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Dewitt: OK, well I started with a/hardwired device that is goingto km read graphs. Onm three levels. I got a piece of graph paper.

It was a TTL device and I didn't build it. In the meantime I talked low with Phil Edelstein whose approach to the rm problem was to plug the camera into a loudspeaker so that he could stand in front of it and wave his hands and say "Yeah, there's something in that!"

So, the next stage was I built an interface with a flip-flop am Phil a toggle to the graph line (??) and Riii wrote an elaborate computer program for the PDP-11/10 which converted that information into a string in the computer core. And he could output it at any speed based on his clock. So it was a graphically-loaded oscillator. No one was interested in it. I thought it was the greatest thing on earth but it was a little too abstract.

Jon: What was the year?

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the home made stuff.

Jon: How much did they give you? The

Tom: They gave us two ten thousand dollar grants that went to WMHT. Initially it was a portion of the WMHT portapak budget. It wasn't even half of it but it was a significant portion. I think they got \$25,000 and we got \$10,000. The second year it was supplementary to their proposal. But their whole amount of money came out to be the same. It amounted to the same thing for them, because they expanded their facility. They were Japanese portapaking at the s ame time as we (inaudible). The computer, however, is worth money becuase it came from a granted project they received a long time ago. It must be about six years. The computer's now worth, you know, \$19.95. Actually, that's not true. It's an 8, and they still have a limited market fax mainframes. But you can buy the chip. And we could make the software operate a microprocessor with the 8 instruction set, but the next step is the Sol over there. Th Sol is probably more portable. It's the Sol 10, it's a kit. It's one step above the PC boards. It comes with a power supply, and a keyboard sufficient to address the (inaudible). It doesn't have any slots. It only has 1K of RMA RAM, like the (imaudible). It costs \$900 and you build (inaudible). It was built by Jerry Jones, who is a very nice person.

Jon: What what was the idea of using a graphic input to this device.

Tom: Isn't it obvious. Electronic Body Arts is a group of dancers

and they had initially done a tape called "Multiple Marathon"

with the sound track from "Bye, Bye Birdie" and cut it from an

hour a nd a half to 40 minutes. And then we had three afternoons

in the SUNY facility in which we made a black and white tape. I ddited the pictures to the (inaudible). And the initial step by those dancers was a success. So I thought, why not stay associated. And out of the joint group, Phil Edelstein was a founding member of EBA, and Georg- Kindler was. So this project was gorn. It is as much Phil's doing as mine. In fact, the technica side of it is far more Phil's than mine. If madness and a stupid desire to use the thing is required, that's mine. (inaudible, hut something about zero ability with machines) Some other people might have said why do it until it's perfected. But I said how can it be perfected unless you try it and see what you can do with it. And a few of the moves that were developed I think will be seen in industry-as the result of artists involving themselves a newer(or intermediate) in the development of thei instrument, which is maximizatedizate similar stepx which we are all taking now. There are mammaxum systems which involve tracki-g chrominance systems, such as Vital Industries and Grass Valley switchers and tied to frame buffers which are Rutt/Etras without that incredible ammunaxmixixmaxx non-linearity. (inaudible) The prices are now approaching the cost of the original system. We hope the system will work soon enough/that it will be cost-sensible to the Arts Conncil. So far it's vastly c ost-sensible becaue the industry electronics and our electronics come from two different points of view. They are wasteful and Jon: So the graphic input to the system

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Jon: So the graphic input rexthexsystemzyemzxzzxz through the CCD camera

Tom: Izksxax@@Dxcamerazx What's a CCD camera?

Jon: The 32 by 32 caemra (rest inaudible)

Tom: Well, that came from a joint mulling over things between Phil and John Driscoll. They were interested in the Cromemco. (inaudible) on the Hearn. As I said, it's sort of faulty, because the level of sophistication is a little high and we are now in the process of one step back, two steps forward because we really want people to see that graphic inputs are useful. Most people would find the matrix confusing (inaudible). But putting in the traces of movement and correlating illusionary spaces with real smeax spaces is intuitive to the industry and intuitive to the artists. John Godfrey really likes the synchronized mouthminer piece, becuase they spend an enormous amount of time and labor, awful **mai,cruel labor for axxists an artist who likes to dream. And I've seen meth-heads . . . inaudible . . . who kill themselves who may have to die because of all the sequential movements which are required in animation. So those people will be happy to see the Pantographx when we can do hard edged graphics inaudible . . . /in the Architecture School that uses/computer graphics system in the same way that cel designersx uses graphic systems for animation. inaudible So, Af you combine the sensing output of the Pantodigression. graph with skilled movements of actors vou have an input device to a computer like that which eases the burden on animators quite a bit... inaudible Jon: But the programming control . . . "its a non-real time programming.

You're storing your switching points in the inaud:

Tom: Oh, being able to direct changes in the analog synthesizer. Well, you have buffers, so it's like a light pen. You can use it as a light pen. The software you develops for it includes the inditating trace against the clock that's internal to the computer. You don't have an internal to the external clock on it today. We might have it one on it by September 1st . . . we haven't really checked it. The last time we checked it there was a general electronic problem inaudible. Phil did all the digital drawing and George did all the corrections. And George has done the analog drawings as far as the drawing has taken place inaudible the rotation system although inaudible. But he's on salary inaudible

Jon: Goerge is on salary?

Tom: Yeah he's under a cost of living salary.

Jon: From Electronic Body Arts?

really
Tom: Yeah. He works so funcking hard. He/does things for people
because they're his fix friendsx and not for the money. Just because
they're his friends. He didn't come to the conference in Buffalo.
I want that on the record. George was not there, he was working for
somebody else.

E Vibeke: He was also not invited. Thit chat not relevant.

Jon: Are there any things you can tell me about factual development of the Pantograph system or the Design Device. How Them Design Device is seen as an expansion and realization of the Pantograph system?

Tom: Well, we built the prototype design device control unit and then se built the Pantograph. The Design Device control unit we built

department and SUNY/ECC. Well, I've been excommunicated in a way.

I tried really hard to get into SUNY and I found myself removed from that environment by Patty Ross. Oh, you didn't press the pause button! How did that happen. We feel relieved that we're not in SUNY, becase it's obviously not a proper institution for us. But the Design Device we developed is inaudible. Now there was an 11/10, an equivalent 11/10 at Channel 17. An identical machine, everything, the tape drives the whole thing. So we asked 17 to let us use theur 11/10 and they said we couldn't use the 11/10. And naturally we asked well, we've already spent \$100,000 but we cant make the hing tho what we want it to do and we're putting it in a closet.

Jon: What did they want it to do?

Tom: They wanted to remotely control thier transmitter. That's all. But we couldn't get it to work, and they couldn't get it to work and the more money they poured into it the less reliable it They became. We/finally put it in a closet and that's where it is today.

Itxbeckmezx As far as I understand. They It became something they didn't want to talk about. They were Nazis, they will wouldnot talk about it.

Jon: They were embarassed as well.

Tom: Yeah, they were embassed. It's a deep dark secret, and I asked engineers about it and they said yeah, it sounds like just what WMHT you need. So the Design Device. Well, we made that cover at KNET, we could have implemented that if MHT had said "OK, here's the 11/10"

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can we do it.?"

***amaximum But basically they said "what the hell do we need it for . We're a public broadcast station not an Arts Council outpost. We're not an Arts Council outpost, get rid of it all!"

And they dumped it.

Azdaxz Jon: WMHT had one also?

Tom: They had an 11/10.

Jon: and the State University had one also?

Tom: Well, the State University's 11/10 and the Arts Council's program aren't all that compatible, because the Arts Council can't fund the University. So while I dissolved it there I had to get the funding from the University and not the Arts Council. And the University wasn't interested.

Jon: Izwerzsszwkilezinezmanikiwazzz So, you got funded at WMHT ...

Tom: I got funded at WMHT and the University has its own funds and they both had 11/10s and I developed the system at the University but I couldn't continue it because the University wasn't supporting it. And I couldn't continue it at WMHT because they weren't supporting it, so the Design Device became stalled. The Pantograph continued based on WMHTs support and the University's support too.

The University supported that by letting me use the performing arts center as a base. WE used all the test equipment at the Electronic Music Studio which was very good equipment. And we used their theaters, which are superb theaters. So the Pantograph was getting it up the ass, and the Design Device was being left in the cold because no one was really was supporting it.

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Tom: Well, I'll tell you

Jon: I'm just trying to get this absolutely clear.

Tom: I do a mot of things for people and I say for a while I was doing things for them.

Jon: So that you kakex had some kind of informal cooperative arrangement with WMHT.

Tom: Yeah. Quite informal. So informal that when they applied for Arts Council funding the year after the initial grant they wouldn't show me their application. When I finally learned what it was it seemed like what they wanted to do was go out and buy what we were building. Which is probably what they should have done with that computer because you can buy a transmitter controller for \$18,000 off the shelf and they spent \$100,000 on a computer system and couldn't get it to work. Now, we got something going that works and they don't want it. You can probably buy something off the shelf that's supposed to do what we're doing and probably won't work because the engineers that are building it don't have the input from the artists who would use it. And there's an importnat communication gap that has to be bridged in the industry. So what I've seen so far im tracking chroma-keys is not so interesting. Well, they do have m otion detection and motion detection on rhythm. Which I didn't demonstrate to you. We haven't perfected it because it requires h ardware multiplication which we can't do in the computer. But the industry offers for \$29,000 a box that does a hardware multiplication that detects velocity and can do a very exciting form of keying called velocity kexing detecting keying. And in that system you c an reinsett a picture at the points where the rays of motion are

ppecified. You canseparate one part of a scene from another.
You can take the entire background and remove it that way. It's great. Great Stuff. CBS in collaboration with the French Concern, CSF, engineers in Stamford Connecticut built that and published the specs in the SMFTE Journal in March whix with a theoretical article that's very interesting. We can do it eventually, but in these cases I'm tempted town say to womeone who sinterested, why don't we go out and get that box. It has a frame buffer in it ing too and the frame buffer address/is very important. We have access to a chroma decoder which is something that we can implement with that kind of data. Inaudible. I thought . . . I built a time base error corrector but tore it apart.

Jon: The one bit corrector?

Tom: Yeah, somebody wanted a proto board so I removed all the chips. And I keep wondering inaudible. But frame buffers of course will do that. It costs \$25,000.

Jon: one of our concerns is to deal inth language, a standardized language to discuss video. Specifically to discuss £ video effects and inaudible.

Tom: Well, the matrix is one appraoch. And the waveform as a time That's the way I seee it. record./You have the waveforms assigned to the channels. You have the change in those waveforms control simultaneously to the switches. And that's all on paper. I saw it as a hand written document so that it could be duplicated by a zerox and to notate it you wouldn't be required to be axix at the site of the computer or a machine like a card punch.

equally

Jon: But in the car you were talking/about the necessity to evolve a certain set of languages that would function in a way like the set that exists for film, in which you could write down on a piece of paper your instructions and have somebody else do your processing for you.

Tom: Yeah. Vibeka, do you want to show him what you did with the sound track from "Temple." You know, the graphic language.

She's done work this way and so has. Gershwin, you know. Amexwany

Jon: And many other composers, in fact.

Tom: It's a good system because it's very much like musical notaton and music is our best reference for time-varying art forms. After all, pictures never moved before except for dance, which is very limited in what you can call pictures. So you have to take a tip from the guys who have been doing it for 500 years. They are homo sapiens, some of them with highly developed Beathoven intellects. Ludwig von Reekhewen and Wolfgang Amadeus Moogzard. Oh, did I mispronounce his name. Well, the thing is you can use a Moog and you can notate for it properly and make a piece on paper and have it realized again and again with the actual instrument much like composers did. And inaudible the recording media become more and more imporved with time, so it has an enormous advantage to write something now and maybe realize it with much greater resolution later. So we're really interested in that aspect of that matix notational systems. The only instrument that I'm though amiliar with/is that simple one, the graphic guitar of the Rutt/ Etra add the Hearn. So what's not on the Hearn are oscillators,

but the oscillators . . . synchronous waveforms, but those can be built with graphic inputs and that would be the composer's access anxwex to that particular instrument. I don't generally hook cameras up, you know it:s like . . . the spaces you want to create from your mind are not available in the real world. They're just simply not available. Simply realistic recording is something I couldn't imageine because the reality is too fantastic for my mind. If you get into high fidelity reality, which is three dimensional and every inaudible and the whole thing is real, I mean that's not what goes on inside my brain. I imagene abstractions.

Jon: What wikks other ideas have you evolved for the notation.

Tom: We do use the keyboard with words in a macro et of instructions in Pantomation with a set of selections that come out as a list.—They're called . . .

Vibeke shows me now her score for Temple or an earlier part

also scores for Videocean

Does

Jon: Wax this keyboard entry m involve a set of standardized language?

We link the strings by

Tom: Machine language. We call it "initialization." and we have a

vocabulary. Some of the inputs are . . . because the Pantograph is

there, we're initializing a lot of stuff with the Pantograph. In those the long run, that might be built into inaudible what you want.

Like I was saying, the sampling rate, we have a program for changin the sampling rate. You can utilize it at a fixed value or you can We can only add. make it convariant with movement, it's that motion detection./We just (set?) X to Y. We don't have an equation to derive the vector in real time, so we give anapproximation. And that changes the setting for

the sampling rate of the device. But it could be initialized when you hammer had event when that you wanted to study. And inaudible you could make a decision later on. We're hoping that the workshops will ave that kind of effect that people will try to, say, the different ideas and will be able to sketch out a piece with this inaudible. I don't think it's going primitive, our primitive to be universal. I'm looking for someone elses universal languge in a way. It's a whistle and bell, the Pantograph. It certainly tells you that the train is coming and where it's coming from and how at fast it's moving. And where it's going to go isn't under your control. So, **kexexex it puts a lot of data on the bus, so to speak. We don't have a good set of instructions make for manipulating the images drawn, such as straightneing curving lines. You don't have any hidden line algorithms available. You don't have extrapolation. Now weve designed extrapolation devices for imporving the resolution of the line but they're strictly linear spline minux counts, they're not in functions that .xzxzxxxxxxxxdxixzxxdz mix@muxixmxxx you find at Csuri's system. And we don't have the Mever's (Wainzkall) algorithm for hidden lines. But we have a lot of other Meyer's algorithms though. Because Roger Meyers is our programmer. So far Roger's programs, *** working on it right now. "Studies in Spatial Algorithms." Mobile colors stuff. In the mobile colors program youcan score the coloss in attack strings that comeout serially or in parallel. You can have a waveform or matrix point simultaneously addressed. It comes out, for example, in the vector dump operation, you draw a picture and you pick it up and carry it around. That's the way it laoks. And you can

do that simultaneously. That's a Meyer's algorithm that's really nifty. He writes in machine language. Incredible character. I mean, he's just wonderful, Roger Meyers. He has a dimension on his head. He works with Joel Chadabe and has written a play in which Joel sells under lisense to interested users. Our program doesn't have any kind of flag, we just call it Roger's spell! wellt Phil has contributed too, and at some points Roger's use-fill (?) inaudible subroutines, I don't know (inaudible) clocked down on the initial fill-load of the initial big program for the Besign Device was 200 machine language steps. That was the graph reading device, but that's an 11/10 16 bit computer language with assumption of an laterface board that you don't find everywhere. Other forms of notation other than graphs and entries? Jon: What about language used to talk about these things? To describe them?

Tom: Boolean Algebra is very important. Mathematics in general is very important if you want totalk about what's going on here. It's an excellent reference. The programs in Boolean have to be built up to a point where they are doing transcendental equations.

Jon: What's a trascendental equation?

Som: Those are the curve functions like the sine, cosine and your returns back, you know, it oscillates. And other functions. Fourier analysis is importnat, but that's not a transcendental equation, I don't think they categorize it that way. But Fourier and its associated practice is apparently important not only for what we're doing, which is silly, but they have holography

based on it and if you can see the overlapping radiation patterns, 2 or three points' antennae radiating put together that space, you can map a three dimensional object in coded form. It's much more economical in storage capacity than repetitive planar data of our keyer systems.

Jon: Where want did you get the idea for the Pantograph system?

THEN What was the necessity of developing a specialized system for these purposes?

Tom: Well I said, we didn; t have the support/to implement the 11/10x Design Device, but we have the/funky 8 and we found an audience of people who appreciated the simplified version of the Design Device. We had also had ahlf the money that we hoped forks the Design Device. We needed \$20,000 reaearch grant money and, you know, any . . Jon: My question was misstated. The reason for developing , for planning out, the plotting of the Design Device, wax what was the incentive fax this? What was the necessity for this? What were the effects? The people who influenced this? Tom: Well. I could say the tracking chroma key systems is being implemented. Yet they derive some serious problems in video that have to do with correlating to input sources in position. They have sources that can be superimposed, but positioning of them is hard. When this relates to the it is being cheated a lot and it doesn't work. Like you have the camera zoom simulate a move that isn't actually taking place. To corellate it to some move that really is taking

place. And you sustain the illusion of geometrical space, of two input space. You have a lot of travelling matter photography in fantasy films in which this kind of effect is called for. Wherever the set is not the real set, but the set is brought in from another source as an illusion you get scale problems, you get movement correlated between the second input and the foreground. There's a problem and you can solve it in all different ways naturally. Somew ways the rear project the illusion other places they use travelling mattes and they animate the travelling mattes, optically printing and moving the printing head around. And interest that hadn't been done in video, so to do it tracking chroma key systems have come about. I didn't hear about tracking chroma key for long after I

animation. Out here in Albania, the Betamax is still a not agreed m upon as the real thing. Some people say it's just a hoax. So I mean, inaudible. That they would have that problem, that production problem they've always had. That's one importnat aspect of the Pantograph. And when we proposed it I think other people say it that way.

Jon: So they idea for you is in someway derived from film technology and film processesx of things you could realize on film. I sthat correct?

Tom: Tame Yeah, sure, you might say it defives from that. Sure,

I've had a problem in film.

Jon: And you wanting to do these kinds of things in video and found them inaccessible?

Tom: Yeah, it's still pretty inaccessible:

Jon: And so that the reason for designing the system to do this was, perhaps, that you could envision a system that would allow you to do such things?

Tom: Yeah, I was thinking recently that when I met Stan

Vanderbeek I was very impressed with his work, becuase it was very similar to something I had done, and I didn;t show it to him., becuase (inaudible) . . . he had me employed, I was his apprentice. And so the day I was ready to leave, Stan said, . I walked framex out from under his wing and I go out there into the mal world and I brought back this collage film. That's funny, he looked at it, he was very quiet, he didn't say anything very much. And shkkanax suddenly I was swept with this inspiration. " You know what I'm going to do," this was like 1965, "You know what I'm going to do next some day, I know w hat I'm going to do with my lifetime. I'm going to make a system to make it possible to combine animation like this collage animation with actors moving in front of xkm camera like we all, can/shoot ax any time." Stan was capable of doing that too. He was used to making films with actors, "Summitt" for example, which you probably haven't seen, but he's got an impersonator of Kruscheve and Kennedy. Very well acted because they look just like them and it's all done in mime. But he cut to animation, they weren't simultaneously operating in the same space, because how could they have been if they were

actors on a stage. And they didn't know where they were, and

he couldn't make that happen in exactly that space. He brought great props in and correlated to the animation. Very well conceived. I didn;t watch that film come together, I wath watched him finish it and put the sound track on. Just to get it exhibited for the first time mix or something. I said, "I will do that, I will do that." Tom numbles some diagog between him and vanderbeek, indistinct. It was a really positing something funny existential moment where I was indicating and now it's coming to pass. And at the same time I was positing EMMERKHING that I with was thinking with some sense of disappointment that it simply wasn't enough. And I had another idea that I wanted to do which had to do with political used of two way communication which at the time was highly unformulated. But I knew about democracy becuase I'd just gone to Columbia and I spent a couple of years studying ancient institutions and I was really hooked on the Greeks. And I was really hooked on the Greeks. I loved Homer and I loved democracy. I was like passionate. And Stan took me away from Columbia, because they didn't teach film, so I was removed from those concerns. But at that time, with thta empty feeling I thought I'd like to do this other thing too. And that uses magic stuff where involved in the medium, where involved in the medium it summons forth illusions of things that don't exist except in yourmind, to allow some kind of xm broadbased communicationx in society that doesn't currently exist. And I'm really hooked on that now. I'm involved

with the National Federation of Local Cable Programmers. tell you that story becuause you asked where did did the idea come from, and I remembered that comversation with Stan althouh he probably doesn't remember it. But it was in the old film building down on 9th Avenue and I projected "Th Power of the Human Mind" for him. And he sat in Sy Freed's (???) viewing chair because Sy Freed used to lend him the editing room, and I sat back there to make sure the projector didnit tear the sole print of his film which still exists as a sole print, which is work now torn. And afterwards I wnet in there and turned on the light and (mumbles) and he didn't say anything. He dust didn't say anything very much about it at all. I passed beyond that in his own work and he couldn't stand to see any more collage animation. He was orking in Bell labs and doing computers. I think that's why he didn't want to talk about it.. It was so much like his early work, that you could cut it right in to his early waork and you wouldn't know it except that it was too clumsy and crude. The first thing. And maybe the last thing, becuase/subsequentix collage animation I did Vibeke did the colage animation. I mean she prepared collagges. I didn the fumbling under the camera routine, but she's the artist whose collages you see over there on the wall. So it may have been the very last time I did that, but as far as combinings that stuff with live action I'm ready for it and I've even done some of the live action, for

want of a better mime at the time, who would do it for nothing, on the budget we have. "maxxax Space," "Maxxax Space," Jesus, I don't know. Your regation to Outer Space was just what I expected it to be. Just exactly. You performed . . . it performed itself. They say that sometimes the things that are done first are done best, but that's not my contention. I think music performed for the first time invariably is unrefined becuase its the first earing/to the performers. They haven't felt all the lines yet. The composer's presence would surely help, but you know, Beethoven is conducting while he's deaf gives axims the lie to the hypothesis that its the first and the best at the same time, becuase those musicians just had to try ignoring him. He was the guy who was hearing in his head. They took him off the stage becuase the piece was over and he was still in the last movement somewhere. That's the famous story. Well I think that's true. I don't think the first time something's done is the best. And on the other hand there are arts that are practiced so well that they always are the best. They're going to be art, called art, by tomorrow . . . mumblesxhere/intelligible. But you can't really be called mime unless you've travelled to higher altitudes because it's already been charged. And with "outer Space" its funny because it incorporates an art that has to be performed to perfection. It's something that's being done for the first time. So there is an awful feeling for me about it. But from your point of view, I dont know. You should see that's its the first time. You know, experimental video, experimental

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film. You're not an esthete from the theater world. That there are elements of practical . . . (break here)

End of Dialog