

Bil Herd and Dave Haynie CommVEx Video

This video was recorded by Bil and Dave and sent for presentation at CommVEx in Las Vegas on July 30, 2005. This transcript is an attempt to capture the content of the video so that those with hearing difficulties may be able to enjoy the material presented here and understand some of the old hardware as presented by Bil and Dave. There are no guarantees that this transcript is 100% accurate. I have placed time stamps in parentheses throughout the transcript to help you keep your place with the video.

Bruce Thomas – Sept 13, 2005

Note from Bil Herd: What didn't make it onto tape was an in depth discussion of the contributions of the key programmers, namely Fred Bowen and Terry Ryan. We simply forgot to have the recorder on while we were talking. Dave inserted some narration to make sure that they were recognized during the tape in time for the Expo, but we really apologize for this omission given the impossible feats they pulled off and their contributions to Commodore's product line in general.

Bil Herd- What is this 20 years later?

Dave Haynie – 20 years.

BH - How Y'all doin? I'm Bil Herd and who are you?

DH - I'm Dave Haynie last time I checked.

BH – We're some of the original Commodore Engineers. Actually we're the original Animals.

DH – The C-128 Animals. Previously the Plus/4 or TED Animals....

BH – I always gave Dave the credit for coming up with the name. I had the long hair at the time but he came up with the name or at least the first T-Shirt.

DH – Ya, I had a T-Shirt from back in High School that said The Animal on it.

BH – Oh. Stories we could tell. But we're not going to tell too many stories here today. We wanted to just reach out to the attendees of this year's EXPO and say "How y'all doin'?" It's amazing that people still even remember the old Commodore Computers. This is actually kind of a special year for me with this. This is the 20-year anniversary of the Commodore 128. At least I think it's the 20-year – we counted time different. Not only was the time compressed but our time it was 84 when we did the work but the product would come out the next year starting January so I felt last year was the 20-year anniversary.

DH – It all pretty much worked by the time we were going into 85 that they started shipping. It's also the 20th anniversary of the Amiga which, depending on how you look at it, was announced before the 128 was out but actually didn't ship until after the 128 was out.

BH – so here it is. Of course, the birthday of any computer was always the CES show in Las Vegas so it's only fitting that you guys met in Vegas this year. I wish I could be with you. It's just that things here in beautiful New Jersey didn't allow me to get away for that length of time. But the good news is that because we've got some hardware here today that I would not have brought on an airplane maybe you can actually see some things from the old Commodore days that you wouldn't have seen had I actually just showed up and carried on for a few minutes with y'all.

BH – If I was to speak real briefly about what it is like 20 years later, and I believe this would be true for Dave as well, that we weren't thinking about what would this be like 20 years after we're done with this. We weren't even thinking what would it be like a year later.

DH – we were just trying to finish. To get whatever it is we're trying to do. Trying to make it work and get it out the door.

BH – Ya, and with time compression we were living 20 hour days and sleeping in our offices and taking baths out of the sinks.

DH – you mean that's changed?

BH – For me. I have a kid now I have to set a good example. We really only focused on the goal and that was the CES show and in fact immediately after a CES show we would be so wired that you would see people walking

around Commodore in a daze, not knowing what to do with themselves so we had to write them a list including things like go home, take a shower, or take a nap because people didn't know what to do with themselves afterwards. It was that kind of environment.

BH – It was a cool time. I try and explain to people these days and I'm not sure there is translation for it. It was a pioneering time. I'm not saying we were the pioneers but we were certainly standing right next to those that were. We were making stuff up as we went along.

DH – Absolutely. It was all – you wanted something in there and it hadn't been done a thousand times,

BH – Hadn't been done before at all.

DH - or before at all, so we would cook up one way to do it and maybe somebody else would think of a better way to do it. Or we'd look through all the old magazines like Creative Computing or KiloByte or try to figure out how the hobbyists did it or whatever but it wasn't like today where it's been done so many times that you pretty much can't change it.

BH – The way I try to explain this we used to put the signal onto a TV set. We used to put the Commodore 64 on a TV set. They say “what you'd set it on top of the TV set?” “No. There were no home monitors.” “What do you mean? You just couldn't afford them?” “No. There were no home monitors.”

BH – It was that kind of environment back then. Today everybody just assumes computer, done by mirrors, two brands out there. But we were fortunate to work in the shadow off some really great people and to have gotten to turn out a few products ourselves over the years in spite of all the challenges or in addition to all the challenges. (6 minutes)

BH – You have anything else to add or you wanna show them some hardware?

DH – Ya, I think it's time to show them some hardware.

BH – Alright, I want to start with. Recently I saw somebody claim that the Plus/4 possibly wasn't well engineered and that's had Dave and I chuckling

all morning. So one of the things I kind of want to do is I want to show some of the progression that's almost comical of the Plus/4 series. We've got some prototypes that haven't seen the light of day; some wire wraps for you here and then we've got a Commodore LCD which I was told is a myth.

DH – I have heard that they don't exist. There's a few things here that actually don't exist but we'll get to that.

BH – so let's change the camera around. Excuse us while we do this.

(7 minutes)

BH – alright. I don't know how many of y'all remember these but this was back when the Commodore 64 cost \$299. Sinclair, later became Timex/Sinclair, came out with this little guy and this was a horrible horrible machine but it cost \$49 and that sounded like a good deal I think to some people in this company. This was back when Jack Tramiel first worked there. When I walked in the door I was hired to do some software to work for a guy named Benny Pruden and I was supposed to be stuck writing code for disk drives. Well, Benny was out my first week so I wandered off to the hardware lab and when he came back in they said "You're going to have to hire a new programmer 'cause we just took this guy into the hardware group."

BH – what they showed me, a guy named Shiraz Shivji pulled a color version of this called the Spectrum out of his drawer and showed it to me and said "That's what we're doing". It had Chiclet keys. Here's what the Plus/4, we called TED, this was the original target device. I don't know if you can see it's actually got fairly usable keys, it's a fairly nice size, but this thing was supposed to cost \$49. When your alternative was \$299 or \$399 or whatever the other computer cost this was a low-cost entry. It was not supposed to step on our own toes when it came to selling the Commodore 64.

DH – This was supposed to be a Vic-20 replacement and proof against somebody coming along and doing to Commodore what Commodore had done to everybody else.

BH – God point. And we didn't want compatibility. With that said I'm not going to act like it hadn't been thought carefully through I simply don't

know. But this is what it was supposed to be like and I will tell you at \$49 this is kind of, I don't know if you can see that, for today I mean this things huge but back then that was a small design there were only like 11 chips in there. 9 chips in there.

(9 minutes)

BH – And I could tell you stories about how they came up with 9. TED was Text Display was the chip that was in there. This is one of those designs that started from the chip design group right, Bruce Aherns, Dave DiOrio and Eric Yang was the designers themselves so in effect they kind of designed the hardware a little bit because it's all based on this one chip right here.

BH- however, Jack Tramiel left that year and I could tell you stories about flammable cases and everything that was left to us but it started getting bigger.

BH – And I was still OK with that. I suppose, you know, make it a better design sounded cool to everybody but management was getting involved. Horrible layers of middle management. This is a 264 and this is a Plus/4. Now I'll ask you what's the difference between a 264 and a Plus/4? And I'll tell you that the answer is millions of dollars worth of lost sales opportunity.

(10 minutes)

BH – The 264 was supposed to sell for \$79 in fact it did when they sold it through Comb they couldn't keep it in stock for \$79. Got a chip. A DRAM. Remember sockets? We don't socket stuff anymore. The Plus/4 of course had this new label, designed by somebody. People are starting to get involved, they're coming up with labels I never saw. Actually, at the end of the day I would have signed off on it. But this had that really bad software.

DH – really bad software.

BH – It cost \$299. Now wait a minute. Now we're squarely in the Commodore 64's market and it's only getting worse at this point. There was a 364 which I had a board of and I do not have with me today I cannot find it.

DH – I had a complete unit which I sold to a Plus/4 enthusiast so somebody might actually use it rather than leaving it in my basement. I didn't get a lot of time on it.

(11 minutes)

BH – Now, we've got people that don't even work in the engineering department designing computers. By the way the 364 talked. We had the guys from TI Speak and Spell, Dr. Richard Wiggins and Kenny Brightman. They were amazing guys. It was really cool meeting them and getting to know them. Going drinking with them. If you don't remember the TI Speak and Spell it was revolutionary. Not only was it in the movies but it was the first computer that talked. You could understand it. And we made a talking version of it called the 364 Talking TED we called it.

DH – Ya. Talking TED. It was the CV364. V for Voice.

BH – That's right, it was. And the idea there was that you had this desk software that used voice so they were at least tying it to an application. That made a little bit of sense. But then these things started to appear and there was just tons of these. Oh by the way there's a 232, somebody said that was rare.

DH – The 232 was the 264 with 32 K of RAM and no place to put a modem.

BH – Oh, really. I didn't know that. So, you know, now what they're doing is somebody somewhere in Commodore is trying to save \$1 because that is about how much the DRAM would have cost between 64K and two 32K. So there was like one of these things only it said 232 that appeared one day and we all thought that was cool. I'm sure there was a lot of Japanese writing on it. By the way something you'll see on all my prototypes here. The thing that you won't see anywhere else or from anybody else is these FCC labels. These prove that these were really the units that we had in our lab and what we were working with. I'm not even sure how I got these so I think somebody sent them to me a year or two after I'd left.

(12:40)

BH – Here's a C16. Somebody took our design. They re-did it in a package. Stuck it in a Vic case I guess 'cause they figured there's a bunch laying

around. And now Commodore's just truly wandering all over the place looking for how to sell a product that started as this, which was an answer to this. So, \$49. \$79. It could have made money or should have made money but Commodore by this time couldn't get out of its own way.

DH – But that does prove that Commodore was at one time a really big company. (laughter)

BH – Jack Tramiel we miss you, right? Hence came the Commodore 128. I had written a memo saying “Yes, Virginia, there is compatibility”. Well, basically I had had to walk around the CES show one year and have everybody give me an earful on compatibility. Of course, I'm trying to explain to them about something that costs \$49 and they didn't care. All they knew was their educational software that they had written wouldn't run on Commodore's new machine. At first they were scared and we basically said “Do not worry. We will fail to sell it correctly so you don't have to worry about your market share going away.” So we came up with the idea of a computer being compatible with the Commodore 64 and I originally was on the Commodore LCD machine. I did the original design on point 1 grid paper. Back in the old days we didn't have computers that we did our designs in. They were just coming out.

DH – In fact we started doing computer design on the Commodore 128.

(14:11)

BH – Ya, we transitioned. We had to draw it twice, once on paper and once on the computer. Dave did all the drawing by the way. You did all the entry didn't you?

DH – Yes, I did all kinds of entry in there.

BH – Dave also proved that DRAMs actually do work. They weren't called spreadsheets. What was it Visicalc back then?

DH – It was actually a VAX spreadsheet.

BH – What was it? What was the name?

DH – It wasn't VisiCalc. It was something weird. It was basically a bad copy of VisiCalc for the VAX. And I did all the timing in there to prove that every –

BH – DRAMs actually worked.

DH - that DRAMs actually worked. In fact there was a negative 1 margin or one timing parameter.

BH- The whole time.

BH – here's what. This was actually my prototype and my proof and I looked at this and said "Oh my gosh. Who would do such a thing" and then I saw my own sign to myself and it says prototype only so even back 20 years ago I was justifying why somebody would have this number of jumpers and stuff. And this is what it took. I mean we didn't wire-wrap this whole board but what this is for example is we needed 3 custom IC's. Well, we would plug a board in representing (let me get that in the shot) into where the IC would eventually go so we had different modules all wire-wrapped by our talented technicians that would actually plug into a board.

(15:28)

BH – And we had 3 or 4 of these and this is what the programmers would develop on going in to CES because we would get these chips. During the '85 Vegas CES they were actually bringing them out as each person arrived. They were bringing us 80 column chips each person would have one or two. And of those even maybe one might work.

DH – And we, right before that CES, we spent pretty much between Christmas and actually including Christmas and New Year's I think testing chips to find the few out of the thousands that would actually work.

BH – Ya. I just got so I was eating Christmas dinner and Thanksgiving dinner off the lab bench out of aluminum foil and I couldn't think of a better place to be. This is what a 128 board ended up looking like. I thought it was signed. Yes, it's RIP Herd, Fish, Guay, that's Paul Ribino's initials I think. I thought it was written bigger in the silk screen. I think they wrote it twice. But that just goes back to where middle management had actually tried to stop the development of the 128 right in the middle and we made up

the time by working 72 hours straight. That's where that came from. Everybody that worked on it died that weekend so it was RIP.

(16:41)

BH- Show them. Boy, those things are so huge these days.

DH – Well, ya. This is what a C-128 looks like after sitting around for about 20 years.

BH – The plastic. I have one that looks just like that too. My 128 that I have at home I actually bought at a yard sale. This is soft tool plastic that is why its doing that. This was actually shot from a mold that wasn't limited.

DH – This was my own personal one that I had for, I had this hooked up to 3, 4 floppy drives at one point. I was running CP/M and regular stuff. I had it on an 80-column monitor. It was great. I mean it was like the first real computer that I'd worked on. So I was happy with it until the Amiga came out at least.

BH – We actually used to work on VT100 keyboards. Our editors and everything. VT100 keyboards hook to a VAX. Well, it's no mistake that this exact footprint, layout, is exactly what a VT100 at the time was. We couldn't think of a better layout and we were used to it ourselves.

DH – And we really hated PC keyboards for years.

BH – Even the Commodore key there I was a little allergic to. Of course, when we arrived at Las Vegas, 20 years ago, we met with a fact that had escaped us as designers which was that the C-128 was expandable to 512. And it had been planned to be expandable to 512 but my boss at the time, who later got let go, told me that there was no time for me to put the MMU that he had promised me I could put in and so we were limited to 128 and then his boss asked him “Where does the memory expansion plug in to?” and he puffed on his cigar and said “In the back.”

(18:24)

BH – So we had to come up with a device that plugged into the back. Frank Pilaea did this. This is a RAM cartridge. People like Hedley Davis got

involved with. We did a spinning earth globe demo which was pulling images out of this with DMA under BASIC control and that was very impressive.

DH – You could actually do faster animation using this than you could without it.

BH – Ya, you couldn't draw something as fast as you could pull it out of memory. So here we came through. By Hook or by Crook we came up with a mechanism and actually added DMA commands in BASIC. Who'd have thought it? Like I said, we were inventing this stuff as we went along. I just threw this in. This was designed by Jeff Porter who went on to become the father of the LCD computer and later Jeff really rose up through the ranks and did a lot of very good things at Commodore.

DH – Ya, he was like one of the last...

BH – He was the guy who knew how to tie a tie.

DH – yes. He could tie a tie but he was also, when people talk about bad management at Commodore he was the opposite he was a great manager at Commodore. I worked for him on a number of projects.

BH – So what you saw back then was the fever he was starting in the later days. There was a lot of things laying around with big orange H's made out of scotch tape on them. This was, that meant it belonged to me and not George Robbins.

DH – George Robbins always wrote A500 modified on his stuff. And I usually wrote something like - whatever it was. Whatever I happened to be working on. Prototype or special hack or something like that which – just to scare people off from walking away with it.

(19:55)

BH – Alright. Now, this hasn't seen the light of day, I don't believe, in many years. This is one of the original Commodore LCD machines. And you'll actually notice the Scotch Tape that's holding the bezel on here is 20-year old Scotch Tape. I'm afraid to take it off. To me that just proves it

originalness because we broke this the first week I'm sure and Ian Kirschman ...

DH – ya.

BH - Ian was the guy on this. Hedley Davis wrote the code. People like Judy Braddick, Andy Finkle, Carolyn Scheppner were writing code on this.

DH – This had built-in software that was actually very good.

BH – Right. Though I heard later that they got - I had one with the memory management to point in and do everything and they bought a bill of goods from the chip designers of the day who said “You can't have the function line on there it breaks everything”. Of course, they didn't know how to hit a chip designer in the back of the head in the parking lot and force him to do what you wanted him to do.

DH – Ya, there were a few issues but this was the response to the Tandy 100.

BH – And you know what else? I was trying to remember was it the 100 or the 1000. But Commodore owned the only, this was our own LCD glass.

DH – we actually made it.

BH – Ya. We were the only company that made glass in America. All other glass came from, when we say glass we mean LCD assembly, came from overseas. And we had bought a company called Eagle Pitchur and we were making our own glass. And this actually lit up and it worked. This may actually work I'm just not willing to power it up right now but if somebody wants to buy this from me someday I'll deliver it probably working with a full set of schematics but I'm talking like lots of money. Send those addresses to (laughter)

DH – This is certainly the rarest machine.

BH – I think so.

DH – At least one that worked.

BH – As a matter of fact the door here, let me get it where you can see it, there's a door here where we can put an EPROM in. I've never seen, I've seen this door, they used to get lost right away so I've only ever seen the LCD's in this mode. But if you see, I don't know how well you can see, these are real low-profile keys. That was a whole new design concept where the key from the top looks like its' got a lot of length and throw to it but it doesn't. That was done for us by Mitsumi.

DH – It's an awful lot like modern laptops.

(22:23)

BH – So we've got, there was even a, show you everything that's here, there is actually a bar code port on there just to kind of show you what we were thinking. And because we can't have batteries back in the old days working all the time there is the ever-present pair of pig tails where we would power it off a power supply on the bench. So this is one of the, as a matter of fact this had the number on it, this is number 2. So, there was another one out there. I believe there might have been a total of 3 or 4. Jeff Porter really put his heart into selling, this is concurrent to the 128 so Jeff and I were actually competing for resources back in the good old Jack Tramiel fashion. But he had a good case that he could sell these and he actually went to a CES and got orders for thousands of these things and Marshall Smith the President back then said that, the way I heard it and it could be wrong, that he had had a discussion with the President of Tandy and said there's no future in laptop computers.

DH – Right. Because who would want something that's portable and you could use on the run.

BH – It was only later that year that we found out that it was their highest single selling product of all Radio Shack was that old TRS the Green and Gold thing, this looked a lot better than that guys – I gotta tell you.

DH – Oh yeah. This was a big improvement.

BH - But Jeff had put his heart into it so it wasn't for lack of trying that this should have been produced. We should have been the first people out there. We should have been first to the PC market. We should have been first to

the LCD market. But Commodore had lost its animal magnetism when it lost Jack Tramiel.

DH – Yes,

BH – The Amiga Junior. I remember. Somebody said there was a memo that the next person who calls it the Amiga Junior is getting fired.

DH – That was years later. That - with the A1000 Junior was what we thought a product that was basically designed poorly by management and the guy who was in charge in those days had been part of the PCjr project at IBM...

BH – though we're not going to drop any names cause we're really...

BH – But speaking of names let me tell you about some of the good names. You may have heard like Dave and I we've got a little bit of Net presence out there. We're still a little bit of geeks. The third member of the hardware team was Frank Pilaia and I'll tell you most of us Commodore people from the engineering days still get together once a year. We haven't seen Frank in 20 years. Frank if you're out there give us a shout. bherd@jersey.net Drop me an e-mail. He's dhaynie@jersey.net

(25:00)

BH – Von Irvine wrote CP/M. As a matter of fact you may have seen my writing where Von produced a small miracle by editing CP/M during the CES show with a disk editor getting the checksums right and everything and making the 80 column chip work in spite of itself. Hedley Davis who is an old friend of mine came from the same company that myself and Terry Fisher (Fish) who did the PC board. We all came from the same company and Hedley had a real good background in hardware and software and math so he produced the spinning globe we talked about.

DH – He was doing both hardware and software the whole time he was at Commodore. He's a real inventive guy.

BH – He did the Commodore Mouse.

DH – He did Hedley HiRes which some of you Amiga people may remember.

BH – as opposed to (unknown) a name I couldn't stand. Of course, Greg Berlin, the man that broke my shoulder – 6 ft. 8, was the only guy I'd fight cause I'd hurt anybody else.

DH – he broke my front teeth.

BH – And you know, he designs like he fights what can I tell you. Dave Siracusa who wrote the code, a devoted family guy, after all these years that's what I still hear about him.

DH - uh, Fred Bowen and Terry Ryan on System Software, those guys could pretty much eliminate any mistakes that we made in systems or the chip people made. Keep in mind in those days it was all in assembly language.

BH – And Ed Parks, our boss, who in later days was my boss, proved that management could do something useful as far as furthering the design. The chip guys, in both the Plus/4 and the 128 a guy named Dave DiOrio, who was my best friend at one time. We broke the barrier between the chip guys and the hardware guys and programmers. Prior to that there had been finger pointing.

(27:00)

BH – Well of course there's finger pointing as the design gets near the end the accumulation of errors is such that people would say “Well, you made a mistake” Of course we made a mistake. We're going fast.

DH – That's part of engineering.

BH – We're going Light Speed. So we started, Dave and I, our friendship started where we knew that would occur. We called the programmer's and said “You're going to fix the problems. At the end of the day you're fixing all of our dirty laundry. Get used to it now. We'll buy you a beer. And get back to work now.” And that worked for us, and Dave and I kind of broke the molds with that and we also started working with the Commodore Japan Engineers to the point where I actually learned Japanese so I could go

drinking with them and talk bad about the boss right in front of the boss and that was always a lot of fun. And so we broke down those barriers too.

DH – And that pretty much was retained when we started doing Amiga stuff too. The hardware, the software, the chip designers, we all pretty much got along. It was very weird because I had worked at other companies where they built official walls between hardware and software which just encouraged the finger pointing.

(28:10)

BH – Right. Let's wide angle this.

DH – That's as wide as we can get without the adapter.

BH – Go ahead and scroll it up. So they're not just seeing. There, see a table full of everything.

DH – full of junk here. Pull it back a little. Can always edit this out. Transition that's not too bad.

DH – There we go. Look we're still here.

BH – So you don't just see a table. See some hands while we're talking. So then some of the other people that you wouldn't have heard about, the technicians, Gail Moyers ran the hardware lab. Kim Constein Gray, who in addition to being a very special person, was probably the one technician most responsible for the Commodore 128 getting completed. She would actually stay at Commodore during the long nights and I would finish engineering about 2 or 3 in the morning and she would get up from bed and she would do the changes I needed to finish something that night and by 5 or 6 the next morning we'd have it working. Do you remember those days?

DH – Yeah,

BH - We would fix it every night. And there wasn't a problem that we didn't fix bin one night.

DH – Right. Every problem was done in a day.

BH – And consequently you'd see me walking around barefoot at 8 in the morning looking grumpy wondering why all these managers walking the halls saying you're in my territory.

DH – We had sleeping bags under the desks.

BH – and air mattresses. And we would actually go to sleep and let the daytime crowd kind of pass us by while we caught our naps there. Jeff Breneckie, Curt “don't call me lab trash” Guthrie aka Chip aka Arlo, Lucky Kowlowski, these are all the technicians. In the IC Lab Group we had Mike Angelina whose no longer with us, Jim Rolhauser is no longer with us, Jim, The Reverend Jim, quite a character. If you ever get a chance he's got some Nash the Slash videos, there still out there, buy one. It's wonderful stuff for 20 years ago.

DH – really cool stuff. He was a pioneer in video. He was doing Rock Concerts and doing computer video before pretty much anybody was.

BH – And he proved you could disrupt an entire work place just by bringing a video camera around. Nothing got done for a day. Dave Esposito, Sandy Roshong Fisher , again special people that, you know, we used to hand layout these IC's. When we got there there were still rubylithe cutters in the drawer I never saw them doing that but they would actually cut films by hand by pushing desks together and cutting them with Razor blades. When we got there they were drawing polygons on screens but they didn't have the design tools that said whether they did it right or wrong so people like Dave DiOrio and Victor Andretti they would spend months with a scale measuring these huge plots and that's how you checked your work so it didn't matter how clever of a designer you were, it mattered how well you checked your work.

(31:09)

BH – That would have driven me nuts because I don't check my work that well.

DH – No way. It's better to have a tool that checks your work like we have these days.

BH – Ya, I have to tell you, like, some of the work like you see Jeri Ellsworth, you know, putting an entire one of these on a chip, and doing it from a PC computer, I mean that's just a wonderful thing these days. You can literally, a person in 3 weeks can do what it used to take 5 or 6 of us 6 months or more to do so it's really changed the environment. You put this on a single chip these days.

BH – But the, ah, pull out that Amiga board.

DH – Ya, this is a blank

BH – Look at the size. Not only could you eat dinner off, 2 people could eat dinner off this and this was the size of stuff. You wouldn't dream of doing this. This is 1/200th, 1/100th of what's in a cell phone these days.

DH – Here's my latest work by comparison.

(32:10)

BH – Well, it's been a pleasure. Hopefully y'all haven't fallen asleep or you've been able to hear us throughout this, but we did want to, we couldn't be with you today but we did want to say Thank You for remembering the Commodore days. Or it's amazing that you remember the Commodore days.

DH – It's amazing that you remember. It's flattering.

BH – When I talk to people these days, 10 years ago, I'd say something about Commodore and, you know I could get a rise out of the person if I'd say "Remember Commodore 64's?" they'd go "Oh yeah, my Dad had one" well nowadays there is a whole generation of people that never even heard of Commodore. My wife thinks Commodore was like the 5 people I go to see every summer and we must have sold a couple dozen computers between all of us. She doesn't realize that, like so many of the generation, she doesn't realize just what Commodore was in the workplace in the computer environment. And you know to the victors go the spoils. Apple's still here. We all know those names but you don't know the names of the people who were putting this out in the Jack Tramiel era. Really cool. Anything to add?

DH – I have a few of the last things that were done at Commodore.

BH – Ya, let's see those.

DH – Here is a CD32.

BH – I've never seen one of these.

DH – This is a CD32

BH – I was gone by then.

DH – The CD32 of course was the game machine and this was I guess the last product, the last major product, Commodore released. This was a year in which they were really hemorrhaging money and it was kind of like if enough of these were able to make, they were able to make, maybe they would have lasted a little bit longer but they were just out of money and the last big thing I worked on which is another thing that has never existed. This was a Triple A motherboard or what we called the Triple A motherboard. This was the Advanced Amiga Architecture, the 64 bit chip set and, of course there's no chips on here because we built 3 boards but we only had enough chips for 2 of them because they were actually doing edits on the chips at that point.

BH – Look at the size of those chips.

DH – That's huge, of course. Even regular PC's have shrunk compared to this.

(34:21)

DH – This one had a network, it had a bunch of stuff on it, it was really cool it had the operating system on a ROM so you could change it on a cartridge.

BH – I just have to show this. This is a KIM-1, this is what started it all. A Processor and some memory.

DH – We even have the manual around here for it somewhere.

BH – All right, well good. It's been a pleasure, you know, talking to you. And hopefully we might get a chance to do this again sometime or run into

you guys down the road. Supposedly there's a book coming out. Do you know about that?

DH – I know about the book I actually contributed a couple interviews and some photos to that book. I don't know if they made it in or not.

BH – Be looking for that and you know my e-mail address if anybody's ever interested is, I have the c128.com domain but it sounds a little pretentious so I give out bherd (b, h, e, r, d) @jersey.net and if you put Commodore in the subject line it will make it through my SPAM filters.

DH – And the same thing with dhaynie@ jersey.net and that's spelled h, a, y, n, i, e not the way they did on Green Acres.

BH – The jersey.net domain, I own an ISP so the domain name's free so that's why those.

BH – Again, it's been a pleasure and we hope to run into you in the future.

DH – Bye.

BH – hopefully that recorded, right.

DH – Yup, that recorded.