Digital Hologram Ambitions and AMIGA BIRD, 1981-1989

By Rob Munday

Digital Hologram Ambitions and AMIGA BIRD, 1981-1989

By Rob Munday

Early digital hologram ambitions

My ambition to create computer-generated and digital holograms began while I was studying for a BA (Hons) in Scientific and Technical Graphics at Plymouth Polytechnic, Plymouth College of Art, and Cornwall Technical College. The hologram bug had already bitten. In 1981 I had seen the first-ever international exhibition of creative holography in the UK, at The Photographers' Gallery in London. I returned to Plymouth determined to teach myself holography while simultaneously exploring a future in computer graphics and animation.

It didn't take long for an idea to materialise - to combine computer graphics with holography. Research soon led me to holographic stereography, a specialised technique for creating holograms from stereographic sequences of photographs. In particular, I became fascinated by the cylindrical holographic stereograms, known as integral or multiplex holograms, invented in 1971 by physicist and holographer Lloyd Cross in the USA.

I wrote to Michael Wenyon, author of the first holography book I had ever bought, to ask whether anyone in the UK could make such holograms. At the time, we were learning to write software on Plymouth Polytechnic's mainframe computer, using Fortran to build simple 3D models, render 2D images, and output them to a pen plotter. My plan was to computer-generate a stereographic image sequence and commission a multiplex hologram from it. Michael replied, explaining, as the letters below show, that there was likely nowhere in the world capable of producing one at that moment. See the end of this document for the two letters.

With my holographic ambitions temporarily thwarted, I instead created a computer-animated anaglyphic 3D educational video. Anaglyphic video itself was quite groundbreaking at the time, and mine illustrated molecular structure and the valence shell electron pair repulsion (VSEPR) theory.

In my final year, in 1983, I finally made my first hologram: a simple single-beam Denisyuk hologram of a metal belt buckle in the form of a ram's head.

After graduating in 1983, I was extraordinarily fortunate to be offered a position at Richmond Holographic Studios, one of the first hologram studios in the UK, working with pioneering artists-holographers Edwina Orr and David Trayner as a trainee holographer and holography tutor. Edwina told me some years later that it had been my interest in computer-generated digital holograms that had swayed her to offer me the position. In fact, a 3D wireframe image of a sinusoidal wave, which I created whilst at college, was adopted by Richmond Holographic Studios as its corporate logo.

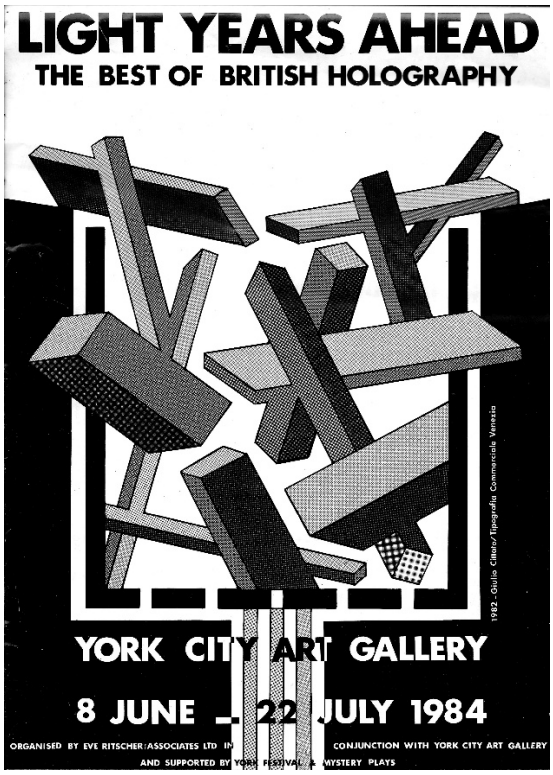
My next foray into combining computer graphics with holography came in early 1984. While working at Richmond Holographic Studios, I was approached by Edwina Orr and Eve Ritscher, Eve being the producer and curator behind some of the world's first major holography exhibitions, including *Light Dimensions* (1983), a landmark show hosted by the Royal Photographic Society in Bath and later by the Science Museum in London. The London exhibition alone attracted more than 250,000 visitors.

Buoyed by the success of *Light Dimensions*, Eve organised her first dedicated creative holography exhibition, *Light Years Ahead – The Best of British Holography* and invited me to contribute a work. I was both honoured and excited as this would be my first appearance in a creative holography exhibition, and my work would be shown alongside that of many pioneering artists - my early holography heroes.

Time was short, so I returned to the same computer-generated molecular images I had hoped, two years earlier, to use for an integral hologram, and which I had already employed in my anaglyphic educational video. From these I created a simple two-image holographic stereogram. Though modest in concept, the hologram, like all holograms in those early days, was technically demanding, and its successful completion felt like a major achievement.

Light Years Ahead – The Best of British Holography marked the first time I exhibited a work within the creative holography community, a milestone that helped set the course for everything that followed.

Molecule by Rob Munday 1984



Light Years Ahead at the York City Art Gallery, 1984

In 1985, while attending the second International Symposium of Display Holography at Lake Forest College, and in recognition of my ambitions to create computer-generated digital holograms, Dr Stephen Benton offered me a much-coveted place at MIT within the hallowed Spatial Imaging Group. At precisely the same moment, however, holographer and artist Peter Miller invited me to join him, together with pioneering holographers

Prof. Nick Phillips and Graham Saxby FRPS, to co-found and build a new Holography Unit within the Photography Department at the Royal College of Art in London. Peter would serve as full-time Senior Tutor, with Prof. Phillips and Graham Saxby appointed as part-time visiting lecturers. One full-time post remained unfilled: Senior Technician.

Because my ambition was to become a creative holographer and holographic artist, I initially declined the role. But when the first round of interviews failed to produce a suitable candidate, Peter approached me again. The decision became a true crossroads - MIT or the RCA. Peter ultimately persuaded me to accept, on the understanding that we would work jointly together, in a non-delineated fashion, to establish and run the world's first and only Master of Arts degree in Creative Holography; that I would design, build, and operate the UK's first dedicated pulsed-laser holographic portrait studio; that I would collaborate with and learn from the inimitable Prof. Nick Phillips; and that I would have full access to the RCA's facilities to create my own holographic artworks.

Although MIT would have offered a more direct route toward my digital holography aspirations, I felt it would be predominantly technical and offer far less scope for creativity. At just 27, therefore, I became the youngest 'senior' staff member in the history of the Royal College of Art and Dr. Steven Benton would later compliment me on creating the world's first 'digital' holographic stereograms.

The first year, staff and students, from left to right:

Back row: Students Martin Richardson and Graham Tunnadene, visiting lecturer and consultant, Graham Saxby, students Kevin Baumber and Jean Bailey.
Middle row: Students Patrick Boyd and Susan Cowles.
Front row: Founding members of staff, Peter Miller, Nick Phillips (visiting lecturer and consultant), and Rob Munday.

Side Note: In 1986, Peter Miller left the RCA under difficult circumstances, and I was offered the Senior Tutor position. Acknowledging my relative inexperience, and out of respect for Peter, I declined. The role was eventually given to the commercial holographer and former accountant Michael Burridge, who was brought in to manage the unit's finances. As noted in the book Holographic Visions by Sean F. Johnston (2006), I therefore became a de facto tutor in practice.

AMIGA BIRD - the world's first home microcomputer generated hologram

From 1985 to 1987, my creative focus as a holographer and artist was centred on making pulsed-laser hologram portraits of animals and people. In October 1987, however, an event occurred that would profoundly influence my career and ignite my ambition to advance the emerging field of computer-generated digital holography: the launch of the Commodore Amiga 500 home microcomputer and the software programs *Sculpt 3D* and *Animate 3D* by Byte by Byte.

Priced at £499, the Amiga 500 was the first home microcomputer capable of producing sophisticated computer-generated models and images. Paired with *Sculpt 3D*, the first modelling, ray-tracing, and rendering program available to home users, it enabled artists to create photorealistic digital images complete with reflections, shadows, and transparency, all from their own living rooms. For the first time, it was no longer necessary to beg, borrow, or steal time on an expensive high-end workstation or mainframe computer.

Naturally, I purchased one immediately.

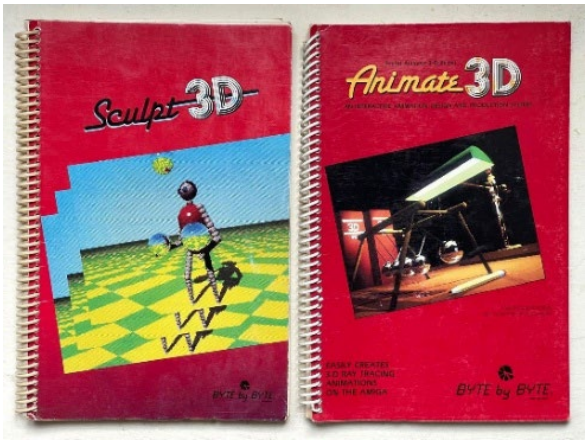
The Commodore Amiga 500

Eager to try out my new creative tool, I began learning how to create 3D computer models and images. Also in 1987, the Royal College of Art Holography Unit was honoured to receive a visit from Dr Stephen Benton of the Spatial Imaging Group at MIT, USA, a leading pioneer in holography and famous for inventing the rainbow hologram. He showed us examples of his very latest work in holographic stereography, including a beautiful achromatic (black and white) 3D stereogram of a range of mountains made using aerial photographs. This inspired our own visiting lecturer, Prof. Nick Phillips, to design and build a holographic stereogram mastering system at Loughborough University, where he was based.

The system was funded by the Computers in the Primary and Secondary Education (CITE) government program and took over a year to complete. Once up and running, it was made available to RCA students and staff to use. The system required that a stereographic image sequence be provided in the form of a 35mm film strip, containing approximately 100 images or views. I took full advantage of the opportunity to create what is believed to be the first-ever holographic stereogram made using a home microcomputer generated stereographic image sequence, and so, in the autumn of 1988, I set out to provide Nick Phillips with a stereographic image sequence, generated using my Commodore Amiga 500 and Sculpt3D software.

By necessity, I chose to create and render a simple wireframe model, albeit with a small amount of animation in the form of a bouncing ball which formed the dot of the 'I' in the word AMIGA, as each of the one-hundred frames in the sequence, even though only depicting a wireframe model, took several hours to render. A full

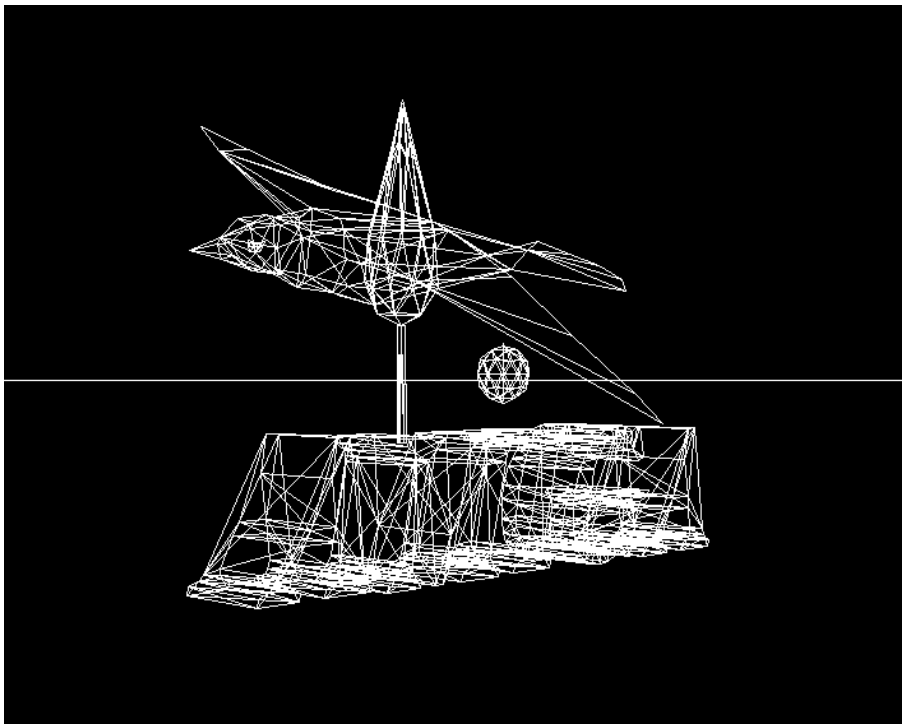
colour, fully shaded model, even though the computer and software were entirely capable, would have taken several months to render.



The Sculpt 3D and Animate 3D manuals by Byte by Byte

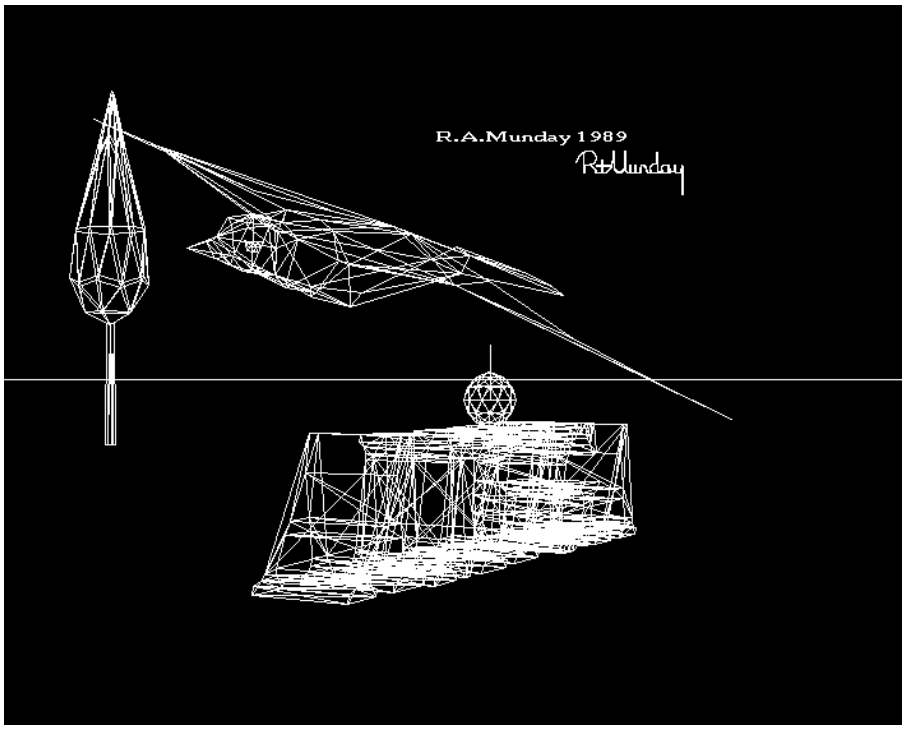
Each frame, once completed, was saved to a floppy disk. After the full sequence was complete, I photographed each frame, one by one, directly off the computer monitor screen and sent the processed film strip to Loughborough University. The holographic stereogram, named *AMIGA BIRD*, was completed in early 1989.

This first stereogram was a test case and was created before it was possible to easily remove the keystone/perspective distortion from each frame. The hologram thus shows, what we would now call the 'carousel' effect, i.e., an unnatural swinging of the image as the viewer moves.

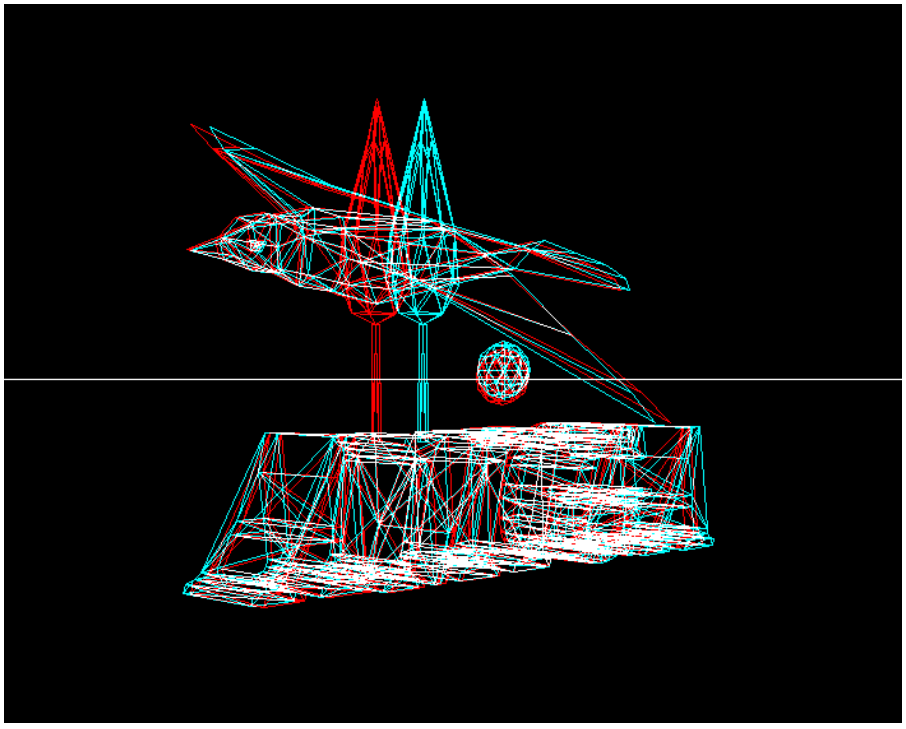


An original frame

I chose to add a discrete end frame to the sequence such that, when the final hologram is viewed from a specific and extreme angle, my name, date and a signature appear.



End frame showing credits



An anaglyphic image

Early the following year, I persuaded the largest retailer of Amiga computers in the UK, the Amiga Centre Scotland, to show my hologram on their exhibition stand at the Commodore Show, held at the Novotel in Hammersmith, London, in June 1989. It was accompanied by a video, running on an Amiga, which described how the hologram was made, and attracted the attention of hundreds of visitors and the computer press.

The display on the stand of Amga Centre Scotland at The Commodore Show, London, 1989

As far as the author recalls, only four copies exist.

One copy resides in the Dr. Tung H. Jeong collection and is on permanent display at the Dr. Tung H. Jeong Holography Gallery, located in the Lillard Science Centre at Lake Forest College, Lake Forest, Illinois, USA.

One copy resides in the Jonathan Ross Collection, London, UK, gifted by the author.

Two copies are held by the author.

Articles have appeared in several magazines, including Holographics International Magazine and Amiga Format magazine:

The Amiga Centre Scotland stand where Munday's stereogram was exhibited.

Munday Makes It With an Amiga

A hologram by Rob Munday of the Royal College of Art in London, Britain, was exhibited at the UK Commodore Computer Show in June. Made using CITE programme equipment (see page 22), the holographic stereogram consists of images from computer equipment which costs less than £1000 (US$1600).

Rob Munday, who originally studied Electronic Imaging, has recently been conducting research into using low-cost computer systems to produce stereograms. In particular he has been using the Commodore Amiga, which is capable of solid modelling with realistic rendering of full colour images. The software allows for multi-coloured light sources which give the scene highlights and shadows, texture mapping, and a choice of surfaces including metal, mirror and glass. Full animation capabilities enables the generation of the 200+ views needed to make a holographic stereogram.

The first Amiga hologram, which was part of the display pictured, was monochrome and of a simple wire frame image, though Munday is already working on a colour sequel. He chose a simple subject partly due to the processing time necessary which, for a complicated subject, can be several hours for each frame.

Commodore has now given the CITE programme some more powerful computers, and a project designed to link personal computers with fast CRAY supercomputers has been initiated. It is therefore hoped that it will soon be a straightforward matter to produce complex colour holograms, using personal computers and the CITE project, in a relatively short time.

Holographers Meet in Bath

The *Second International Conference on Holographic Systems, Components and Applications* is due to take place in Bath, Britain, from September 11-13.

Organised primarily by the Institute of Electrical Engineers, the conference will include sessions on holography in measurement, display holography, computer generated holograms, photorefraction and phase conjugation, and holographic optical elements.

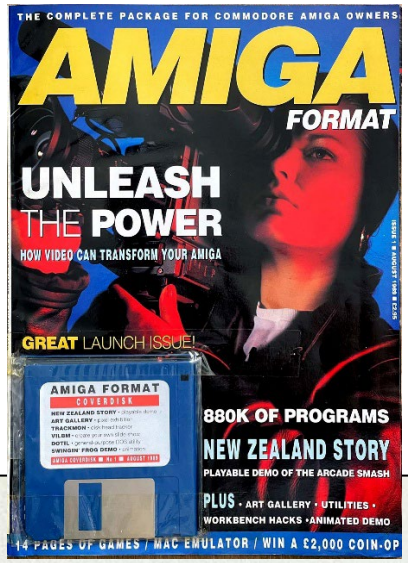
For registration details please contact Conference Services, IEE, Savoy Place, London WC2R 0BL. Telephone: (+44) 01 240 1871.

Zec Chairs FRG Holo Society

A holographic society was formed in the Federal Republic of Germany on March 3 of this year. Its chairman is Peter Zec, author of *Holographie-Geschichte, Technik, Kunst* (see reviews page), and its vice chair is taken by Brigitte Bürgmer, author of *Holographic Art/Perception/Evolution/Future.*

The society was founded to promote awareness of holography, and its members are mainly holographers and artists. To this end, the group intends to organise exhibitions, and has access to two holographic studios, in Osnabrück and Munich, in which members can produce their own work.

For further information contact Peter Zec, Deutsche Gesellschaft der Holografie, Lerchen Strasse 142a, 4500 Osnabrück, FR Germany. Tel: (+49) 0541 186059.



GSIGNS OF LIFE

ch was
own by
ave an
usions.
since
e have
ftware
clusive
Music
at the
taking
n staff
work,
oing to
e final
a pro-
sed for
tivision
egotia-
ut con-
o stand
!

SY

on the
gs are
it was
will be
have

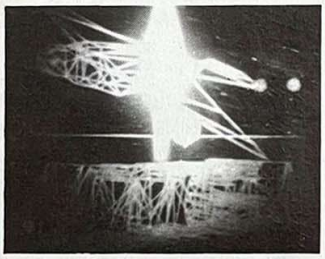
int has
of the
ges for
ne easi-
interly'.
e easy
best
on the
ew ver-

Microillusions is available on import from Digipro, Southampton (tel 0703-703030) at £79.95.

HOLOGRAPHIC AMIGA

One of the more unusual sights at the Commodore Show was the first hologram generated from a microcomputer image. Using equipment developed at Loughborough University and an Amiga 500, Rob Munday and his team, with advice from the Amiga Centre Scotland, have produced a 3D holographic view of a partially-animated wireframe bird rendered using *Sculpt 3D*.

To produce it, over 100 frames were generated and recorded onto a holographic plate in stereo pairs as a series of vertical strips. Viewing the image from the front, slight movements of the head reveal hidden parts of the object that would normally only be seen if it was real and solid. This is normal for a hologram as anyone with a bank card knows. Usually though, the object from which a conventional hologram is taken is a 3D model; here it is a series of flat, 2D images. This is much more difficult and has previously only been achieved using high-powered Cray supercomputers. Now, in another first for the Amiga, a 3D computer model has been recorded holographically.



The physics is quite difficult, but if I understand it correctly, the process works something like this: conventional holography captures the image of a complete 3D object in such a way that the parts of it that can be seen vary according to your viewpoint, just as would happen with a 'real' object. In effect the hologram has superimposed an almost infinite series of 'views' of the object which are revealed as your viewpoint is changed. Stereoscopic holography has the same effect but in this case the 'views' are captured separately like the frames of a stereovision film, one for each eye, in the form of pairs of vertical strips on the plate.

The advantage of this method is that the content of each 'frame' is much more controllable so that any object capable of being modelled on a computer can be captured in 3D and even animated. The use of Amigas, or other cheap micros, also means that the commercial potential of such 'animated' holograms is much more likely to be realised. It is only a matter of time before full-colour, fully-animated sequences and even whole films appear.

Faculty of Art and Design
Head of Faculty P. McComb, F S I A D.
Deputy Head of Faculty G. B. Hewitt, N D D., A T C.

6th December, 1982

Goldsmiths Holography Workshop,
The Millard Building,
Cormont Road,
London,
SE5 9RG.

Dear Mr. Wenyon,

I am at present a student attending the above College and studying my fourth year of the B.A. (Hons) Scientific and Technical Graphics course. After reading your book I have become very interested in holography and have based one of my fourth year projects on the subject. In particular I am very interested in combining computer generated images with holography. In short, the College is willing, on my behalf to purchase, depending obviously on financial considerations, a 120° integral/multiplex hologram made from an animated, computer generated image, supplied by myself on 16 mm film. I am therefore very interested to discover if there is anywhere in Britain that can make such holograms. I would be very grateful therefore if you could inform me, if, to your knowledge, there is any such facility available and if so, an address to which I could write for details.

I would also be grateful if you could forward dates of future introductory holography courses at Goldsmiths Holography Workshop.

Yours faithfully,

R. MUNDAY

Cornwall Technical College

Principal
L P S Piper
Redruth
Cornwall
TR15 3RD
Camborne
712911
Telex 45382

Goldsmiths' Holography Workshop

The Millard Building
Cormont Road
London SE5 9RG
England

(01) 733 3716

22 December 1982

R Munday
Faculty of Art And Design
Cornwall Technical College
Redruth
Cornwall TR15 3RD

Dear R Munday,

I don't know of a company offering a reliable commercial multiplex service currently anywhere in the world, let alone in England. We have the technical expertise and equipment to make such a system, but it would be a time-consuming research program of several weeks to do so and we certainly don't have the funds to support such an enterprise.

The workshop's teaching programme has been suspended indefinitely because the grants given for this project expire at the end of this month. I can't give you dates for an introductory course now but I'll let you know as soon as one is scheduled.

Thank you for your interest.

Yours sincerely,

Michael Wenyon

Michael Wenyon

Published 20th May 2026 •