, was called Carlov, ('v' being pronounced 'w'). In the end they decided that Waterford was a more auspicious place to start a glass factory because of its background.

Myroslav Havel had worked with Bacik in one of his factories in Czechoslovakia and had proved to be a promising student, so Bacik wrote to him, requesting him to come over to teach cutting to the new Irish apprentices. Havel spent some time at The National Museum in Dublin looking at the authentic old Waterford pieces. He copied from the initial designs, and then added his own interpretation to the cuts giving them a more modern feel.

The first factory was set up in Waterford, at Ballytruckle. In 1950 they were taken over by the Irish Bottle Company in Dublin; with Joseph McGrath, Chairman, Joseph Griffin, Managing Director. Initially, the workers and Bacik did not want this take over, because they thought that they would get through the starting difficulties themselves. The merger, however, did prove to be successful, as the Bottle Company gave them the much needed financial backing.

The war had put many glass houses in Europe out of business, so they decided to employ blowers and cutters from there to teach in Waterford Crystal. Many of them were used to working on piece rate, (a rate that they would be paid for each piece that they make) and left after a short time because the pay was not as good for teaching. Havel was the only European who stayed, until his retirement in 1988, he is now approaching the age of seventy-five (see Fig vii).



Fig vii: Myroslav Havel before he retired from Waterford Crystal in 1988.

"Through the years Havel has been our chief designer. He's a genius. He can blow, sculpt, paint and engrave as well as design . . . we have some good Irish designers who have learned from him."⁶

Originally, at Ballytruckle they used blanks of bottle (soda) glass imported from Belgium, in already formed shapes, to teach the apprentices how to cut. Each apprentice was in training for eight years before he could officially become a master of his trade. This lengthy apprenticeship is still used to train new cutters in Waterford Crystal at present. Many of the cutters pick up the skill much quicker than others in this eight year period, but this ensures that they all know every type of technique to be used on every shape and size of glass.

Later, in 1951, exactly one hundred years after the initial factory closed, business started getting better and they moved to a new factory at Johnstown, still in Waterford. Then they started making their own 'crystal' (with only 24% lead). By this time it was almost entirely manned by Irish workers, who in turn were passing on the craft to the new beginners.

In July 1952, they brought their first products to sell in the United States. Some buyers complained that it could not be real "Waterford" Crystal because it did not have a 'blue' tint. Eventually, after several weeks they found a few buyers in America and Canada. It was a slow start in the States in the early years, and because of importation laws on luxuries like crystalware still held in Britain, they could not export to England. At home, in Ireland it was selling well, people had spread the good news about Waterford setting up again and were buying it for their homes and as gift items (see Fig viii).



Fig viii: The Lismore suite, one of the best selling, original design still in production at Waterford Crystal.

It was not until the 1960s that the sales started to pick up in the United States. They set up a new company in the U.S. called Waterford Glass Inc. that dealt with the marketing end of the business there. It was an American operated distributor that negotiated specifically with the American market. John Miller from Altman's N.Y. became manager, an American with Irish ancestors, he travelled across America enthusiastically dealing person to person with only the top stores of each town. Soon the orders were piling up.

Production was now the problem. The more workers they employed the more space they needed, so by 1970 they moved to a new factory at Kilbarry. Even before this factory was completed they had opened up a new plant at Dungarvan (28 miles from Waterford city). A third factory, was later opened in 1974, at Butlerstown. By this stage the expansions at Waterford Crystal had almost grown out of control, the workforce in the 1970s exceeded 2000.

The company was by now owned by share-holders, and it was managed by many different directors over the years. Each new managing director had conflicting views on how the company should be run. Some putting the craftsmen at top priority, with good pay and conditions. Other managers considered profits for the share-holders to be of more importance and in doing so, they cut down on costs and labour. Each managing director made their own contributions towards Waterford Crystal's success.

At present Waterford Crystal employ about 1700 people in total. They have three plants around the County of Waterford, that includes: the main plant at Kilbarry, in Waterford city, the Butlerstown

plant (which deals with mainly lighting-ware) just outside Waterford, and another factory at Dungarvin, approximately thirty miles outside Waterford city. It is often neglected that they also employ about another three hundred people in the United States who mostly deal with promotion work and marketing.

Waterford Crystal has once again become famous for its cut crystal and its products were being exported around the world. Many people still think that Waterford Crystal has been around for two hundred years, not realising that the factory was nonexistent for one hundred of them.

CHAPTER TWO

THE ADVENT OF MASS-PRODUCTION IN THE INDUSTRIAL REVOLUTION
AND IN THE 20TH CENTURY GLASS INDUSTRY

**But chief by numbers of industrious hands
A Nation's wealth is counted: numbers raise
Warm emulation: where that virtue dwells,
There will be traffick's seat; there will she build
Her rich emporium. Hence, ye happy swains,
With hospitality inflame your breast,
And emulation: the whole world receive,
And with their arts, their virtues, deck your isle.⁷**

When a nation starts to grow so does its industries: agriculture, manufactories, and commerce. As each expands, the quality of their produce is upgraded: ". . . which at last leads to performing works, which in poorer times, would be thought wonders."⁸ In poorer countries produce is usually limited to the arts and crafts made by individuals. Through trade and tourism much of the crafts found in foreign countries have become available world-wide. When the call for such items rises, the individual artists may then decide to acquire some help to increase their output to meet the demand. The artist must then train others in his craft. After some time the artist may have many craftsmen working for him, thus, a small industry is born.

About the middle of the 17th Century, in industry, designs made by artists were starting to come into common use. Initially designs were copied from foreign sources, but eventually it became more important to come up with original designs than it was to copy those of an adversary. To do this they employed freelance artists within the factory. The artists' designs were modified to suit production and the market.

By this stage all pieces were made using the 'division of labour'. Division of labour results in changes of the level of design and changes in the level of the manufacturing technique. Goods,

originally made by the craftsmen from start to finish, were later produced by specialists, the common labourer becoming the specialist improving his dexterity and saving time overall. Design was a specialised task of an artist, who by this stage did not do any manual work on the actual pieces. His designs, therefore, sometimes became restricted compared to the spontaneous original pieces he had once made.

The designer's inventiveness was then turned to resolving technical problems that occur in the actual make-up of the piece. After all, why should man still be labouring to make something a machine can do for him? New equipment was then invented to solve manufacture problems. A desire to be better than the competitors started the search for improved materials, techniques and standards of design. This led to the introduction of mass-production for the international market in huge factories employing a large workforce.

What was 'fashionable' sold better than items of merit. Marketing, as a business in its own right, arose from the increased scale of production. It was now necessary to employ staff who were adept at selling the many items produced. Later in the 18th Century, the person who influenced fashion was no longer the designer, but the sales person who understood what the public wanted, or were prepared to buy.

Improvements in design and craftsmanship had an effect on the division of labour, in that, better quality goods were being designed and made by the designers and craftsmen. However, this was only short-lived as they were both debased, temporarily, in the 19th

Century with the introduction of mass-production. Manufacturers started producing on an even larger scale, encouraged by simplified techniques, and competitiveness. Design was overrun by production. Increased sales led factories to aim at what the public could afford, and quality took second place. The craftsmen and designers were now turned to wage labourers, and their sense of design diminished by the division of labour. The appreciation for good design deflated when what was fashionable took over the society at all levels.

Although 19th Century art had some influence on industrial design; "there is now abundant evidence that, in the 19th Century, mass production and the new industrial processes stimulated popular art forms no less vigorous and attractive than the 'peasant art' preceding mechanisation."⁹ Thus the two (industrial design and art) influenced each other as far back as the industrial revolution.

In the 18th and 19th centuries British industrial supremacy demonstrated to the world its techniques by exporting goods, thus making Britain wealthy. In this age of iron, steel, steam and railways, machinery was becoming easier to use, even without technical training. The jobs on the machines were often tedious and exhausting, this led to constant updating of old machinery making the labourers' jobs less tiring, and to some degree less boring.

We are now in our third industrial revolution: the first depended on coal, steam, iron and railways; the second relied on petroleum, electricity, aluminium and aeroplanes; finally, the third, (still in its infancy) depends on electronics, plastics, man-made fibres and micro-chips. Improvements in mechanisation are developing so

rapidly now that what was once state-of-the-art is outdated a few years down the line. The same applies to Waterford Crystal, according to Myroslav Havel:

"This is a sad thing, but that is how progress is in this industry. It is amazing that you buy the machinery that cuts the glass and so on, and two years later it is obsolete. New machinery comes and beats that one a hundred times. Its going through every industry, a development that is so quick that you buy something today and two years later they are selling it at a bargain price because of a much better thing that covers everything."¹⁰

Problems caused in the glass making production line - blowing, cutting, engraving, polishing - stimulated the organisation of scientific research. This encouraged an urge to go beyond the best products of the past and be better again than the competitors. This often meant engineers had to invent more efficient, faster machinery keeping them up-to-date and in competition with the rival glass factories. Many glass factories in Europe have piloted investigations into new methods of working and developed new equipment to streamline the flow of glass production through the factory. When doing so they patent their ideas and sell them to other glass factories. The glass industries are making big investments in new machinery to update old methods, save on time, waste and labour.

For many centuries the making of a simple wine glass has been totally dependent on the skill of the craftsman and his team. The advent of mass produced moulded and cut glass in many countries during the 19th Century could have caused the death of this ancient craft, but fortunately this was not the case, although there may have been a decline in production. With the re-establishment of the modern factory in Waterford in 1947 . . . Ireland has once again come to the fore as a country which produces high

quality hand-blown glass whether it is cut engraved or unadorned.¹¹

Over the years Waterford Crystal have been seeking out new inventions and developments from various glass factories in other countries in order to improve their production. Each new apparatus has its own technique of cutting down on time, wastage (excess glass) and labour, in order to decrease costs.

Recently a new electric tank furnace has been installed in the Kilbarry plant. This furnace allows for a cleaner, better quality of glass, as well as lessening the amount of wastage. The apparatus has a huge tank that has a steady flow of batch (a mixture of crushed glass, lead oxide and potash), flowing into the tank through a shoot, that is constantly being melted. The machine pours an accurate amount of molten glass for the blower to gather, so he has the exact quantity to make whatever item he is assigned. Time is also saved using this process as the blower does not have to keep going back to the furnace to get more glass.

At the other end of this tank furnace, is a machine that actually makes the blanks of glass itself. Molten glass pours into the moulds and is blown into by the machine, the glass is allowed to cool a little and is then removed from the mould and is placed into a lehr (an apparatus that allows the glass to cool slowly, to avoid shattering the piece). The tank furnace is being used in many machine-made glass factories around Europe, and has recently been acquired by Waterford Crystal.

In the sculpture department at Waterford Crystal, a more efficient way of making glass animals and figures has been in use for several years, this method works in conjunction with the tank furnace.

In the past all sculptural pieces were made by carving from a block of crystal using the cutting and engraving wheels. A new development from France, using laser cut steel moulds has now been put into use. To make one of these moulds, the sculptor must first make a maquette, initially from clay, and then a copy is made in plaster. It may take several attempts to get the prototype correct. The difficulty here is that the mould has to be opened somehow. Depending on how intricate the piece is, the mould might need several openings to allow for 'under-cuts' (undercuts occur when there is an overhang, for example, a fold on a garment, or even a protruding part of the face on a statue). The plaster model is then sent to France where the steel mould is made, which is then sent back to Waterford. The mould is assembled in the blowing-room; the blower pours molten glass into the contraption, (in some instances the glass is injected upwards into the mould to prevent 'cording'), the glass is allowed to cool, then the mould is opened and the figure is removed. This way of making sculptures is a quicker, neater method, and allows for less wastage.

More accurate, cleaner more precise cuts, have come about with the use of industrial diamond wheels, as opposed to the old ceramic wheels. The diamond wheel also has its disadvantages, when it was first brought in, many of the cutters, who were not as well experienced, chipped the wheels, once the wheel is chipped it is useless, (they are very expensive to replace) and unlike the ceramic wheel, it is impossible to sharpen again. The advantages

of the diamond wheel are, however greater than the disadvantages. The diamond cuts straight away to the final cut and then is dipped three times in an acid bath to polish. The ceramic and Carborundum wheels had different grades of texture, each cut made had to go through a process from the rougher stage down to a smoother one, then it was dipped once in the acid. This has an obvious disadvantage, as, not only is it a slower process, but it also gives rise to the likelihood that there will be more mistakes made going over previous cuts.

Although Myroslav Havel pointed out the advantages of the diamond wheel to me, he still prefers the cuts made by the old method:

"At the beginning the diamond required three polishes, because they were still leaving scratches. Now once you put the glass three times in the acid, the edges of the cutting marks get softer. It spends a long time in the acid and naturally the cutting is getting blunt, . . . if I did something for myself I always did it the old way"¹²

Even though there were a few mishaps at the start, the use of the diamond wheels has enabled the cutters to speed up production quite considerably. The problem now was not the equipment, but the cutters themselves, who had to then try to meet their quota each day, and come up with a good standard of work.

"The problem with production is to maintain the standard of the product. When we reached a large number of cutters and blowers, the standard went down."¹³

According to Havel, in every factory, there are cutters of a very high standard, then there are cutters of an average standard. The latter



Fig ix: Master cutter pieces.

earn more money, because they can cut the glass faster than those of the higher standard. Glass cutters of a higher skill level are naturally proud of their work, and spend more time on each piece, which usually results in a higher quality of work than the speedier cutters. Unfortunately, the average cutters are appreciated more for their amount of work, as the talented cutters are often reprimanded for cutting so slowly. There comes a certain stage where the craftsman becomes machine-like, as he is in a continuous motion of cutting the same type of glass over and over - almost always flawlessly.

"It is a two sided thing, you know that 'quality' and 'quantity' are always two enemies. You can't have both, so one of these things must go and one must lead the way. So quality always suffers, quantity never gives way. You want the quantity and you can arrange the machinery for any quantity you want, but you can not guarantee the quality of the glass. Its as simple as that.¹⁴

In industry engineers try to invent machinery to reduce the gap between quality and quantity, to shorten the amount of time involved, and in so doing decrease costs.

Years ago Waterford Crystal bought an old machine to cut the stars on the bottom of each piece. Stars are the easiest part of a piece to cut by hand, but they can be very time consuming. If the master cutters are doing these it can be very costly. So they decided to experiment with this machine. Once the machine was set up, 500 wine glasses were attached to it, the machine cut them all at the same time. Havel remembers watching:

"It was a very complicated machine, they switched it on. In about half an hour everything was out and it was horrible to look at because the blower does not

slant the bottom (the foot) the same way - they have a flat one a slanted one etc - and the machine cuts them all in a certain way. The machine does not adjust itself to the foot, so we have some of them cut on the edges, some of them touching the middle and so on. Not one glass came out perfect when it was finished."

That machine was designed specially for machine-made pressed glass, where each piece is exactly the same. The tank furnace was not in operation at this time, so the thickness of the glass was not regulated.

"That's the problem with this machinery, if you have these cutting machines you have to give them also 100% the same glass. That's why you also have a machine to produce the glass, because no one glass blower in the world will produce the exact same pieces hand-made, it's impossible."¹⁵

Even with moulds to blow into, the pieces will always be at variance, as there will be different thickness in the glass. With wine glasses and goblets it is even more difficult as the stem and foot vary greatly according to the way in which they are applied by the different stemmers. The other problem with this particular apparatus is that the factory would have to have a huge production of 'blanks' (uncut glasses). Although, the machine may take a while to set up, it does cut around 500 pieces at the same time. In machine-made glass factories they use it for only six months of the year. The rest of the time is concentrated on making the blanks. When glasses are made this quickly they can be sold quite cheaply.

Another computerised technique, which will prove to be the most controversial yet, is being experimented with at Waterford Crystal. The PROGLAS (Fig x) is a machine that was invented in Germany and is already in use in many foreign companies at this time. Three



Fig x: Top: The PROGLAS cutting machine. Bottom left: Example of a design on the CAD system. Bottom right: Cutting tools.

dimensional designs are created on a computer screen and then registered into the memory of this glass cutting machine. According to PROGLAS, their "control system is based on the mathematical model of machining freeform surfaces."¹⁶

The system uses programs with the Computer Aided Design (CAD) system, that is already in use at Waterford Crystal at this time. The designer can draw up his three dimensional design on the CAD system, and can then view his work from any angle he chooses. At this stage it is easier to see if the design needs to be modified before it is programmed into the PROGLAS machine. Once the design is transferred into the system, the apparatus will then be assembled. Like the manual cutting machines, there are different cutting wheels which can be attached to the machine. Once the correct size and shape of wheel has been selected, it is then attached to robot-like arms inside the machine. The corresponding 'blank' of glass is then secured. The glass stays in position and the arms rotate around the piece. As the arms rotate the wheels spin and cut the glass to the exact depth and length. Once the glass has been cut in one direction, the glass turns so that it may be cut in the other direction.

The benefits of this machine are phenomenal. First, it can cut any shape or size of glass that is administered to it. Secondly, it has a memory to lock in all the traditional designs already in use in any factory - designs can, therefore, be altered to suit the customer. Thirdly, it is nearly always exact, so there is less waste. Finally, it cuts the glass quicker than manually - it can even be left on overnight (with supervision).

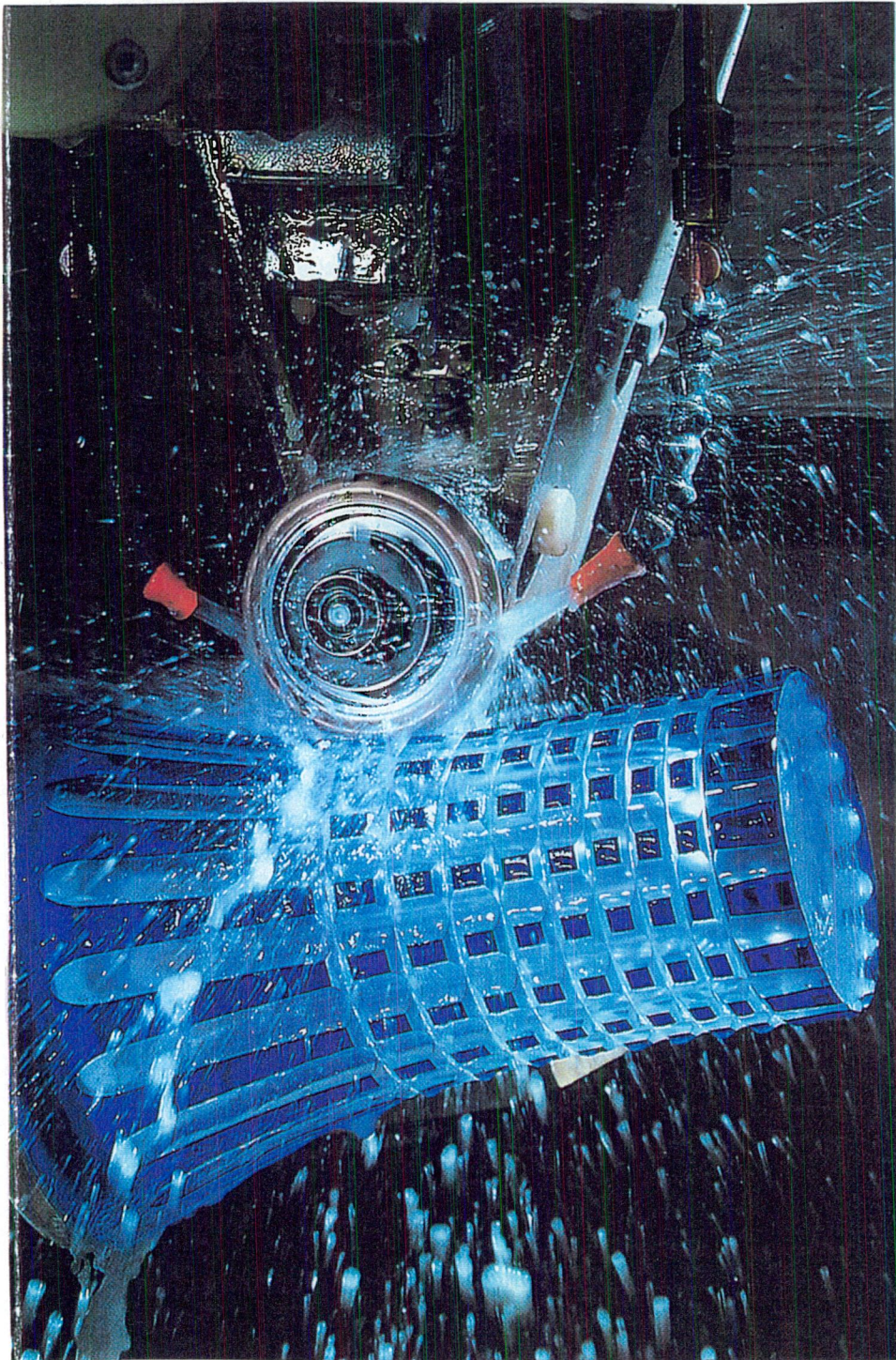


Fig xi: The PROGLAS cutting machine in action.

Up until 1960-1965, machine-made production concentrated on cheap glass. Now it is possible to achieve the same type of quality of glass, machine-made - and some times even better - than the hand cut method. In 1991 Waterford Crystal introduced the Marquis range to this country. The line has all been machine-made in Czechoslovakia and is sold alongside Waterford Crystal's own brands. The range is very modern in that it has less cuts, is more delicate and lighter than the traditional Waterford Crystal ranges. The fact that it is machine-made, and is not made at Waterford Crystal has not deterred the buyers. Waterford Crystal estimate that Marquis now counts for over ten percent of sales. The Marquis range is consistent with Waterford Crystal standards. "Aimed not so much at cost-cutting as appealing to a new sector of the market: younger, more cost conscious collectors who want more contemporary, sparse lines."¹⁷ Through this venture Waterford Crystal have proved that there is a market for machine-made glass in this country and in the United States.

The consequences of these developments could be disastrous for the cutters. These new technologies will take jobs from traditional craftsmen. Waterford Crystal estimate that some 200 cutters will have to go with the introduction of eight of these PROGLAS work stations.

In the past the workforce has been cut before, but the employees have never been superseded by machinery. According to the company, there will always be cutters, but not as many of them. They will probably sort out the good from the bad, the good probably being the cutter who can cut bigger quantities of glass rather than the cutter who takes pride in his work. This could

inevitably lead to a lower standard in the quality of the work. Waterford Crystal, who have always had a reputation for quality may in the end have to bring the prices down. This seems to be the objective of introducing this machine in the first place. Dr Paddy Galvin, Chairman and Chief Executive maintains that:

"We're constantly looking at ways and means of improving the process, streamlining the flow of glass through the factory . . . The first priority has to be to continue to get cost reduction. That doesn't mean going after the workforce, but with our programme of reducing the cost base so that we can get the margins and good profits. Profits are essential for the shareholder, for investment in new plant and equipment, covering our debt and reducing interest charges:" ¹⁸

Many of the craftsmen who were made redundant in the cut-backs in the 1980s have started new crystal factories, such as Tipperary Crystal, usually maintaining the same skills and techniques they acquired through their apprenticeship in Waterford Crystal. Their craftwork is still redolent of their old employers. Although, they have had a great deal of success, as yet none have ventured into the art world, still restricting themselves and their skills from being completely individual and untraditional.

Another new invention in the glass industry is at present at use in Norway where they have discovered a less time consuming method of engraving glass. Traditionally engraving is a lengthy process using various sizes of copper wheels to carve a relief drawing on the glass (see Fig xii). Each wheel is skilfully applied to give a number of different impressions. In Waterford Crystal an engraver can spend weeks on one piece in order to register a certain amount of detail. The deeper they carve into the glass, the



Fig xii: Examples of engraving at Waterford Crystal: Limited edition pieces, left: Falstaff, 1980, right: Richard III, 1981.

more three dimensional the work will look. Norwegian glass engravers have discovered that by using computerised lasers they can cut away precise contours in the glass to achieve similar effects. There is one small disadvantage with this technique, that is, the glass is left with an alabaster finish on the surface, the only way to overcome this is to go over the work again with the copper wheels. Again, the time saved using this method out-weighs the disadvantages. As yet Waterford Crystal are not making any plans to explore this method, though it is possible that engraving might be the next department whose costs could be cut down on and methods updated.

With the introduction of all this new machinery the question has been turned from what was good craftsmanship to what is good marketing? Subliminally, it is no longer the quality of craftsmanship that attracts the buyer, but the way in which the product is marketed. Over the years there has been much debate as to which is more important. In fact, the craftsman and the executives are often in contention over status.

If there were not such a high standard of quality goods made by the skilled craftsman there would be no demand for the produce, thus marketing would not have invented itself. On the other hand if it was not for the shrewd marketing of the businessmen the produce would not be in such a demand.

What was originally run by the craftsmen has now been taken over by the businessmen. So much so that at Waterford Crystal the offices used by the executives and businessmen are increasing and the size of the work-shop space has remained more or less

stagnant. The new machinery is also taking up space that was originally devoted to the craftsman. The introduction of more machinery will mean the workforce will be further reduced. It is unfortunate that what originally put Waterford on the map - craftsmanship - should have to take second place to machinery and business. It also is unfortunate that the role of the craftsman should be over- looked, and take second place with the introduction of this machinery.

CHAPTER THREE

WATERFORD CRYSTAL VENTURING INTO THE WORLD OF
"ART" GLASS

"People are always confusing art and industrial design. I personally think that industrial design is far more difficult than art. In art, you take care of yourself and you can do anything that comes into your head. But if you have to design industrial things you have to support a workforce. You have to give them work. That means designing an article which sells and other things that can be produced."¹⁹

The relationship between art and industry has converged and diverged throughout the 20th Century. Art and industry have educated one another with their alternate ways of working with glass. In recent years glass has spread from the industrial setting to the fine art world. Artists have realised that there is potential in glass as an artistic medium; recognising that glass is a relatively unexplored material, they have experimented with various methods of using it in order to express themselves and their ideas. Craftsmen who have been taught in the traditional, industrial setting have also ventured into new areas of glass-making, by setting up their own studios and designing their own unique styles of glass.

In America, studio glass - orientated towards art glass and art techniques - is common practice, as opposed to the conventional industrial methods of making functional glass. Many American glass artists have, more or less, been self-taught, and their art often reflects the freedom they have in experimenting with the glass in their own studios. Although, they have also recognised the benefits to be had with an industrial collaboration.

A good example of this occurred in the summer of 1995, when Dale Chihuly, a prominent American glass artist in his own right, teamed up with Waterford Crystal. He brought a team of blowers and

assemblers over with him and they set to work in the Butlerstown plant of the Waterford Crystal factory. Chihuly is almost an industry of his own, for he no longer blows glass himself, due to a car accident, he has only the use of one eye, and so he relies on the competence of his team. He manages to design quite freely, unrestricted by functionality and the likelihood of difficulties in making each piece (Fig xiii).

Chihuly appears to be one of those outward-looking, all-is-possible men who are happiest when dealing with big commissions and projects, and working with teams of chosen people and helpers.²⁰

He lived for a period of time in Venice, which had a big effect on his style of glass, his work being redolent of Italian glass with its emphasis on strong shapes and clashing, vibrant colours. More often his work has been described as flamboyant and, sometimes, vulgar, but in itself superior in its scale and structure, to other contemporary art glass. He excels in overcoming technical difficulties in such a way that it calls attention to its own skill. His Waterford Crystal pieces utilise cut glass in the tradition of the factory, but he managed to give a more modern feel, not only in the forms that are blown, but also the way the cuts on some of the pieces contour the glass - apparently an innovation by Chihuly.

The chandeliers that Dale Chihuly and his team made in Waterford Crystal are part of a series that will be made in various places around Europe, including Finland, France, Czechoslovakia and finally Italy. They will be exhibited along the canals in Venice, in the summer of 1996, as part of the 'Chihuly over Venice' project. This project was conceived by Chihuly, as a gesture incorporating the



Fig xiii: Blue chandelier by Dale Chihuly, photographed at Lismore Castle, Waterford, October 1995.

five countries, in paying homage to Venetian glass for its contributions to the glass world.

Chihuly is one of the few American glass artists who has ventured forth to dissolve the barriers between contemporary and traditional glass. The fact that he chose to do this project in Europe shows that he has a high respect for European industrial glass.

Europe has always had an industrial glass background, using stringent glass making techniques to create traditional practical forms. It took some time to establish studio glass in Europe due to the long-standing industry-orientated education system. In Europe, where there is a mainstream of glass-makers with small studios, art glass has had a close association with industrial glass for many years. In Czechoslovakia and Sweden, where there is a strong interaction between the designer and industry, they have set up glass schools within some of the factories. Orrefors in Sweden is a good example of this. Orrefors has been training glass-makers from various countries using the stringent old fashioned approach for many years.

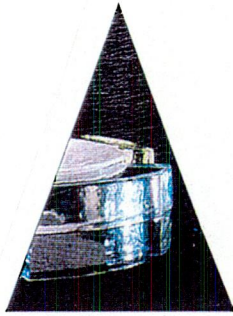
The Orrefors factory which was set up in the 1726 has had freelance designers working alongside craftsmen as far back as the late 18th century. A glass school was set up, within the factory, by the Swedish government in 1922 to primarily teach engraving, until the interest for other glass-making techniques arose and the school expanded venturing into other forms of glass-making. Many innovative techniques in glass-making originated at Orrefors. The new generations of student artists and craftsmen were not content with perfecting traditional methods, and they pushed the boundaries of glass to its furthest point. The techniques they

conceived such as graal, (a method of engraving or sandblasting a pattern on the surface of the glass, re-heating it and then gathering a layer of hot glass over it) and centrifuge (a technique using a spinning mould, into which molten glass is poured) are to name but a few. These innovations in glass artistry have helped to inspire generations of glass-makers, not only in Sweden, but around the world.

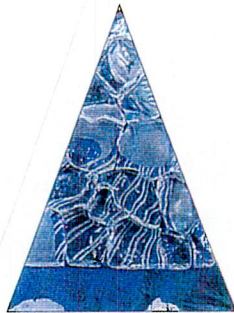
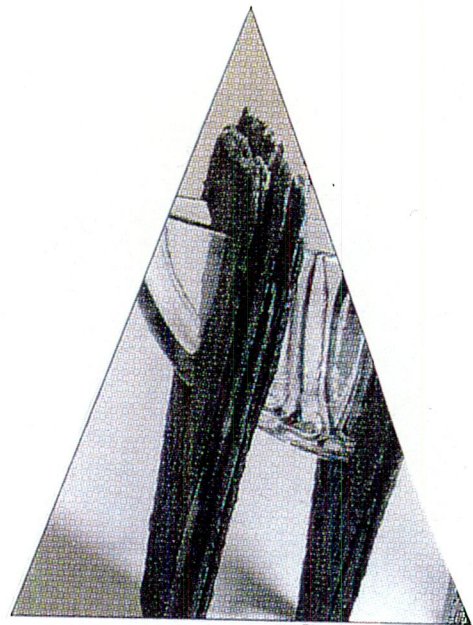
Waterford Crystal have managed to develop some new schemes to extend the knowledge they have for crystal and to try to find a new unconventional way to look at glass. In 1993 Waterford Crystal, influenced by their foreign competitors' departures in art glass, organised an open competition - Art and Design in Crystal - to forge a link between themselves and contemporary Irish art glass. Jim O' Leary (Head of Design) conceived a venture that gave emerging glass artists an opportunity to work with crystal in an industrial setting. The four winners were final year glass students from N.C.A.D. who were chosen for their combined volume of ideas. Their prize was to have their work made using the facilities and expertise at Waterford Crystal.

"We believe Waterford has an important role to play in promoting the use of crystal as a design tool and to establish crystal as a modern artistic medium in Ireland today. Art & Design in Crystal goes part of the way in achieving this."²¹

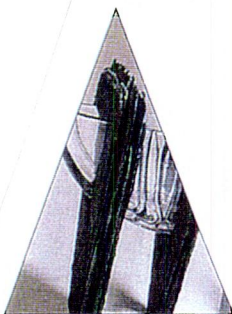
Each of the finalists applied their own interpretation of art glass and all came up with very innovative, energetic and exciting works. The inspirations for their pieces varied from: "movements in nature", by Elaine Griffin; to movements in "water", by Niamh Lawlor; to the



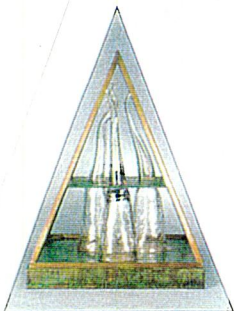
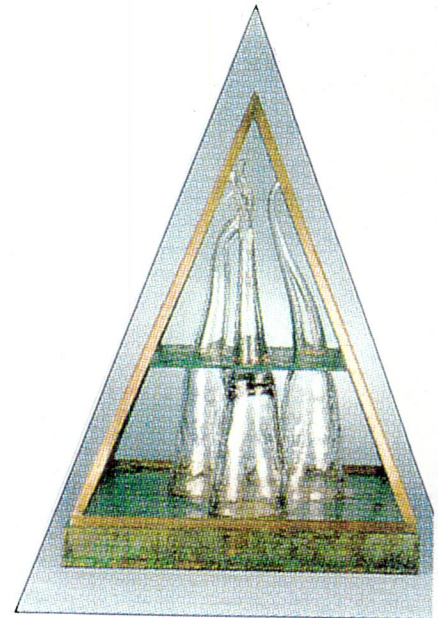
1 Elaine Griffin



2 Niamh Lawlor



3 Deirdre Rogers



4 Ruth Shortt

WATERFORD[®]
CRYSTAL

Fig xiv: Left: Solomon Gallery catalogue for the Art and Design in Crystal exhibition. Top right: Deirdre Rodgers, "Fragmented Unity II". Bottom right: Ruth Shortt, "Pyramid".

"natural forms" of Deirdre Rodgers; and finally the "Pyramids" of Ruth Shortt. These students who saw their idea through, from the initial concept to the staging of the exhibition, benefited greatly, not only from the celebrity of working with such an esteemed glass factory, but also gained from the advancement of their education and experience.

This was an ambitious and very generous project for Waterford Crystal to undertake, which proved to be a success at the exhibition in the Solomon Gallery, Powerscourt, Dublin. Waterford Crystal did, unfortunately, overspend on their original budget, and have not been able to have as big a competition since. They have, however, had smaller competitions such as the one I was involved with, that have managed to sustain links with N.C.A.D.

There is now consideration of further communications between the two groups, using ideas from glass students in exchange for technical experience and advice. Waterford Crystal are hoping, in the future, to set up a workshop to be used by up and coming young glass artists. Although, this idea is still at the initial stages of development and may not happen for at least another ten years.

Waterford Crystal already donate greatly to the arts and crafts movement in Ireland through monetary donations and guidance. They are not afraid of competition, in fact they encourage it. Their contributions will do much to bring Ireland in line with European and American glass companies who have already a strong link with art.

CONCLUSION

"I think the future of the glass industry is in the machine now."²²

Whether we like it or not this is the way the glass industry seems to be going. There will always be a market for hand-made products, but, there is now this new emergence in the industry that cannot be ignored.

Waterford Crystal will still produce hand-made glass, the new machines at present, are just there to speed up production. There are other aspects that the machine could be used for, such as experimenting with new ranges that the glass cutters would not be able to cut. When I asked them to put a simple spiral on a glass this summer, for example, I had the programmers stumped for a few days. Eventually, they produced three different types of spirals which would have been almost impossible for the average cutter to achieve, because each piece cut was of such mathematical precision that it would be extremely difficult to line up the cuts by hand.

The time saved using the PROGLAS system, could be put to good use by giving the designers and cutters more opportunity to experiment with new ideas. All of the designers at Waterford Crystal started as apprentice cutters, as they familiarised themselves with the techniques they began introducing some of their own designs to the blanks they were cutting. They showed promise with their innovative designs and cut patterns, and were duly rewarded with promotion. Having this background in the company each one of them has a superior knowledge of what is a good design, how much time is estimated to make each piece, and most importantly,

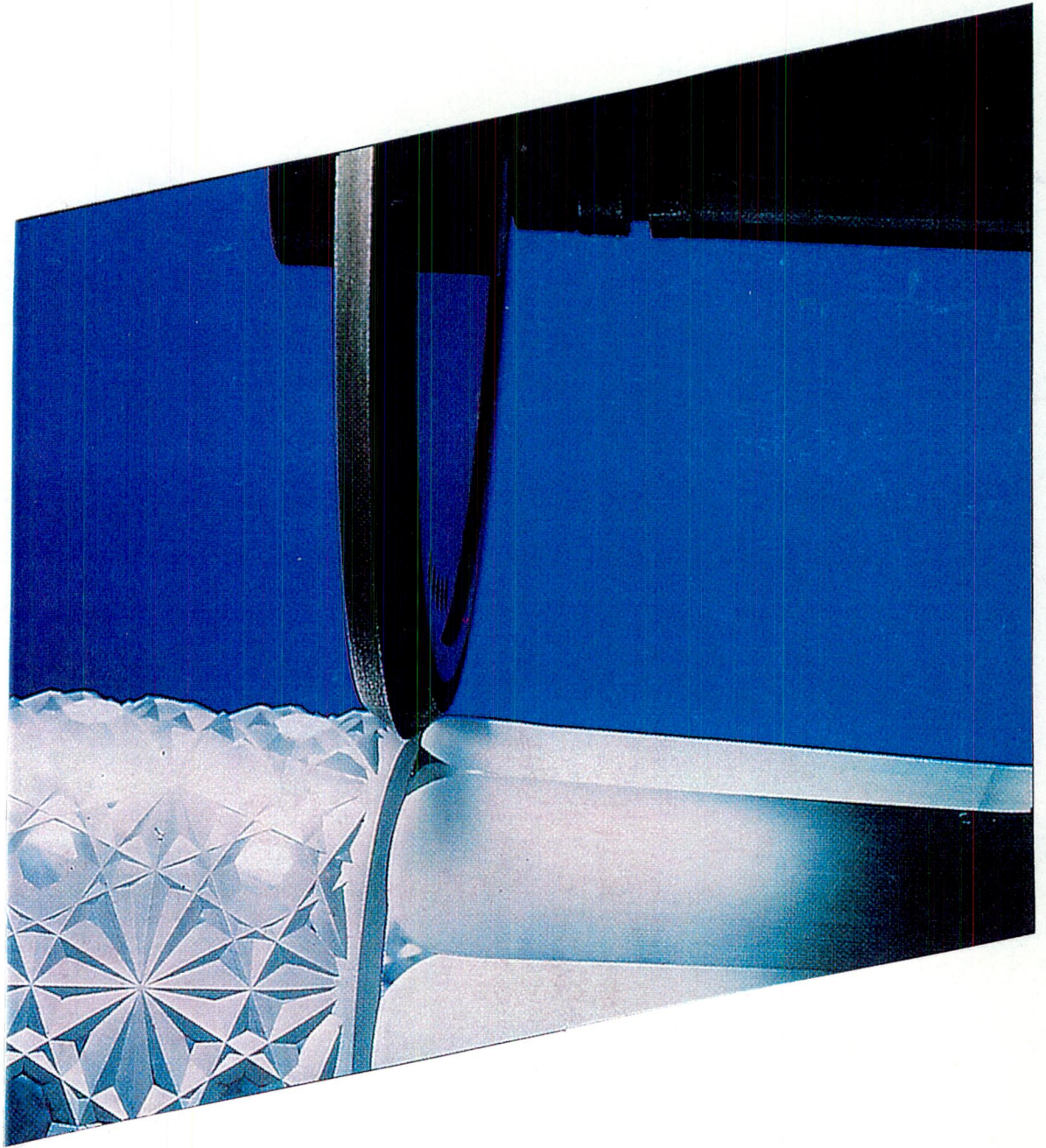


Fig xv: Close up of PROGLAS cutting.

what will sell. Unfortunately, their background can sometimes have an adverse effect, much like being imprisoned, they are often only influenced by their immediate surroundings, especially by previous company designs from earlier generations. Although they also examine designs by foreign competitors and use aspects of them in their own work, some of the designs have only changed marginally over the years. Their designs cannot be original if they continue to use already developed pieces as their source of inspiration. I do think there is room in the market for more unique, modern trends in cut glass, to attract the younger buyers.

Waterford Crystal have tried to do this with the Marquis range, and it is selling well, but I think that there is a niche for more types of art glass that still use the traditional cutting techniques. This has not been experimented with to the same extent as in foreign countries, such as Czechoslovakia and Sweden, who now develop modern cut glass ranges that retail in some of the top stores - even in this country - such as Brown Thomas.

Technology will continue to develop, engineers will improve older equipment with larger, speedier, more accurate machinery. As technology changes, so should design, so that the two are working together. I think that if Waterford Crystal are going to use the machinery to its full potential, they are also going to have to invent some original designs. This does not mean that they have to get rid of their already successful traditional designs, but they should have more contemporary designs to run alongside them.

Waterford Crystal have the potential for doing this, they have proved that they want to show the world their achievements in the

'Art and Design in Crystal' competition. They have also proved that they can work successfully with artists, such as Dale Chihuly. Now all they need to do is look retrospectively at what they have achieved in the past and use this to their advantage in the future with their own designs or the designs of young artists.

My initial reaction on learning of Waterford Crystals' advance into machine production, was one of shock and disgust. I feel sympathy for the craftsmen who will lose their jobs, however, after doing some research into the subject I can now see the advantages.

Whether you like cut crystal or not, it has to be admitted that Waterford Crystal have played a huge part in putting Ireland on the map as far as craftsmanship is concerned. It still remains to be seen whether they will have a part in its demise with the PROGLAS machine. I personally feel that there is room for both. As industrial design and art have recognised each other's achievements and have come to benefit one another through design and techniques. The art of the hand-made and art of machine-made will always be at war, but there is no reason why this should not be a creative and productive one.

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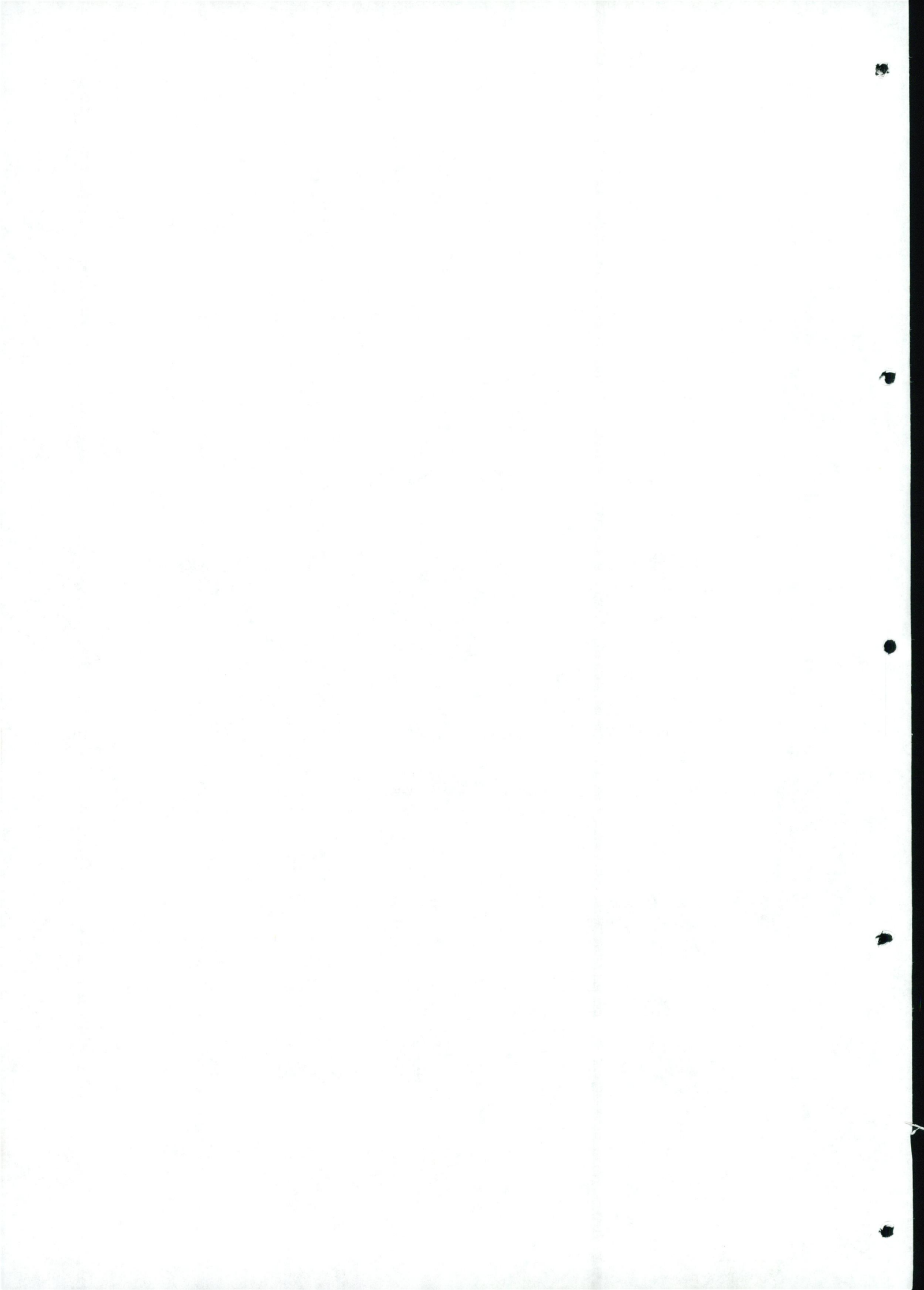
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