

# Rough Draft Story of Multiplex by Lloyd Cross

This is the story of Multiplex as I've seen it happen. And the story of Multiplex starts with the School of Holography, which starts with Jerry Pethic and I meeting up in Ann Arbor, Michigan in late 1966 or 1967. At that time I was working for a technical company, KMS Industries as the head of the laser laboratory. I had been primarily interested in laser development up until that time and I was just beginning to become interested in holography. I meet Jerry because he was a Canadian artist living primarily in England for the last ten years. He was interested in holography for use in his work - in sculptures as well as any other of his works. I also operated an art gallery and a print shop, print and frame shop and was interested in the arts. My personal friends were artists or crafters at one time or another, at that time. I went over to London to help him set up a rudimentary holographic arrangement on his studio floor which we made a couple of very tenuous sort of holograms on. And later that year he came back to Michigan to stay for a while. We quickly developed a close friendship and spend many hours and days spending a lot of time sitting around trying to get to the bottom of the complications of holography, which at that time seemed enormous. Huge granite slabs required for stability with expensive three point metal components. Neither of us knew much about the process itself, I knew it from a theoretical point of view but not from a practical point of view. It was one of our evening conversations that Jerry came up with using boxes of sand as a base for making holograms. And after going through a few of the ideas, we tried it once and then a couple of times and wound up with using tubes to hold the components in the sand. It of course worked incredibly well. We were both amazed at the amount of stability and the incredible ease of setting up making holograms. So we built a little studio in the basement of the art gallery area and proceeded to make holograms. I fortunately had a cripton laser at my disposal from coherent Radation. so we were able to make some incredible holograms right from

the start. Everyone we showed the holograms to were more than amazed they were overwhelmed by simplicity of it all (the sandbox, etc.). We didn't try to keep it a secret or anything, we were primarily interested in the art itself. I began delving into the literature, learning as much as I could about it and along with Don Brodbent, Allen L., and a few other people, Carl B., we formed a sort of small group of holographers. We found ourselves, suddenly, putting almost all our time and energy into holography. Through Peter VanRiper we got a chance to put up a show at the Cranbrook Institute in Detroit which is a fairly, locally at least, precious art museum. So with a small grant, we mounted a small show with over twenty-seven of our holograms. It was the first show of any kind of art holography and certainly the first major show of art holography anywhere in the world. And that was in 1969 at Cranbrook. I had left KMS Industries in the mean time and formed one other corporation on my own which lasted for one year before I finally got out of that. That enterprise had to do with the development of laser projection, devices for visualising sound, called Sonovision. At any rate in 1969 we had our first show of our holograms and they were really good, a lot of the classic holograms, many of which are gone now including the 'Champagne Glass', 'The Ceramic Doll', some of Jerry's plastic sculpture holograms. Allen L. and mine 'Lemon Meringue Pie Piece', which was a series of four holograms showing a lemon meringue pie being eaten. The show was a tremendous success, packed incessantly with a line of people standing in line to see the 'Champagne Glass' which had its own special guard to protect it. And one of the people <sup>John</sup> Lane Varium from Finch College Museum in New York. Lane had the reputation for being the first person to show a number of artists in New York. One of the first people to show Andy Warhol, the first to show Bob Roushenberg, Jasper Johns - people like that. So, when she saw our show, she was impressed by it and decided to be the first major art

gallery in New York to make a major show in holography. In April of 1970 we made another incredible batch of holograms, took them to New York and set up the "In Dementional Space Show". Which also incorporated holograms made by Robert Indiana, with Robert Indiana in our studios, George Ortman who made the "Egg's Hologram", Robert Indiana made his "Love Sclupture" hologram, Bob Nomin contributed one of his spaces of a pulse hologram. And although the show was rather formally arranged, it was a very good show of laser lit holograms. It was for this show that Jerry made the "Space Going Away" hologram. It, again, was a tremendous success in New York. It had very good reviews in all the magazines; Douglas Davis, the art editor of 'News Week' gave it a full page. It still ranks, I would say as, perhaps, the best show in Holography that has ever been put on. At that point, we were definitely into holography and we decided to move to New York.

That was sort of a short chronology of events up to 1970, the In Dementional Space Show in New York. Now, I'd like to go back and review how we felt about it or what we were doing during that period. My initial motovation for getting into holography was, Pretty much an equal interest in the technical challenge and being a new field where where so much obvious inovation possible, so many things you could do with it. Jerry, I think, was interested in the same kind of thing But a bit also mor specifically on how he could use it in his own ongoing work at that time. But then, as I said before, it very much quickly became a pretty much a total obsession for all of us that were involved in it. I specifically remember the day, sometime in 1968, walking across the \_\_\_\_\_ of the University of Michigan in Ann Arbor and thinking that my head really had finally found something that I wanted to put my time and energy into for a number of years. I wanted to become a holographer, it wasn't as much of a decision as a revelation to me. I could really feel my interest and my energy going into this craft.

art, trade. Then, we were interested, also as our time became more involved with holography, in supporting ourselves through the work we were doing and that, of course was part of the motivation for the shows. Along with just showing our work, we also wanted to sell it and we also wanted to support ourselves off of it. So we began to, right from the very beginning to explore techniques that would make holography more commercially feasible. Namely, white light techniques to eliminate the laser primarily in the viewing of it. In New York, our sort of artistic aspirations, sort of peaked for a while and we set up a studio first on Broom Street and then on Prince Street. We had a lot of problems with vibrations, of course, the environmental conditions were not good in New York and we didn't stay there too long. Both Jerry and I had been to the west coast, I had been to San Francisco many times, through the 1960's and we both were interested in coming out here to San Francisco to stay and work. So it was that Jerry first left New York and came to San Francisco during 1970 and I followed a few months later. Pim Giebles and I loaded all the holographic equipment into a station wagon and we drove it across the country. And on the way Peter Nicoloson and I a New York artist, whom I had met in New York, stopped at \_\_\_\_\_ College, or met at \_\_\_\_\_ College, Prep School rather in Arizona where we spent three months teaching sort of a special course in art optics and holography. It was at that time that I gave my first actual class in holography to a group of eight or ten highschool students. And worked out a basic method of teaching holography to people in the sandbox who had absolutely no previous technical experience of any kind but were simply motivated, interested by the phenomena itself. The experiment, you might call it, in \_\_\_\_\_ Valley was quite successful and all the students made good holograms and had a good time. So when I ----- on in to San Francisco that summer, we set up another show of holograms at the Exploritorium, where I also worked part-time for a few

months and immediately began thinking about a school of holography here in San Francisco. Now at that point, our feelings began to get a little bit mixed, we went through a little paranoia, which I think was mostly voiced by me. Which had to do with the fact that, sort of, here we were, artistically at least from our reviews and so forth sitting on top of the art hologram world. Why should we spend our time and energy in teaching other people these techniques, permitting anyone to go out and make the kind of holograms that we were making, and letting our own work go in the mean time. Well, that didn't last too long but we did go through that paranoia and we got through it and decided to start the school of Holography because we really wanted to. The sort of basic things we were looking for from the school was a base, sort of a minimal base level of income. Not to make a lot of money out of it, not as a capitalistic enterprise, but as a way of supporting ourselves and supporting a holographic studio of a major kind. So, as soon as we got our heads clear on that, we started out with a lot of energy and no capital. We built all the initial equipment out of the first tuitions from the first classes and the fall of 1971 we began the first classes at the school of holography at project I in San Francisco. The first classes were held in October late October 1971 and they were an immediate success. Jerry and I had a good time teaching the classes, It was a lot of work in the beginning but it got easy later on. We immediately got a number of students who were more or less totally interested in holography and eventually became assistants and began helping us teaching and then instructors in the school. By spring of 1972, we began looking around for a larger warehouse and we found the warehouse on Shotwell Street, where we are now located. It was initially thirtyfive hundred square feet and a pretty solid stable location, about the best we could find in the city for the price. We then continued the classes in the school and then in the summer of 1972 we had our first advanced course or really advanced projects course in holography. Now

this first projects course in holography was a group of ten to twelve people including ourselves that were really interested in both making new kinds of holograms and just making holograms of our own. We discussed a number of things we wanted to do. dividen up into small groups and began working on these various projects. One of the projects was multiplexing holography. Now here I've got to take a step backwards to Arizona. In Arizona, my set-up a small sandbox in an old barn, a small structure in the middle of this beautiful desert in Verde Valley. I would be continually shocked every time the door was opened and looked out into this incredibly beautiful brilliant blue sky red rock green plants flowers hills, Arizona countryside. And realise that with our present technology I could not capture that incredible three dementional scene with people and horses and soforth on a holographic plate. So, I became quite determined to at that time to do something about that, and of course, one of the answers was multiplexing holography, as were a number of other people at that time. So that was sort of the, you might say, the place where I got the determination to the multiplex holograms. I worked out the ideas to make an intergral hologram from cine film at the Verte Valley School. At that time I didn't have any idea of how to view this in white light except to project this into the image plane, but I was certainly thinking about it. So, the school got started and the first advanced project class in the summer of 1972, naturally that was one of the projects among several others that we desided to work on. Myself and a fellow named Tim and Lesley are princapily worked on making a multiplex hologram of Lesley. This was done with thirty-five millameter still camera. We built the wooden apparatus, I had actually built Verde Valley We sort of rearranged that to fit 35 mil cine and arranged it to move at a 60 angle moving about her face and take 35 color slides of Leslie It took about fifteen minutes and she was very good at holding very still during this time. It was a still except for the last frame where

Leslie smiled in the last frame. By then, set up in a sandbox with a little two millowatt laser a basic Multiplex camera used the actual slides themselves, in a little holder made out of plastic where we placed the slides one at a time. And it took me one whole night to shoot that plate it was a four by five inch plate. The slit was moved across the plate by typewriter platens, this is something that anybody can do right today in a four by four foot sandbox very quickly and I got this little postage stamp three D picture and it worked. It worked exactly the way I knew it would, but again, the visual impact of a little head in there, especially the last frame with the smile was really a knockout. The visual impact was more than I had anticipated. That same night I took that plate, projected the image in space and made a reflection image plane hologram which also worked. I made two of those plates and they were viewable in almost any kind of white light because the image plane was essentially perfect. And that was the basic reduction ~~concept-of-my~~ practice of my concept of multiplexing with white light viewing in the image plane. That was done in the summer of 1972. The next step after the advanced course, well, at that time we were interested in two things; image plane holography itself which Lon Moore really got into heavily, we produced several hundred plates of spacemen, trains, rickshaws made by Liliana and myself and a number of beautiful 4" by 5" images. Lon Moore has now gone on to become an expert in that field and produces beautiful 4" by 5" reflection holograms and he lives in San Anselmo. So we built that whole camera up on a concrete slab and got it working and we also set up another slab on which to set up an automated camera multiplex camera. During that one night in the summer of 1972, I vowed to myself never to do that again. Somewhere between holograms, 16 and 17, when I was trying to keep track of the slides, wondering what number I was on and exposure time and the setting time and that would be the only Multiplex hologram I would do that way. I designed the basic automatic machine which became the Mark II

later on that year. The project slowed down in the fall because we started the classes again. At this time I want to mention the people that were involved and again our directions at the school of holography. Jerry and I at about this time decided to expand the school in the sense of allowing other people to become instructors in the school, and teach classes on the same basis as we did. I think that first group was Gary Adams, Fred Undisere, Lon Moore, and one other person, possibly Michael Fisher, I'm not sure and anyway we formed a group of five or six instructors and it was an interesting and significant change for us. There was Jerry and I having this little business going basically and letting other people sort of into it for nothing except they had put in a lot of work. They became instructors in the school and we sort of came up with a point system based on sort of days of work put in which had to do with our value or ownership of the school itself. But this was a significant change in the school and allowed us a formula for expanding and it was a self defined group. Jerry and I being the first self defined group of instructors. Anybody else became an instructor in the school came in agreement with us as to how we were going to do it, at least four people did. The agreement was basically based on communication. Jerry and I had always had good communication between ourselves. We talked about everything we were going to do before we did it, not after we did it, we considered the other person all the time in what we were doing. We figured talk was cheap and it was usually pleasant because it was easy to talk of what do you think about this idea or about that idea. Very little debating, mostly just discussion of what was going on. The only thing we required of the people who came in as instructors of the second group were that they followed that same principal with us in order to keep our life simple to talk a lot about what we were doing, about specifics. That doesn't mean that we spent a lot of time talking because we were also very action orientated and of course working in sandbox holography the talk would center around holography and we could very quickly end the talk by saying well lets go to the sandbox, lets do it



now. Let's not talk about it anymore. But, it never had anything to do with the facility or the publication or anything that we put out information with other people, we simply communicated with each other about it before we did it and that was about the only kind of agreement we wanted to come to with these other people. Financially it was very simple set-up, instructors money was split between the overhead. 50% to the school 50% to the instructors after you took out materials for the classes. People didn't have to pay for classes, they could work for the classes. Naturally the overhead demanded more money the instructors got less money and it was seldom that the instructors got their full pay. So it was working but it was a financially on the downslide all the time. We still had to borrow money our thousand dollars from Hugh Brady that summer to keep going into the fall. We had borrowed a thousand dollars from Doctor Bob to move into Shotwell Street. The thing was not yet self supporting and we were debating between the energy to put in to really get the classes going and a better basis to make it more self supporting or putting more effort into commercial techniques to make to make holograms we could sell and support ourselves. In any case we wanted to support ourselves off of holography and keep the basis of our energies about the directions of the school of holography, which was again, primarily, a nice working setup for ourselves, the instructors to use for for other people interested to use to make their own holograms and to provide us with a basic source of income in trade for what we could produce with that facility which was classes and holograms for people to have. Into that situation, now comes, in the winter of 1972 Selvin Lisic who came here and saw our Multiplex Lialiana, the multiplex hologram of Leslie and took it back to New York with him on the basis of a little tiny postage stamp hologram sold Salvador Dali a whole expensive program to make a twelve inch high , twenty four inch diameter 360 degree multiplex of Alice Cooper for one of their promotional campaigns. He was then a rising rock star and Dali was going to do the artistic composition

of a hologram. Selvin was arranging the cine shooting in New York, was in constant telephone communication with me here in San Francisco. And in over a period of thirty days with literally a telephone call every day, we finally got the filming done in New York in 16 Millimeter film and Selvin brought it out here in 1973, I think around February. And that of course sparked the beginning of the Mark II printer. We now had a customer for one of these holograms. The Mark II had been previously set up more toward information storage holograms, so we took that beginning set-up down and then began an incredible period of forty five days in which I designed and built the Mark II camera with a lot of assistance from a lot of people. Now, here other people come into the story, Mike Kan had always been around the school of holography. He wasn't really an instructor at that time but he had always been around helping, showing a lot of interest. David Schmidt who Mike was living with had been around a few times and then when we started on the Mark II, Dave started coming around a lot and quickly became full time. It was through Mike and Dave that Peter Claudius, Bob Tautin, and Carl Extine became involved with their cine equipment and technology. At any rate, the Dali hologram was made, it did work and the only problem with that sort of holography was that it wasn't white light viewable. You had to have a laser or arc source, neither of which were satisfactory. We made a bunch more holograms; the group hologram, The pam to best advantage, thi chi, Lloyd Zooms, and several others and took them to New York for a showing of holograms on Fifth Avenue at a place that Selvin had set up and also to attend the first medical conference on medical applications of holography. It was chairmanned by pal Greguse, the inventor of acoustical holography. This was one of the first public showings of the multiplex holograms tended by Emith Leith and Denis Gaborth. Both of those gentlemen saw the hologram for the first time and, of course, it was by far the most spectacular thing at the conference. One interesting thing at the conference though, at the table right next to mine where I had

the 360 set-up was a little white light rainbow hologram of Steve Bentons. And there was Steve Benton looking at my hologram and me looking at his hologram and both of us realising that putting those two together was the way to make a white light viewable multiplex although the way wasn't clear yet. Denis Gaborth and Emith Leith saw a hologram for the first time at that time and three of us stood around while people were taking pictures talking while I was explaining the technique to them. Denis's G. first word upon seeing the hologram after a minutes hesitation was splendid. Everyone was completely impressed by the technique at that conference. We then came back from New York, Pam went with me on that trip and when we came back. I immediately began to work on the white light technique. I made a rainbow hologram of a train which developed into the rainbow camera technique that we set up into production later on in the fall of 1972 and then about July or August I made the first white light hologram of Lilana holding a tea cup. To do this of course I had to make the plastic oil filled lense. I knew technically what I was going to get and I told everybody for a couple of weeks ahead of time what was going to happen what it was going to look like. It was going to be very coarse lines very bright white light viewable totally clear perhaps with some wierd optic effects as well. But, again, I didn't know what the visual impact was going to be until I saw the hologram and all I can say about it is for the first four hours after after that hologram came out of the wash there is no-one in htis building that did anything except look at that hologram, well into t night. It was just incredible. Again the effect was more than I could possibly imagine. That was done on the Mark II camera and in August we wrot up the first papers for the Multiplex Partnership and started the Multiplex Company as a business enterprise to support the school of holography and ourselves the fall of 1973. The multiplex company basically was a merging of two groups. The school of holography group; Myself, Mike Fisher, Gary Adams, Pam Braiser, at that time - George Dibinco, Fred was starting to work Lilana was going to start work on it and a number of other people. And in

David Schmidt's group there was Michael Kan, Peter Claudius who came in the scene sometime that summer - the summer of 1973 and Bob Tauton and Carl Extine a group of people who owned four Michael cameras among other things. A lot of processing equipment- a warehouse full of equipment over in Oakland It-had and had experience in cinamatography in 16 and 35 mil. So it was a perfect merging of two groups, both of which wanted to develop their own trade to support themselves and their own technologies. It was the merging of basically two loose partnerships these were labeled the Lloyd Cross partnership and the David Schmidt partnership into Multiplex company. Lloyd Cross partnership putting in their facility and equipment as a place to set up the business and Dave and his partners putting in the equipment necessary to set up a complete studio. So it was a pretty even match of talents, backgrounds, and as it turned out it worked almost perfectly for us. Carl, several people dropped out of both partnerships. Carl Extine and Bob Taunto dropped fairly early in terms of putting in day to day work effort. Lilana Fred Undishere also eventually George Dibinco and Paul Laveck dropped out of the school of holography side but the basic core of people are the core of people that remain here today plus new people who have come in since then. So thats really how the company got started. We desided to raise moneyfrom, to raise capital-working capital for an investment on a planwhich did not guarantee the investors large sums of money continued and huge returns for their investment. It was nowhere in the partnership papers and many partner. comented on it, many limited partners - investors comented on this whereby the investors could make a lot of money off of their investment. There is no guarantee of profit although they own a certain percent of the assets. The only thing we guaranteed was that they would get their money back as a percentage of sales once we were open for business. They would get their money back and then they would have a permanent ownership which ended up to be 15 percentin the company with no control of the operation of the company however and with a continued return on their investment in porportion to their ownership. But no guarantee of profits and no guarantee of a large

dividend or a large sale price based on us selling the company at a later time. So the investors we obtained were interested in what we were doing primarily for our purposes and wanting to help us and become a small part of what we were doing rather than take us over in any way and make a lot of money off of us. So I don't really in that sense the Multiplex Company was not organised as a conventional capitalistic structure where people invest a few bucks and make a big killing or investing a lot of money to have a continued return of income. Nobody in the limited partners intending to get rich off of the multiplex company. And the company itself was set up primarily just again for the same motivation as the school of holography. although the people who came into the company from outside of the company had more than that in mind, more of a standard business operation in mind. So there always has been a bit of conflict between the capitalist structure that we are emersed in which its only goals is profit and return on investment and our own goals which is to do holography, continue our work and support ourselves in an easy fashion. ~~Now-the~~ It was our intention to maintain the school of holography operation, teach classes, which we did for the next year and operate the multiplex company business as well. The first goals of the multiplex company where stated in August and September of that year as building a better version of the mark II namely the Mark III printer. Then going on to a new series of cameras called the Mark IV series, building a continuous roll film processer, or at least a semi-automatic film processer to process the multiplexes. Developpe the problem of displays even though we only needed a light bulb we still had to have a holder for the light bulb and the hologram. And to continue to developpe the facility. into a fine comercial cine and multiplex optical printing facility. We got the mark III printer running sometime in January of 1974, it was a bit of a slow start because we consentrated for a bit of a while on rainbow holograms which was a combined effort of the school and the multiplex company we were all the same people and we spent the fall of 1973

into 1974 working on rainbow holograms. It was a good experience for us but it did delay a bit the Mark III printer. Anyway the Mark III printer was up and running in good shape by July of 1974. In six months-January to July, 1974, I spent almost every single day in a little tiny room surrounded by the parts of the Mark III printer, getting them to operate. Building the lenses, making the lenses work, working out all the problems. Mike Kan and I principally were in that room for about 120 to 180 days. Until in the summer of 1974 the printer was operating satisfactorily, we knew all about it and all the problems were - we had the glitches all figured out the zebra lines were all figured out - any number of a wierd pheonomena that comes up when you first start to put together a Multiplex printer. We'd thoroughly worked out , we hadn't developed the slit optic yet, but we were ready to begin to test the market with the needs of these holograms the prices and methods of selling. So the real, we're really ready to start trial business in July of 1974 and thats about two years ago. todayand now we're ready toopen for business on a full world wide comercial basis. Thats pretty much a capulation of the first two fases of the multiplex story. The first fase being from 76 to 71 the story of Lloyd and Jerry up to the in dementional space show and coming to san francisco. the second part is the school of holography starting in san francisco. up to the actual beginning of the multiplex operation in july of 1974.

I first heard the workd holography in an artilce about Emith Leith in either local papers or in a local memo. I was working in the same laboratories as Emith Leith at the University of Michigan a well run development center 1962 , I think it was 1962 when he did that. i saw my first hologram that year and it was shown to me by no other than Emith Leith, himself. He had made it with his own hands and it was a hologram of the word 'fire' about a foot back in space, flat letters,and he he showed me the projected image and the virtual image of that hologram. You could only see a few letters at a time but he showed it to me on a frosted screen. and he gave me an explanation ofhow he did it not byusing

the componets but by just describing the pattern on the holographic plate in the terms of communication theory.

Starting with the July of the summer of 1974 when we first started selling holograms out of the Mark II printer after our one hundred eighty days in the hole, but by Mike Kam and myself primarily although David did a lot of the work <sup>on</sup> ~~of~~ putting the mechanical aspects of put---ing of the Mark III together, Peter and Gary also helped on that. It was Mike and I that I remember were working many, many hours also Pam was in there working many hours in that dark hole <sup>TUNING</sup> tuning up that printer. Anyway by the summer of 1974 we had it working and started making holograms for outside customers on a trial basis. The first one was a ring hologram for someone from Texas, I can't remember the other first holograms but at that time we started an invoice system at that time, we have complete records of every single hologram that we've sold. And I started making the first Kiss at that time I made Kiss II, I mean Kiss I of Pam with a hat and some flowers behind her. Kiss II is a technical perfection of Kiss I with the intention of going back and making Kiss III which would go back and combine all the pictorial aspects of Kiss I and Kiss II,,however Kiss II came out so bright and beautiful that we sort of stopped there for a while and began

The Pam and Helen hologram was made shortly after that and that was composed by Pam, directed and shot by me and pam together and then the Fisherman hologram and the all the other studio copies started to be made. But that first hologram that I made, what I consider to be my first perfected hologram was the Kiss II, made in the summer ~~made-in~~ of 1974 It hasa always been the most popular hologram



and the best selling of all the holograms that we have made. During the two years 1974 to 1976 we have been trying to do two things; One is trying to day by day work out our business relationships with the rest of the world. We started pretty openly with a pretty simple principle which was that we did not want to incorporate or get stuck in a capitalistic structure in at all in terms of receiving money for investment to make money to go into stock market operation of any kind. We wanted to keep it simple and orientated to our principle goals which were to

support ourselves in the field of holography and not break away from the school. We stopped the school activities sometime in 1974 to take a sabbatical to set up the business, we were hoping to accomplish this business thing, get it out of the way, to go back to the school. On the other hand the day to day dealings with the business world really slowed down our progress and in accomplishing our technical goals even though we stopped giving classes. We started then to get enough money from investments, we raised a total of forty thousand dollars in a period of two years, just a few thousand dollars at a time as we needed it on this 'limited investor' which I described previously.

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We've been primarily trying to do three basic things in the last few years First the technical development of the devices needed to set up a fully operational comercial optical printing business in Multiplex Holography which set up printers, the Mark IV, the automatic or semi-automatic copy process, a practical feasible display for the

holograms and new formats for the holograms such as the image plane hologram I first made in 1972. The second basic thing that we've been doing here is to establish a coherent, simple set of business policies. as how to interface this product with the outside world, our selling policies, our manufacturing policies, our prices and everything having to do with the sell and distribution of the holograms themselves.

And of course the third basic thing we have been trying to do at the same time maintain our own work in the field, to use the technology to make holograms of our own creation either to sell or simply to have for ourselves. In the course of doing these, we were actually doing business all along, our actual sales have been growing on an exponential curve, the many significant events-increases in sales and so forth, the many holograms that we have made for people, the key one's, such as the Cowboy, Logan's Run,                      hologram are all documented in other places, so I won't go into the detail here but this business, market                      , whatever you want to call it demanded that we come up with a set of policies to answer questions that people continuously brought us - exclusives, manufacturing rights, all sorts of demands to utilize our technology and in exclusive ways. The basis of all of our decisions has been a policy of no secrets. The policy ,of course, started with Jerry and our own work and the school of holography, which would have been absurd to have secrets since we were trying to teach people everything we knew and could think of and we kept that policy straight into the multiplex company since it's part was to further the School of Holography. It would have been detrimental to all of our goals to have suddenly adopted proprietorial

business positions with the multiplex company. So amazing as it seems, people came to us and we showed them everything and they couldn't believe it because that just wasn't done. This is exactly what we have done over the past two years. We haven't made major technical publications, We have let it come out in the popular press, technical conferences, and any visitor that has come to our place. The word about what we are doing, how we are doing it has been unrestricted in every way ever since we started the business. and will continue to remain so. Our old work suffered as a result of these two major efforts; to keep technically in tune in order to keep up with business demands from the outside. as our sales grew and contacts grew and the technical work also grew suffered because the immediate demand was to sell holograms, answer questions and to get out of exclusives, etc. other than direct sales. Now during this period of the last two years, several new people have come to Mltiplex. Three of them have become members of the general partnership. They are: David G. Friedman, David R. Friedman, & David A. Harrell. Three David's. and are all now members of the general partnership The basic group of people who have come to our company in the last two years are myself, David Schmidt, Peter Claudus, Gary Adams, Michael Can, Michael Fisher, Pam Braizer, and the three new people 'Zap', Rufus, and Dave H. And as the new people came in and as our own goals <sup>we fin came to a conclu</sup> consolidated, not without a lot of discussion (sometimes very heated), as to how we are going to operate this business. We have now finally arrived at the conclusion of how we are going to operate this business. We have now designs on new equipment and

a total operationg ~~phziszlphy~~ philosophy and although our own work deteriorat in terms of quanty during this period we have continued to perfect this type of holography. We have developed many different types of multiplex holograms such as the mini's, the 720. and are now working on the world's first real 3D movie with Bonnie Cosack on a real to reel which is actually complete. So we have actually accomplished all the technical and artistic goals that we have set out to do and I think in a much better way thab we ever could.

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 The following is a capsule statement of our ~~following~~ technical position and the results of our own work in the last few years. Our present returned to the basic technology of the sand box, even though we aren't using a sandbox, we are using very fundamental materials such as concrete blocks, C clamps, raw aluminum and steel stock to build the basic components The designis basically a bed made out of concrete blocks C clamped together with riders on the bed which extend out over the end of the bed at any length. so that each seperate optical mechanical elèctrical can be mounted on its own rider, adjusted, taken off and ~~at~~ and placed on another / or replaced. In other words we are now building a final packaged system of the Mark IV, printer beds and components that fit all the printer beds Our first printer's of this type will be built shortly IN image plane we have done some premilary experiments, we will not yet set up an image plane, we are going back to the sandbox to work out the final configuration of the image printer. The copyc processing, we have worked out a system that produces holograms by batch processing at the rate of \$24. per. sheet and we have produced master processes that have allowed us to produce 144 holograms on a single sheet 1" by 1". we are still using Kodac film and are still looking for better film tech. with less poluting use of chemicals and we have done experiments in photopolomers and printing both. Our display work is a blue tube cardboard display, sort of a photo

equivalent of a photo cardboard mount. and several different displays for 360's but we still need several displays. Display problems have become one of the biggest tech. problems we have. Our facilities have increased to 1500 sq. ft. plus an outdoor lot 1100 sq. ft. we intend to base all of new tech. on 12 volt D.C. systems so that they can ultimately be charged by batteries and solar energy cells. and we will be handling all of our chem. waste problems by evaporation pools in the lot. We have built one boom for outside work setup our own cine studio with a large 8ft. turntable and have it functioning usefully now. We have helped many people set up **outside** studios around the world and we have been the first to produce the first 4ft. <sup>4 1/2 ft long</sup> wide hologram, so our tech. position is a very good one based on fundamental, raw materials tech. with no intention to go into packages equipment of any kind. We also plan to manufacture the Multiplex lense and the Multiplex 'slit optic' as standard items for sale. Concerning our business position, we have very simply come to the position of ultimate application of a no secrets policy to sell every single thing that is of interest to the outside world; lenses, slit optics, cells, plus racks, automatic processors and everything we are going to make that cant be purchased somewhere else, we will make if it's a good business for us. If not, we will set other people up in the business to do it. We are not going to restrict the business in any way. The other aspects of our policy is that we have no exclusives with anyone, we will never have an exclusive with anyone. We are publishing our own catalogue to describe our position completely. Anyone who wants to work with us, with other customers who provide services we do not can do so openly and without fear of being \_\_\_\_\_ by the ultimate customer.

Our orders are taken on invoices with a 50per.cent. deposit C.O.D. , Our detailed business policies are detailed elsewhere. The other comment to make on our business policies are that they are very unusual there are very few companies , particularly in our field that operate without restrictions on their priterian information and there are also very

few of them that operate without distributors or a sales force. We have no intention of developing any sort of sales arm here we will leave that work to people who can provide that service to the customer. As we, ourselves intend to provide little or no outside services other than the manufacture of the holograms and the components of integral holography. The ultimate statement of our business policies is summed up in the catalogue which is an open catalogue published to be distributed throughout the world. The current statement of our tech. position is due to be made at the Gordon Conference in June of this year, at which we will make a complete disclosure of all that we have done and all that we plan to do in this field. Concerning our own work, we plan to continue our own work and complete many of the things we haven't had the time for and make a lot more multiplex holograms. for our own purposes, for art shows and we intend to have a large exhibition of our work sometime in the near future. and continue innovating in the field of multiplex holography. at the present time we are working on electron beam, recording system and vacuum systems that are already running. we have designed and will soon build a linear-verneer camera system to get incredibly smooth outside shots and continue to work toward the goal of real time intergeral holography through the use of Photopolomer and electron beam tech. and as well as nonpoluting methods of copying copying the holograms themselves. Not now at this point I would like to go back and talk about the new people that are working at the Multiplex Co. with us that are not partners of the co. These people have come in over the last year or so and mostly in late 1975 and 1976. approx ten people are here full time or part time and they include the following names which I won't put into the tape at this point. The plan is being set up which will allow new people to become partners of the Multiplex Partnership and or qualified workers in the multiplex company.

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Concerning the future of the business of M. Co. it will certainly be based on our present position which I said before will be no secrets of any kind which I said before we will publish anything we are doing in our own catalogue periodically so that all of the world may benefit from whatever developements we come up with. All the people working in intergeral holography can benefit and be encouraged to trade information freely about the field and that we will have no outside contacts with outside businesses except well thought out contractual agreements. the catalogue will be published periodically and will contain the latest prices, what we have done and what we are thinking about doing. We do not plan to continue a patent policy of any kind at this moment, although the present patent applied for will be issued shortly, we do not intend to make active use of the patent at this time nor continue further patent policies. We do intend to maintain our copyright position with information and holographic images. under the current existing laws of various lands and countrys. In terms of the facilities, we do plan to be finished within another year or two with a complete M.Co. studio in San Francisco 15000sq.ft. inside 11000sq.ft. outside and within the near future find a location in the countryside from which we will operate M. studios not only from our own power but from the sun and our own ecological enviroment. And this is a definite goal of the business as well as the people involved in the business. We do intend to maintain studios in S.F. we leave open the question of whether we will operate studios in other parts of the world or this country, very open. We are definitely looking fr land at this time in the country, on a river as far as possible away from power lines or existing roads. for the immediate future. Tech. and Artistacly we plan to developpe the helium filled camera dolie to enable us to take outdoor holograms of something happening up to two yards to a few miles/many miles distance, the ~~floatang~~- floating camera dolie will provide us with a stable base to operate from without any vibration such is found in a helecaptor. Forward, reverse, left,

right motors so that it can maintain stability even in high wind conditions. It will continue the processing of documenting the outside world up to the ultimate hologram of the world. / a hologram of the earth itself taken from a satellite, hopefully in one of the NASA sat's or someone's. Which will supply the earth with a continuous weather map of the weather, 3 D & moving every 90 minutes of the given band of the earth. A band of these could enable us to completely predict the weather for the earth, without attempting to control it. ON the other side of the M. holograms, we are already developing our own vacuum beam holograms, electron microscopy holograms directly onto electron beam created photopolymer materials so that we'll be able to with noise integration techniques of the M. hologram take multiple two dimensional views of the electron microscope right within the electron system itself and create a final 3D M. Hologram of (moving) shapes and configurations right down to the monocular level. The ultimate hologram at this level is of course is holograms of the basic components of the DNA molecule itself. And down as far as we can go into the simpler components and down as far as the simpler basic compounds., certainly Benzene Ring, hopefully down as far, perhaps as ice crystals-water molecules- in that region. The electron beam part of this system is now being developed by Michael Kan. On a personal side my own interest is in the M. hologram, and beyond the obvious of the image plane techniques is to make a series of holograms of functionaries in our society. I find that I am totally immersed in a functionary society that I am sometimes at odds with, I feel that to totally understand it and to really get to know it and perhaps for the soc. to know itself it would be useful to make certain-holograms a series of holograms of all possible functionaries; doctor's, lawyer's, Indian Chief, Policemen, firemen and so forth, right on down the line. portraits of these people with their uniforms on, 360's of these people with carrying out their work and perhaps even short movies. In conjunction with that I want to have a series of ants because they are



the closest to ourselves (socially organized). And I intend to have a showing sometime within the next year or so with the first set of this series which will be a combined set of functionaries and electron and microscopic showing of ants. Both individually, by life stage and in their social environment. In general I think everyone in M. Co. right now is interested in developing certain other applications of the multiplex hologram. Mainly to the field of information storage and retrieval and the field of solar energy. Information storage has been demonstrated both with white light reconstruction and laser. However no one has still built a simple integral hologram storing frames of holograms information which can be from individual pages or frames from individual frames from strips of film on a single hologram easily readable by a single scan from a laser. We intend to develop this information to its utmost along of course with obvious applications such as acoustical applications and we intend to develop white light storage holograms, which will have less information storage capacity than the laser viewed holograms but will be viewed completely white light. One of these techniques for example will be a method of recording cine images on a continuous film strip with a thirty times reduction in film length, which means a full movie can be contained in a 400ft. can. and shown on a device very similar to and even adapted from ordinary camera-device taperecorder. This device is under design stage now. The laser and white light holograms (information storage) will be done before the spring of this year. We have the first of these completed now. And we feel that this is a very important area of holography. It is a return of our original goal of the school of holography and it will assist everyone in the world in gathering and retrieving information about the world about us which is very complex, based on very simple principals but very complex in its varied information content. We feel the new parallel storage technique of the information storage hologram will provide an experience totally

unexpected and unlike anything ever seen before in information systems. The person will be literally able to float through an information space so deep, so complete including all references to all articles, all dictionaries and in all languages, all translations needed to understand the material that people will literally be able to create their own universities with information storage holograms. Seek out finances to problems to problems that we cannot even begin to state today. Finally- The other other area of application of hologram is energy and I have a design for a M. hologram that will that will continually focus the sun's energy at one common focal point at high energy or a pre set pattern without any physical motion of the hologram itself <sup>as the sun goes</sup> through the day. This will be accomplished with the development of a hundred overlay master hologram of the sun's track during the day versus the pattern of the desired focus combined with a photopolomer material, which is real time-in the sense that it will decay with a minute or two decay time and yet have a high efficiency in sunlit conditions. The two materials being in intimate <sup>contact</sup> contact, the master hologram-probably be a printed hologram will copy onto the real time material even with low beam ratio-such as one out of a hundred-creating a highly efficient hologram for one position of the sun's angle to focus all of that light into one spot. The sun then moves to the next angle of the hologram, the first hologram will fade out and the new hologram will take its place in the phototropic material. In this way as the sun move through the sky the hardening or index refraction of various sets of molecule in the hologram will change but the atoms in the holograms will not be grossly transported nor will the hologram itself be moving. The course itself will naturally be controlled by the sun. This concept of a self directing focusing hologram does not any second law of \_\_\_\_\_ dynamics and is completely tech. feasible. Most materials, the materials that exhibit all the properties stated are available today. To find the exact materials

that will do may take a few years but there is certainly nothing to say that they can't be done or that they can't be found. Finally, in a more personal vein, I'm interested myself in making holograms in my brain. I'm interested in understanding my brain and other's brains, hopefully, through the holographic model of information input and storage. Basically what I'm doing at the present time is making one hologram, I'll soon be making more, in my brain which is a M. Hologram. I have at separate times in time and space, <sup>places in</sup> separate times and spaces combining two consistent inputs to form a correlative network in my brain. Over a period of time as I repete these events I am basically composing a hologram in my brain. When I then in the future receive one of the other of these <sup>stim</sup>stimuluses I'll be able to be able to read out not one repeated event, such as the Pablog Dog's did, but I'll be able to read out an intergrated image of all of these events that have occured in the past with the variations of course sort of averaging out and the similarities coming out very strong. and clear. Yet I expect to filter back through these holograms and even remember minor details of every event, I don't know. I do know this, I feel that as a result of my past work in M. holograhy, I will be able to predict the result tech. of this new hologram that I'm making in my brain. I will never the less be amazed as I always have been previously. The spific hologram that I'm making, by the way, is the combining of a visual input, a tactal input, and an auditory input. And the visual-tactical input which is closly corrolated is that of the sun, it's more tactal than visual basicly I position my body while I'm looking at, with my eyes closed or open, through appropriate optics at the sun and feeling the sun's warmth on my body-feeling the actual input of radation from the sun and at the same time I am hearing in my ear the word 'yeto", spoken at different times by peop from different parts of China describing what I am feeling, the radiant energy from the sun. I expect that I will soon be making more holograms with my brain and as I refine the process, I expect to learn a lot about the

operation of my brain through the holography model. In a sense I might say whereas Denis Gabor's desire to get into holography was based on his desires to see atoms. I feel beyond seeing atoms, I am interested in seeing my brain.