COMPUTER GRAPHICS PIONEERS

Green and Hopgood Share UK Computer Graphics History

This issue's column stems from an invitation I extended to a couple of UK computer graphics pioneers to share their thoughts about early computer graphics activities in the United Kingdom. Richard Green's recollections of Brunel University's CG68 and CG70 conferences bring back fond memories of my participation in both. It was at CG68 that I learned that "Chase" Chasen was legally blind. He had given a brilliant presentation, complete with extensive visuals - I happened to notice the published proceedings, and it transpired he had memorized the entire paper and was giving it verbatim!

I also learned at one of the conferences never to try to follow Richard's boss, Prof. Mike Pitteway, by car to an underground station. It was worth my life trying to keep up with him. When we finally reached our destination, and I shakily got out of my car (after slightly sideswiping a railing), Pitteway said "You did a good job of keeping up with me!" I asked, "What would have happened if you lost me?" "I would have slowed down," he replied. I later learned that Pitteway had quite a reputation as a race car driver!

Bob Hopgood writes about his work and experiences at Rutherford Appleton Labs and Brunel covering a similar timeframe to Richard Green's work at the latter. (Incidentally, Bob (F.R.A.) was recently honored with the O.B.E. for his work in computer graphics).

I'd like to thank both Richard and Bob for their stories. Richard Green can be reached via fax at +61 2 9450 2787 (he doesn't have an email address quite yet!), and F.R.A. (Bob) Hopgood can be reached at **F.R.A.Hopgood@rl.ac.uk.**

Incidentally, we'd be delighted to receive personal recollection stories from our readers which we could consider publishing in future columns.

—Carl Machover

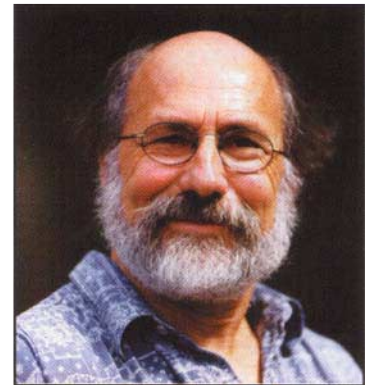## Do You Remember CG68 or CG70 at Brunel University? A Tale of Two Conferences

April 1970

March 2000

Richard Elliot Green

It was 1967, and I was a sales engineer in the UK selling nucleonic instrumentation to universities and research facilities. I had started to lose sales to competitive equipment which incorporated new-fangled mini computers. Computers had to be the future — I wanted a career change and after considering the various options decided to accept an offer to join with the newly formed Department of Computer Science at Brunel University, Uxbridge.

I registered for a Ph.D. developing a new low costs computer graphics terminal. The research project was a joint effort between the Computer Science Department and the Electrical Engineering Department who were responsible for hardware development. My role was the design of a machine code interpreter program which defined the graphic elements. These were to be stored in a MOS shift register refresh buffer and displayed on a CRT.

The work was very introverted and we were keen to find out what was happening in computer graphics on the other side of the pond, where we felt that work must have been far more advanced. This is where the conference idea came from. American researchers surely couldn't say no to a trip to England. We could fund the travel by staging a conference and charging fees to the delegates. Sounds corny now, but we were at the sharp end of commercial technical conference organisation. This sort of thing just hadn't been done before. My boss, Prof. Mike Pitteway got access to university funds by defining the event as a "short course" which university departments had authority to stage.

The event, CG68, was a three-day single track invited speakers conference. It was followed by a two-day information swapping seminar restricted to speakers and Brunel researchers only. It proved a very effective way of dealing with the steep gradient of my learning curve.

In order to ensure an attendance and not be embarrassed with a financial shortfall, we all worked hard developing mailing lists and distributing leaflets. In fact we ended up with an 'embarras de richesse,' over 450 delegates. The largest lecture theatre in the university seated only 180 — fine for the first 180 registrants — everyone else had to watch the proceedings on CCTV. Such was the thirst for knowledge about computer graphics in those heady early days.

Flushed with the success of the conference, we started planning for a major event. CG70 would be the world's first ever major computer graphics congress — I obviously found the event organising much more stimulating than writing machine code! For CG70, we would run three parallel streams of sessions — we planned for more than 100 speakers and also to run a hardware exhibition. We set our sights on 1,000 delegates.

Again unwittingly funded by the university as a short course, we set out to do the job "properly." A call for papers went out to worldwide mailing lists and I scheduled a three-week tour of U.S. research facilities to pick brains and develop the structure of the conference programme. I also had to persuade the key computer companies to participate in the exhibition — essential in view of our limited cash flow.

It was this trip that alerted the university administration to the fact that we were not running your average short course. I remember being summoned to the vice chancellor's office. He wanted to know why I was going and what would be the effect on our conference if I didn't. I naively explained that my trip was essential for the development of the conference programme and also for the exhibition. The university had announced that it would be running this major congress and we would look pretty silly if it was a flop.

In hindsight, his response was quite prophetic. "Well, you had better go, but I'll tell you this — your expenses for this three-week trip are greater than my annual travel budget — and you are a research associate at this university and I am the vice chancellor."

As many older readers may remember, CG70 was in fact a big success — over 100 speakers, 40 exhibitors and in excess of 1,000 delegates. The published proceedings were the computer graphics bible for several years to follow. The university broke even on finances but sent out an immediate edict — never again would it risk public money in this way. I had already started developing the theme of our next event due for 1972 — Online Interactive Computing. The university was keen to hold the event but with commercial funding. I did try to get support from various computer related companies but they all considered the venture too risky.

I was determined that the event should run so took the only option left — to go it alone. I packed up my research — which hadn't gone that far anyway and reentered the real world. With no more personal income and no open university chequebook for the event, my mind became focused quite quickly. If all those people were so keen to pay delegate fees to the university to learn about computer graphics, I thought, then what

about getting them to pay me. So I scheduled a computer graphics tutorial seminar at which I would be the primary presenter. I invited two co-presenters from the U.S.A. — Prof. Andy van Dam from Brown University and Prof. John Brackett from MIT. Together we presented a three-day, two-track seminar. My conference marketing skills developed with CG68 and CG70 didn't let me down. Again success — as well as happy delegates. I had sufficient funds to finance office space and staff to help me set up Online 72.

But the treadmill had started. I needed to stage regular seminars to keep up the cash flow — big conferences are expensive to run. however it all worked out well. Such was the thirst for knowledge that Online 72 was every bit as successful as its predecessor. Conference organising, which for me had started as a means of quickly climbing the learning curve in my chosen research field, had become my profession. Gradually I developed and broadened the range of computer and communications events that we staged. Online Conferences Ltd. had become a real and exciting business.

To cut a long story short — after some 20 years of designing and staging technical conference events, in 1987 I sold the company on the London Stock Exchange. By that time it employed more than 120 specialists and had offices in London, New York and Singapore.

I was in the right place at the right time and was lucky enough to be able to take advantage of the opportunities. I have not been near a conference since. I emigrated to Australia after selling Online and now am besotted by helicopters. My pride and joy is my twin turbine Eurocopter EC135 which I use for outback photography missions. This machine well illustrates how computer graphics has come of age. Its instrument console has no less than eight computer graphics screens for flight control and pilot information.

Rutherford Appleton Laboratory

Computer Graphics on the Chilton Site in Oxfordshire

F.R.A. Hopgood

Just South of Oxford in the United Kingdom lies an old Battle of Britain aerodrome at Chilton which, just after the 1939-45 war, became the site of the Atomic Energy Research Establishment. Later the Rutherford High Energy Physics Laboratory was located on the same site and in 1963 the Atlas Computer Laboratory was set up in between the two.

Aldermaston was located about 20 miles away and the Culham Laboratory for thermonuclear research developed as an offshoot from Harwell in the early 1960s. I arrived at Harwell in 1959 and started working on a fuel rod analysis programme (that is how we spelt it in those days!). Somebody mentioned to me that, rather than using graph paper to plot results, there was a Benson-Lehner plotter that would do the job, and that's how I got started in computer graphics. The plotter accepted paper tape and it drew lines between points specified on the paper tape. The speed was not that impressive, being measured in a few vectors per second. The plotter would wander off course if the increment between points was large, so care was needed not to make too large a vector movement. Accuracy was not too good either - drawing a circle as a number of line segments inevitably produced a circular curve where the first and last points did not coincide! We used to put our paper tapes in the queue and

About the Columnist
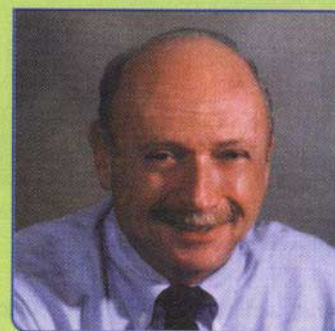
Carl Machover is President of Machover Associates Corporation, a consultancy providing services to computer graphics users, suppliers and investors. He has been interested and involved in the field of CG for many years, written numerous articles and conducted a number of seminars. Machover is Editor of the CAD/CAM Handbook (McGraw Hill, 1996) and serves on the editorial board of several publications.

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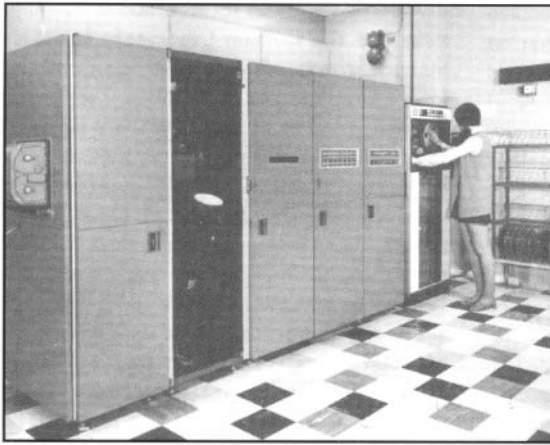*Photo credit: Louis Fabian Bachrach*

Figure 1: The Atlas SC4020.

Figure 2: Bob Hopgood presenting at the 1969 VAIDE Conference. On the far right, Nelson Max awaits his turn.

the output came back later. As the machine started getting busy, the chances of getting your own output back receded. The next exercise was to produce a simple character font so that you could write your name on the output! This I did and people were most impressed asking how I had managed to get it to look like handwriting - the accuracy of the device was such that that came for free!

Early on we became interested in the Stromberg Carlson SC4020 microfilm recorder with its CHARACTRON shaped-beam tube, which must have produced most of the world's graphical output in the period 1956 to 1960. The beam was extruded through the character template so that output was significantly faster than a conventional lineprinter. The SC4020 could generate 20,000 characters a second or 10,000 vectors. A single SC4020 could produce 1.5 million frames a year while the average plotter was doing 5,000 frames a year. By 1962, it had its own user group, the Users of Automatic Information Display Equipment (UAIDE) and its annual conference was the home for leading edge computer graphics papers until SIGGRAPH came along.

Aldermaston got an SC4020 in 1962 and I was seconded to Aldermaston in December 1962 for about nine months to help write a Fortran Compiler for the IBM 7030 Stretch, as IBM's delivered compiler turned out to be too slow to be useful. There, some of the more demanding users of the compiler system were also attempting to produce animations on the SC4020 although it had been primarily purchased as a fast lineprinter.

Late in 1963, a significant part of the Harwell computer group moved to set up the Atlas Computer Laboratory and we installed two IBM tape decks so that we could continue to make use of the SC4020. We eventually acquired our own SC4020 in 1967 and at that time started providing a computer graphics service to Harwell and the UK universities. This carried on until about 1985.

Computer animation started around 1961. The early SC4020 systems only came with a 35mm camera and no pin registration. This had two major problems. Firstly, not many people had 35mm projectors so that it was difficult to view the output. Consequently, it was necessary to reduce the 35mm to 16mm before viewing or attempt to use a 35mm editing bench. The lack of pin registration meant that unless the camera was in excellent condition, the film jittered up and down on projection, and this was the second major problem. The results tended to be admired less for the quality than for the fact that they could be achieved at all! Stromberg Carlson eventually added a 16mm Voight film camera, alas with no pin registration, and we had one of these on both the Aldermaston and Atlas SC4020s.

For software, Stromberg-Carlson provided a device level package and we added a Fortran system developed by Paul Nelson. I developed an Algol graphics system called GROATS (Graphical Output on Atlas for the SC4020). I had looked at the facilities in the GHOST system developed at Culham (by 1967 they had their own Benson Lehner Microfilm Recorder) and the POLY-GRAPHICS system developed at the Polytechnic Institute of Brooklyn, and used the best of both these plus some ideas of my own.

GROATS had recursive region definitions and the ability to define objects that could be animated, and we also added animation effects such as pan, zoom and dissolves. The SC4020 became the focal point for a great deal of graphics production in the UK, particularly animation, in the period 1967 to 1975, after which we replaced it with an FR80 that continued in service until the mid 1980s.

We regularly attended the UAIDE conferences. By the late 1960s, UAIDE had lost its SC4020 exclusivity and Burtnyk and Wein from the National Film Board of Canada, Francis Honey from Computer Image in Denver, Ken Knowlton from Bell Labs and many others were regular presenters. I met Nelson Max for the first time at the 1969 UAIDE Conference in San Diego at the Hotel Del Coronado. In the UK, I started teaching at Brunel in late 1967 using computer animation to illustrate compiling techniques, and became involved with the two international conferences, CG68 and CG70, organised by Richard Elliot-Green, Mike Pitteway and Bob Parslow at Brunel.