Autobiography – Part 2

# Alan Agar

## His Memoirs from 1972 to 1989 -

## Entrepreneurship and growth of a sustainable microscopy business

I decided that I should try to construct a business based on my experience in electron microscopy. It was obvious that it could not be based on complete instruments because the capital needed would be enormous. I could, however, be a consultant offering unbiased advice to those looking to buy a microscope and I could offer training courses on a bespoke basis. I could supplement this by offering small items which were difficult to make. Chief amongst these would be calibration specimens for calibrating magnification and for measuring different aspects of instrument performance. Many of these were quite difficult to make and I checked on some that were already offered by other companies, and found they were generally of poor quality. I spent much of the last two months with AEI practising making such specimens, refining the technique and establishing the pass criteria.

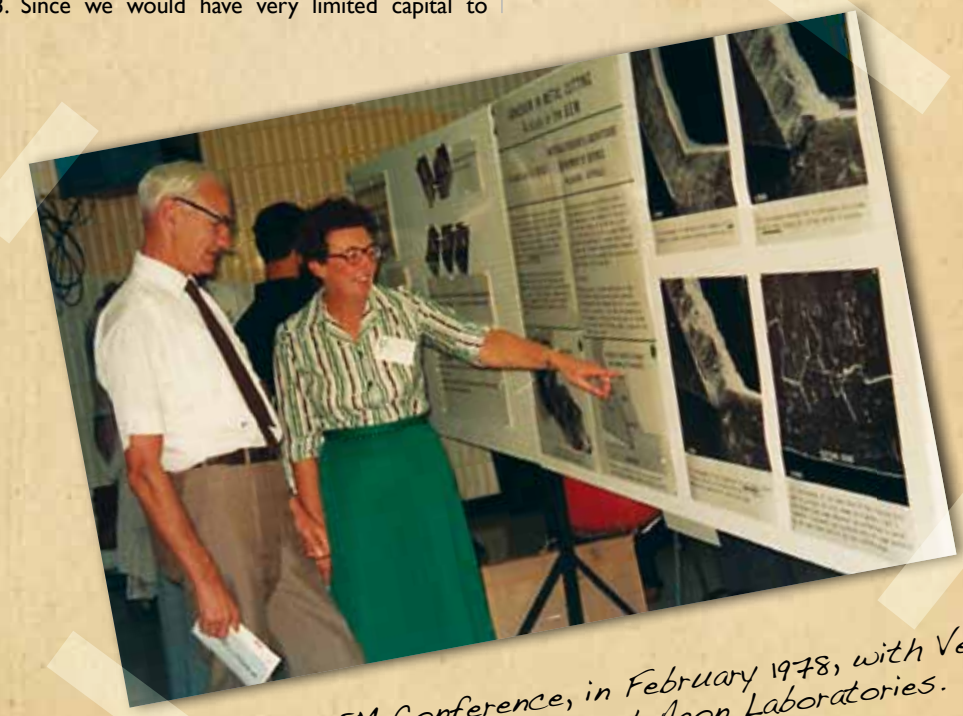
Some work I had done in AEI many years earlier had shown that one could improve on the replaceable filaments used as the electron source, though nothing had been done about it. While this formed part of my initial plan, it turned out that there were enough problems in sorting our raw materials and then having jigs made that they did not contribute at all to the crucial early trading.

An old friend in Bolton, Philip Smethurst, who manufactured the small Athene copper grids used as specimen supports, said he would let me sell them as part of my service. I could also think of a limited number of other small items worth offering. I was encouraged to do this because the main supplier of such things in the UK had a reputation for slow service and some laboratories disliked their minimum order charge.

I set out some objectives for the new business:

1. As far as possible we would try to offer a 'return of post' service on orders received.
2. We would not apply a minimum order charge but would endeavour to make ourselves efficient enough to do this without losing money.
3. Since we would have very limited capital to spend on stock, we would restrict initial stock to items not generally obtainable from laboratory suppliers but pick items specifically needed for electron microscopy.
4. We would not seek any capital from banks or private individuals because an injection of capital to a start-up company usually involves surrendering a proportion of the business, and since our capital was very limited, we could have lost control before we started, for the sake of a very small amount of money.

Then came the problem of capital. In September 1972, I received a notice of redundancy and with a six-month notice period, I received a total of about £3,350. I had about £1,500 of savings. I found that I would not qualify for any unemployment pay during my notice period, so we had to live off our capital plus any money we could earn. Of course my wife was fully engaged in this project and she immediately enrolled on a course to learn how to type (having been a schoolteacher before we married). She found that the rest of the class were young enough to be her daughters! We spent about £1,000 on initial equipment - £650 for a used Ford Escort, £200 for an electric typewriter (to conceal



1. At the Australian EM Conference, in February 1978, with Veronica Spiers (as was) formerly a colleague at Aeon Laboratories.

2. Hamburg Conference in 1982. From left to right: Margaret Agar, Dr. Werner Noli of Plano GmbH, Alan Agar, Fred Sheldon.

the fact that we had a learner driver), a scrap vacuum coating unit from AEI and some old storage racks. I committed about £1,750 to buy items of stock and this involved a great deal of agonising over the best things to buy.

Looking back at this period, I have to admit that we did things the hard way. Starting with such a small amount of capital greatly slows down the achievement of a viable business level, besides imposing severe financial hardship on the partners. We did not start to draw a sensible salary out of the business until year 4 and since all our expansion was entirely out of profits, there was no way of speeding things up. If we could have just found another £5,000 to start with, things would have been much easier. We did later use short term bank loans for major items such as the purchase of premises.

I spent the next two months preparing the infrastructure in our home. Firstly, I insulated the garage walls and roof so as to accommodate our stores. Since we had a large kitchen, I was able to appropriate space at one end to set up a laboratory for preparing the calibration specimens. The sight of the vacuum coating unit near the door caused much interested comment from delivery men. The main bedroom became our office and the dining room table was our packing bench. I spent a lot of time making contact with suppliers to establish a supply line for items we would need. I prepared a mailing list from those using AEI instruments, and other acquaintances of mine. I would have to devote much time to making the calibration specimens which were the most unique offering in our first catalogue. All the initial sorting of these for quality was done with a cheap monocular Polish microscope which I had bought many years earlier for my daughter Janet. I found that to establish reasonable quality levels, I needed to examine each specimen which had passed the initial check, in an electron microscope. A colleague in Cambridge, Dr. Audrey Glauert, generously allowed me to use her microscope once a week for this purpose – an invaluable gift at the time. Never was any electron microscope used so intensively.

At the beginning of January 1973, I was able to circulate a mailing to 1000 addressees to announce my consultant service and to enclose a list (covering nine sheets of paper) of items I had for sale, including prices. We had had long discussions about our trading name. In the end, we chose Agar Aids for Electron Microscopy and we used Agar Aids for short, with its two connotations – Agar aids you with advice and Agar Aids are for helping you with your work. We were very lucky in being recommended an excellent designer for our logo and business paper and it was still in use 20 years later – the company was sold at our retirement, but retained the name we were then using – more on this later.

Because of our very small capital base, there was at first no question of a bank loan, so I devised a very simple form of monetary control: we would pay all our bills promptly on a 30 day basis and since each transaction was executed at a profit, there would normally be more money owing to us than we owed out. Therefore, any cash in credit in our account was free for us to use for equipment or new stock. This system allowed me to sleep easily at night since our house was at stake if we went into debt and we had two children still in school.

After we had operated this way for some time, it became apparent that it had some merits. We soon found that our system earned us preferential treatment from our suppliers who, when supplies were short, sent goods to us rather than our competitors, who were slow payers.

A corollary to our determination to give a fast service was that we had to attempt to keep a certain minimum stock of each item. It could be justified not only on the grounds of good service to the customer but also because a missing item from an order involved an additional shipment and a new invoice and so more costs. This violated another management nostrum: that one should keep stock to a minimum in order to reduce capital tied up, but this assumes that service to the customer is of secondary importance. It is worth mentioning that when we retired, we received a large postbag from our customers thanking us for our excellent service over the years.

By the end of May 1973, we had to think seriously about progress. There had been a considerably better response than we had expected on our sale


3. Fred and Diana Sheldon at the Budapest Conference in 1984.


4. Our display at the Budapest Conference.

of small items, of about £1,000 per month up to March, but sadly the orders dropped away in April and May (experience in later years showed us that this was completely typical: the Government financial year ends at the end of March and all Government establishments and many universities are busy spending money that would be lost if not committed before March 31st). We therefore issued a newsletter in early June with details of new items and we duly got an increase of orders. However, by early August I had earned only one day of paid work as a consultant, so we decided that technical advice would be given away free, but that we should concentrate on adding more items of stock. I took a loan on two life insurances and spent the resulting £880 on stock. This was effective in increasing turnover, and we finished the first year with a turnover of £12,500 with a nominal profit of £1,477, before taking account of the £1,644 drawn out for us to live on (as partners, we did not draw a salary). We had obviously found a novel way of living on the breadline.

The preparation of the accounts opened my eyes to several interesting facts about accounts. The accountant spent quite a time in making sure that the money balanced to the last penny. He then asked me for the valuation of the stock. We did this by costing each item at its cost price. We then had to estimate how much of this should be written down to account for bad or useless stock. I was determined that the accounts should not show a misleading picture of the true worth of the business, so we established a strict procedure for determining value. Any stock representing over one year of stock usage should be written down by 50%, and anything over two years stock usage by 100%. Any chemicals or photographic material would lose 50% of its value because we could not be certain that it would not have deteriorated. A similar process was carried out on creditors. If an account was over 3 months overdue, we included it as a bad debt thus reducing our assets. In later years, if we had already reached our budgeted turnover for the year, we stopped invoicing before Christmas and carried the business forward into the next year. All these adjustments were very large compared with any possible error in counting up the pennies and left one fairly cynical about the accounting exercise. But I was satisfied that the accounts showed a very conservative valuation at the year end. The only real disadvantage of this system is that the business becomes progressively undervalued and when it is valued for sale, one loses money on the sale.

The main project for 1974 was to prepare an illustrated catalogue of all the items for sale – our competitors had them and our typescripts looked very second-class. This work was completed by the end of April, costing what seemed to us an astronomical sum. It had an instantaneous effect though, and we paid off the cost of the catalogue inside three months. By this time we could afford a part-time typist, much to Margaret's relief, and she could now devote her time to supervising packing and learning about export procedures. We had decided to make a start on exporting because in several territories I had persuaded the AEI representatives that I knew to take on our line as well. So we had some exposure in Canada, Australia, New Zealand and France. We started getting enquiries from the Crown Agents, with requests to quote for what then seemed large orders. We succeeded with a number of these and sent goods to India, Iran, Iraq, Saudi Arabia and Egypt.

About this time, we decided we needed an overdraft facility owing to increased cash flows. The bank granted just £2,000, though I had to surrender the deeds of our house, with a second mortgage, an assignment of my life insurances and a floating charge over the assets of the business. Talk about belt and braces! I think this was typical of the attitude of banks to small businesses – and so was their later attitude when we had a healthy balance and the bank was asking if they could lend us more money!

My deferred project for making improved disposable filaments proved to be something of a marathon. I located a company who could seal pins through a ceramic base but I required them to be kinked, so as to have a narrower spacing on the filament side. The company could do this but when they tried to press flats on the pin (to receive a weld), their press machine was too violent and cracked the ceramic. Therefore, I had to have a jig made to give a controlled press. I next found that the UK supply of fine tungsten wire was too brittle and it could not be formed into a V shape without splitting. I had to obtain supplies from the USA. Finally, I had to have jigs made to form the tungsten wire into a V shape and then have it held in position while it was being welded. In the meantime, I discovered that the old spot welder that I had been given was not suitable and I had to buy a new one with lower current capacity and a phase control to use only a fraction of a cycle for the weld. By the time all these things had been sorted out, we were well into the autumn of 1974. It was an object lesson in how difficult it can be to develop a new item, however small.

Our publicity had, thus far, been exclusively through direct mailing, as I considered it a very effective system. We were selling to a small and very well defined market, and it was normally not too difficult to know who the microscope users were. It was also usually effective to attend a conference where electron microscopy was being discussed (Photo 1). The list of participants gave us up-to-date information about the people who were interested. In the end, we did put small adverts in conference literature and much later, after we were very well established, a small regular advertisement in a widely read magazine to retain our name in view. But direct mail has always been the best form of publicity for us. Of course, we needed something worth writing about and a twice yearly newsletter about new items seemed very effective. The catalogue itself was our vital selling aid.

We made a point of attending any conference on electron microscopy since we could display a wide selection of our products, and it gave us a chance to talk to a large number of our customers. We

could also see what our competitors were doing. At conferences abroad, we had the chance to train our local representatives and to clear up any administrative problems.

Over the next three years, we made steady progress and in 1977 had a turnover of about £100,000. The range of items had increased significantly and our second catalogue of 100 pages appeared later in that year. By then, we had three part-time members of staff in clerical and packing work and a full-time technical assistant making calibration specimens. I had also started looking for a senior electron microscopist who could be my deputy in due course. There was quite a lot of pressure on space in our house but we had found it very difficult to find suitable business premises. We were assured by several agents that there were no commercial premises of less than 5000 sq. ft., as it was uneconomic to rent smaller areas (now of course, there are plenty of smaller sized premises available). We were looking for about 1500 sq. ft and in the autumn of 1977, I was offered a single storey prefabricated building of 2300sq. ft, plus a sectional bungalow of 550 sq.ft., which was excluded from the planning permission. We gulped hard but in the absence of any alternatives, we bought it. We had to make a separate application to use the bungalow when we required the space.

The continued expansion necessitated a bigger overdraft facility and this time we had no difficulty in being granted up to £20,000. By this time, the bank manager had seen three balance sheets which all showed better results than the conservative budgets that I had submitted.

My search for a deputy was solved in the autumn of 1977 when I engaged Fred Sheldon, who had demonstrated Philips electron microscopes for some years, following several years in a metallurgical laboratory. He brought some new background into the company, as well as being able to back up my own experience. Two years later, we were able to add Dr. Lynne Joyce, a biologist, to complement the management skills. We now had a broad background of science to offer help and advice.

In this period, we made an effort to establish agencies in all the major European countries. This was generally with companies who already had contacts with other UK instrumentation companies. Germany was different and I interviewed two small companies there. I was impressed with the second I saw (Plano GmbH). This was a newly established Company, formed by Wolfgang Plannet and Dr. Werner Noli, who was an experienced electron microscopist. I found both men very agreeable and enthusiastic and thought we could work well together (Photo 2). It turned out that they had tested us by placing a small order to see how quickly we responded: apparently we had passed with flying colours! This agent (Plano GmbH) proved to be a real find. They quickly translated our catalogue into German and we loaned them negatives of all the illustrations. They issued our catalogue in German and became our most successful agent. I tried to persuade our French agent to do the same thing but they refused and never produced the same level of business.

The biggest potential market was the USA. However, this vast market was already served by three large US companies and some smaller ones. I had learnt during my stay there that it was a very difficult country to work in and would absorb huge resources. We had a number of items not readily available there but a large part of our catalogue would only duplicate what was already available, often at a lower price, because of their ability to order in greater bulk. We therefore decided not to attempt to sell directly in the USA. Instead, we came to an arrangement with one of the big companies over there to offer some of their special items in the UK and they would sell items from our catalogue which they did not have. In this way, we obtained some useful business in a relatively risk free manner.

We continued to try to expand our export efforts, as I had the feeling that we should spread the risk as far as possible, in case the funding of UK universities and government laboratories continued to shrink.

5. Agar Aids staff, 1987.

Having covered most of Europe and our Dominions fairly successfully, we had now to tackle the Far East. Singapore was not too difficult, but we decided to seek the assistance of our embassies in Malaysia and Thailand. They agreed and, prior to my travel, had set up appointments with two university notables. When I visited them, however, I found they had no use for electron microscopy and no prospect of it. I was obliged to apologise for wasting their time. I concluded that our embassies were probably very useful to big businesses selling power stations or cornflakes but that they were out of their depth with technical specialities. This feeling reinforced an earlier attempt to find some EM labs in Greece. The local embassy wrote to tell me that there were no electron microscopes in Greece. But I knew that there were at least two because I had seen papers from them submitted to a conference – I was just trying to find out how many more there might be.

In fairness, I have to mention the successes of our foreign representatives. At a conference in Japan in 1966, we consulted the library in our embassy and they found for me the trade statistics of the Japanese electron microscope manufacturers. This was very revealing as we found that the price of the microscopes sold in Japan was roughly double what they were charging in England. It furthermore showed that they were employing large numbers of young graduates in their development work at cheap rates. This was at a time when our trade department was allowing duty free importation of Japanese instruments on rather flimsy technical grounds. It caused AEI to lose a significant number of orders.

As part of my search for new exports, I went to a trade fair in Moscow. We had active help from our embassy with advice on dealing with the Russians and they helped a lot when we were stranded there

6. York EM Conference in 1988. Alan with Prof. and Mrs. Kanaya on the stand.

because of the cancellation of European flights at the time of the shooting down of a 747 in the Far East. They helped to organise our escape by various tortuous routes. The search for business in the USSR proved abortive. Many of the visitors were delighted with the items we had on show but were not allowed to buy a sample to try out because petty cash accounts seemed to be unknown. If anyone thought that an item might be interesting, they would request that we send full technical details to some central purchase organisation, who, if they were satisfied, might then order some huge quantity.

We were not allowed to know the address of many of the visitors to our display, though if we were lucky, they could provide us with a contact telephone number (telephone directories were not published, they were secret). There was, apparently, no way in which I could visit an electron microscope department in Moscow University while I was there – this should have been arranged some months before my visit, having been applied for to the protocol department. I concluded that there was no place for our informal approach and that the system was too inflexible to allow a small company to operate.

In 1977, I was invited to see a computer controlled microscope designed by Dr. K.C.A. Smith and his colleagues in the Engineering Department of Cambridge University, which could do some very impressive things. They were talking to a small computer firm with the idea that it might be sold commercially. This firm were intending to offer a basic unit at a high price (to my way of thinking), but that one could buy extra facilities for relatively small extra sums. I thought they had no grasp of the practicalities in electron microscopy. The basic offering would do one function and it could in no way be attractive or useful to a customer. It made me realise that once the basic data was entered into the computer, it could be looked at in many different ways. This sounded to be just what we needed to help run our business. The manual stock control and order handling was beginning to creak a bit with the volume of business. I decided that what we needed was a program that would reproduce our existing system. I accordingly wrote the requirements, including a coding system which would give us maximum information as required. We finally got someone to do this for us and we started computer life with a mini-computer. We had a long testing period with the computer running in parallel with our manual system. The wait was well worthwhile. We had a superb information system which served for twenty years (after upgrading the minicomputer). The bank manager was astounded at the quality of the information he was given.

In 1978 we decided that we should form a limited company, Agar Aids Ltd., so that our personal finances were less threatened. This proved pretty ineffective though since as soon as the company came into existence, I was obliged to sign a personal guarantee to cover its potential losses. We still had to leave our house mortgaged to the bank.

In later years, our German agent asked us if we could possibly change our company name. Apparently, there is no German word looking like aids but there was great sensitivity about Aids. We decided that we should take no chances with this, so we became Agar Scientific Ltd. Many of our UK customers were sad that Agar Aids was to be no more and our pens marked Agar Aids became collectors' pieces.

We need not have worried about taking on premises larger than we wanted. In just over a year of occupation, we found we had to add another 1000 sq. ft. of space to expand our stores.

We initially found all our part-time staff by word of mouth. Our first recruit brought along the next three from amongst her acquaintances, which resulted in a close-knit group. We did try interviewing school leavers for some jobs but, in general, found them unsuitable for our kind of firm. Because of our type of customer base, we might frequently have professors or quite senior scientists calling in so we had to maintain a high standard in those who might answer the phone. We made a


7. York Conference in 1988. Wolfgang Plannet, our German agent.

point of keeping in touch with local rates of pay and paying our staff a bit more. It was economic to do this since trained staff were valuable and we would spend expensive time training newcomers.

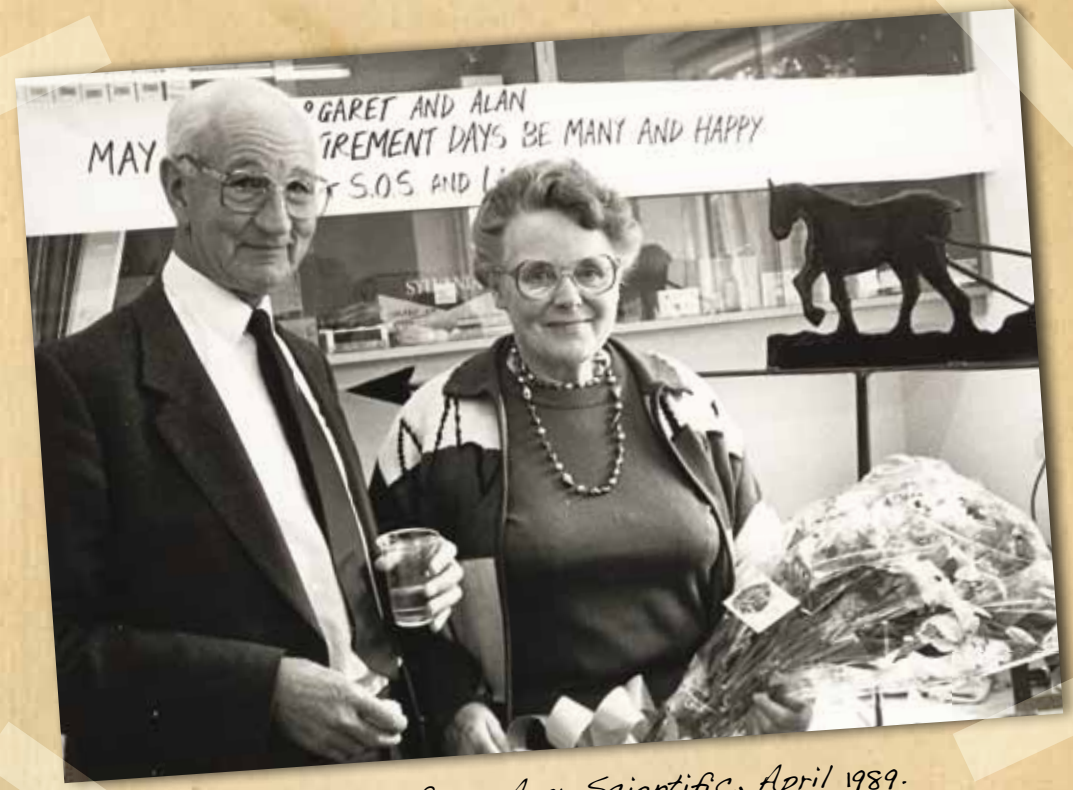
We paid everyone a Christmas bonus which was related to our trading results, and everyone got the same amount. I would call a staff meeting to present our results and point out the money from profits that we were using to further develop the business. I was very conscious that our good reputation depended on everyone doing their job conscientiously and tried to make the staff feel a vital part of the company. We finally had a staff of twenty and there was, in general, a very happy atmosphere. Both Margaret and I are very proud of this staff record and would recommend this approach to any small business. There can be no doubt that high staff morale and business success go hand in hand. When we printed our fourth catalogue, we included a photograph of every member of staff on the inside cover pages to demonstrate the concept of the whole team working for our customers.

The advent of our third catalogue in 1979 resulted in an increase of 60% in turnover in the next year and we continued to expand rapidly. We continued to develop our filament business by making many more types of filament suitable for the different microscope models. Each time we had to go through the expensive business of new tooling and new ceramic bases but all this could be afforded with the expanded cash flow. We had once again to expand with new buildings in 1981 to accommodate our activities.

Unfortunately not all of our ideas were successful. I kept a close watch on new developments so that we might be at the forefront of the introduction of useful equipment. I noticed it had been demonstrated that an electron energy analyser was most sensitive in differentiating light elements, the part of the spectrum most difficult with solid state X-ray detectors. One of the US experts in this new field got his design manufactured by an American company. I got the agency for selling this equipment and soon got an order from the Admiralty. We duly installed the equipment but soon afterwards were told that it was emitting X-rays well above tolerance levels. We could get no help from the US company, so were obliged to take back the equipment and refund the purchase price. This was a very expensive lesson. I apologised profusely to the customer and feared we might never hear from them again but our prompt action in refunding their money actually created a good impression, so all was not lost.

From time to time, someone in a university would show us some gadget they had developed. If it looked reasonable, we tried to encourage this knowledge transfer and we would give them a small royalty on each model sold. I cannot say that this was a highly profitable stance, but we thought it worth it.

We were increasingly importing equipment from the USA and one particular item struck me as a waste of resources. It was a plastic box containing one of several inserts which accommodated perhaps ten specimen mounts as used in a scanning electron microscope. These were light but fairly bulky items of a very moderate value. The freight costs were high compared with their value. This seemed a good subject for import substitution. We found a firm making plastic boxes and provided samples, with some ideas for improving the design. It proved a long process. At first the boxes did not have a good enough finish and some came apart at the hinges; it was disappointing that there was so much difficulty in getting the right quality. Having cured this, we then found the printing of our logo poor. The inserts were not made to tight enough specification, so they would not always retain the specimen holders in transit. All this took a lot of time and we had to pay part-tooling costs for the job and, in order to get them at a good price, we had to order large quantities – we estimated about




8. Our retirement day from Agar Scientific, April 1989.

three years supply. The finished article was quite satisfactory and they sold well. We had to hold a lot of stock, so it was nearly three years before we recovered our costs and started making a good profit. In the end it was a good thing but we had to invest a lot of money to achieve it.

One of our early decisions, to give our advice free of charge, became quite a significant factor in our operation. Quite often I would have someone explaining their problem, which we would chat about for a time without any solid conclusion that I could detect but at the end of the conversation I would be told that I had helped very much and the customer departed happy. In the later years I would have a call from out of the blue, starting with "I have been told that if you cannot help me, no-one can", and they would pour out the problem. It is very difficult to quantify the value of this, but it seemed to make people happy and it was gratifying to feel we were satisfying a customer need.

We worked closely with the Germans and set up a joint company to deal with export territories where they had expertise. They had both been working in Latin America with the Peace Corps and could speak Spanish and Portuguese, so we gave them authority to trade on our behalf in all of South America, Spain and Portugal. Since they also had close links with East Germany and the Eastern block, they were to handle this area also. The profits of these operations were to be fed into the joint company. On our part, we agreed that profits from other foreign countries not already handled by us (e.g. Japan) would likewise be passed to the joint company.

Our regular attendance at major conferences was an excellent meeting place (Photos 3, 4, 5, 6 and 7).

What we had not realised when starting up was that most of our business was conducted with universities, government laboratories, and large

industrial companies with research laboratories. All of this was blue chip business and since many orders were for relatively small amounts of money, the risks were very low indeed. The result was that we had very little difficulty in securing payment in good time and our final level of bad debt was exceedingly low – it seldom reached £150 in a year. In fact, we usually recovered these amounts. The only debt I remember which was never paid was for £70 from a customer in Ireland. Another interesting fact emerged after we had been operating for some years. Several of our suppliers told us that we were their biggest customer, which surprised us greatly. We realised that our small firm was providing major support to a large number of other small firms, so that we formed a mutual support network.

This aspect of small business is not much emphasised. Announcements of the number of jobs lost as a result of a firm closing down take no account of the probable loss of jobs in a whole network of other companies. This is particularly the case with the loss of a company with an export business. A manufacturing company closing down is lost forever: the accumulated skills are dispersed and the foreign contacts, built up over many years of painstaking work, are destroyed as well. The equation of new jobs created, in for example a supermarket, versus those lost in an export manufacturing company is highly tendentious.

The progress of the company followed the lines outlined above. Every year, we would try launching new ideas, particularly where we were following some new trend in the science. As with any experiment, a proportion of these ideas failed but we reckoned that we were well on the positive side as a result. The turnover increased year by year, until in 1988, we had a turnover of £1.75 million and assessed that, in worldwide terms, we were the third largest company in this sector of business and 45% of this amount was in exports. We continually invested in new equipment and ideas and were able to present ourselves as a dynamic company. Within the last three years of this period, we achieved a solid net profit of over 10% of turnover and 35% on capital employed. We felt that these figures justified any unorthodoxy in our methods. At the same time we had a very happy atmosphere and Margaret and I enjoyed ourselves hugely.

Our financial objectives were realised, we had accumulated a considerable amount of free capital, and we could look forward to a sizeable expansion in a related field. Since this would clearly take a number of years of close attention, we decided that we had come to an appropriate time to retire and let our successors take up control of the next phase of the business. We were already nearly 69, but things had been too absorbing to think of retiring any sooner (Photo 8). The company was, at this stage, sold to Fred Sheldon and his wife. Unfortunately, he died only four years later and the company was then managed very successfully by Lynne Joyce

I count myself very fortunate in having had a career of absorbing interest for the whole of my life. There were peaks of excitement in achieving something entirely new, or of launching a fine new instrument. The satisfaction of creating a flourishing business from nothing was intense. What a pity that we cannot convey more vividly to students the satisfaction that could await them in science or engineering.

## End Note

*During the first six years of my retirement, I researched the history of all the commercial electron microscopes in Europe. A similar job had been done for Japan and for the USA and I felt it needful that European achievements should also be recorded. It was very interesting to obtain much information from the former East Germany and from the USSR, much of which had been unknown here. What is fascinating in the context of my own experience is that I had to conclude from the results of the survey that AEI failed to realise early enough that the electron microscope could only be a viable business if adequate resources were devoted not just to instrument development, but to the manufacture and selling. The AEI approach had been that of the interested amateur but without any overall plan to drive it as a possible business in its own right. Siemens in the 1940s and early 1950s made huge investments which resulted in a spectacular increase in business. Philips too, following some solid basic work at the Technical University of Delft, made a fine microscope of which they sold 350 starting in 1949. This meant that they had enlisted the help very effectively of their worldwide sales teams. In the period up to 1956, AEI had sold 136 instruments against 410 by Philips. The Japanese companies started somewhat later, but by the 1960s were making large inroads in Europe. Back in the 1950s when I was with the research team in Aldermaston, we had the strongest research program anywhere leading to a prototype instrument of great technical strength but the factory and sales resources were then inadequate to exploit the situation. By the time I rejoined AEI in 1961, we still had a technically advanced instrument, but we were far behind our competitors in terms of instruments installed and working (something that we suspected but did not know quantitatively). Our competitors could therefore sell their new instruments to existing customers – a much easier job than convincing customers to change allegiance. We also had a backlog of unfulfilled orders due to lack of space in the Manchester factory and the new factory in Harlow needed some time to get production running smoothly. We started to clear the backlog just as the order rate was slowing because of the appearance of the new scanning instruments. In the mid-1960s, when the Cambridge Instrument Company was making the startling new scanning electron microscope, AEI failed to link up with them at the crucial moment. AEI were thus left selling only part of the range of electron optical instruments. Siemens also failed here, though Philips, Leica and Zeiss had the full range. Siemens and AEI both chose to develop the new STEM (Scanning Transmission Electron Microscope), which proved premature, and both went out of business in the late 1970s. With hindsight, these facts help explain why my hope of establishing AEI as an electron microscope company of the first rank was doomed from the start in spite of our technical ingenuity and quality.*

# Websites... worth a look

www.edwardhfd.info

www.pageant.org.uk

www.robkesseler.co.uk

www.millennium-microscope.org

www.microworldofgems.com

www.emu.arsusda.gov/snowsite/

http://home.att.net/~seberhard/

www.deckart.de

www.paulineaitken.com

www.micROCKScopica.org

www.micro-designs.com

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