

Track #2.
#1.

S. This is Track #2 of the continuation of Interview TC-27.

M. Okay. Well the principle was this, that it has been observed that if you have a customer become an IBM customer in the first phase of his getting into using data processing equipment, that the tendency is very high for him to continue with IBM and grow on up into the more profitable, bigger systems in IBM instead of something else. So I guess the reasoning was that we should accept a less than maybe normal profit situation in return for which we would build this tremendous base of small business....

S. Was the 3000 going to be marketed just in Germany or all over?

M. Oh it was going to be ... well as it started out it was going to be just in World Trade. But it wasn't just Germany, it was all over. And this great big base would lead to large pots of gold at the end of the rainbow in terms of those of these companies that did grow and of course some large percentage would and they would grow up into the standard products which were more profitable and so on. It was also recognized as part of this marketing side of this thing that you'd have to do something rather special in terms of how you'd handle this market place. You see, the problem is that if a salesman is on quota, he's not ordinarily on a quota of specific boxes. He's on a total point quota. So the salesmen are very smart and take the path of least

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resistance and they would quickly observe that they could sell a bigger machine for essentially the same amount of selling effort

S. That's the story everywhere.

M. Without too much effort on his own part after selling it, in getting it installed, the problem of teaching the customer how to use the machine properly and all the rest, the troubles, bugs and so on. So the path for a salesman of least resistance is to go after the substantially more expensive machine, which is also a big seller. So the way to get around that we tried to fix it up so that the salesman's efforts to do the selling and in particular the installing, would be reduced from what they normally were. So they had a whole team of guys, I believe the fellow that sort of master minded it was a fellow named Orlin Deanie (?). In any event, they developed a whole series of application packages right down to being virtually a cookbook for the customer and for instance in Germany they had one set and in France another set and so on, in the language. But also with the variations that occurred just because of the different countries. So in Germany for example, they would have a payroll computation cookbook that would do the guy's whole payroll for him. And that would have possibly two or three different approaches to handling payroll which were the two or three more typical ones used generally in Germany. But the guy

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wasn't told you've got to use that. He had a choice between two, three or four.

And within the payroll, the computations were all done based upon whatever

requirements there might have been for withholding taxes and all the rest

that are common in Germany as against what the French do, etc. So in theory

at least, the guy definitely could take that book and just follow it cookbook-

like and get his payroll out and it even went so far as to give him the wiring

of his plugboards and the whole business, so that it was all done for him.

And they did what looked to me to be a very complete, thorough and I gather

excellent job, although of course the thing never really got a chance to be tried

to see how it really worked out in the field and how much did it really do for

the salesman. But at least we had it and there was a several foot long shelf

of these for all the inventory, and payroll and blah, blah, blah for each country.

So that was part of it and then there was also a consideration and I don't know

personally whether this was done, that they would have kind of a junior sales-

man category, a fellow that was just out of sales school would perhaps for a

year only have the 3000 series in his portfolio, so to speak and that's all he had

to sell and he had to make his success or failure on the basis of that. This was

thought to be a good way to motivate the guy and it would also provide a very

wonderful experience and training for the salesman to get in and install several

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of these during the course of their early careers and then graduate up into the big system. Well anyway there were all those kind of considerations and there was a lot of foot dragging on the part of some people who felt that it was a mistake to go this way. I do understand that there was even some difference of opinion between Dick Watson and Tom Watson, Jr. as to whether we ought to have this machine and do it on the basis of the kind of profitability that was forecast and so on. But in any event, it was finally concluded that we ought to go forward and we got to a point where we were in the last throes of trying to get through Product Test. We had been having a couple of kinds of trouble in Test. One was in the printer where the ink from the ribbon was getting down in between the segments and causing eventually an accumulation of ink and dirt and so on which was causing some of the bearings to bind up and it was beginning to look like there was going to be a heck of a lot of "at ease" (?) time required, excessive for the machine really in terms of the total FE cost. They would have to take that doggone printer out of the machine every so many months and dunk it in a tub of cleaning solvent or something and get the ink out of there and free it up and get it back to where it worked right. That was very unattractive of course. But that eventually got fixed by some changing in the type of ink and the type of ribbons we were using and ink and I guess

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they did some adjustment of some of the clearances too, some of the type tolerances that would allow a little more stuff to accumulate in there before it caused any binding up. Now the other trouble we had been having was card reading accuracy. The thing used a pin sensing system which involved very sharp pins being lowered down onto the card and if there was a hole, the pin of course went on through and caused a contact. If there was no hole, the pin was held back by the card and the contact didn't work. Well we had had some random failures of card reading, a very intermittent kind of thing and we went to all kinds of trouble to try to find out what the dickens was going on, because it just happened once you'd run thousands and thousands of cards and all of a sudden you'd get one misread and they had a very cute little scheme in the German lab. They set up a Strobe (?) light, or flash lamp kind of thing and a camera aimed at the point in the machine as best they could get at it, where these pins came down on the card and they had an error detection circuit and they turned on the camera, opened the camera lens, and they had it in a dark room, absolutely dark, so the camera was just sitting there staring at this card reading location and if the error detection system found an error, it fired the Strobe light and you got an instantaneous super-high speed picture of what these contacts, these pin testing things were doing. And it turned

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out there were a couple things. One again was some binding. These were spring-driven type tolerances and card dust and stuff like that which apparently occasionally had been giving trouble. But the other thing that came out was that there was trouble with the cards. There is an ingredient in punched card stock which is an undesirable one, that shows up which is called slime. I guess that's a term used in the paper industry. What it amounts to is that in the grinding up of the pulp and making of paper stock, there are occasional pieces of the rosin of the tree. And so in the card here or there you may find a little brownish area which is in fact a piece of rosin rather than paper fibres. It's pretty hard and there it is. Well that hadn't been a real problem with card stock before. But with pin sensing, you came down pretty fast with a fairly sharp point on the card and if it just happened that there was a piece of this slime or rosin there, sometimes it would pop out of the card, leaving a hole right through the card, whatever the same shape of the particle was. It would pop right out like a nut coming. a knot coming out of a tree. Well now all of a sudden right there would be a hole in the card insofar as the card reader was concerned and you'd get errors from that. Well we had a big flap over that. There were question such as should we change the shape of the tip of these pin-sensing things to get a little better radius, a little bigger

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diameter so they wouldn't press quite so hard and finally we had a discussion with the manufacturing people and Bob Dunlop, who was in World Trade Manufacturing in New York who worked by Cy McElwain, who was head of Manufacturing in World Trade, joined us at a meeting over in Stutgaard (?) about the card stock problem because the card stock over in Europe it turned out, was much more prone to have this slime in it than the American card stock. They had two things going over there. They were first of all, promising to upgrade the quality of the European card stock suppliers, and I guess I don't remember how they were going about doing that, whether it was just tightening down on Quality Control or whether it was to be developing some new sources of card stock, I don't know which. But in any event, they had a definite plan to improve the quality of card stock and this was being done I think, regardless of the 3000. There were problems with card registration in key punches for example, which were attributed to card stock differences and so on. So they were going to go ahead with that and so ultimately that would fix the problem. Meanwhile, because these cards of course only used about one-third the amount of paper as the normal sized card, and the program was going to be some time before the volume of actual cards to the customers would really be substantial, we'd have to have an awful lot of machines and so on. They were going to get card stock from the States and they were going to make 3000 series cards

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with U. S. card stock in the interim until they could get the European suppliers up to speed. Well in any event, we felt that that solved the problem and some of these other troubles we had been having with the cards, had been fixed so that there was just this slime business was all, as far as we could tell. Well we finally came to the day when we had a bit meeting with Product Test and the engineering people and myself and we concluded that we were able to support the announcement of the machine. I can remember we sent a telegram back to Dick Watson and said, hey we've just concluded this big meeting and it was a couple of days long if I remember rightly, and Product Test has agreed and Engineering has agreed to go ahead and announced. if the CE test is successful. So they did and they had a couple of the laboratories laboratory built models. They were nice looking machines, nice covers and the whole works, just like the real finished product, which were taken around and shown at various business shows and routing demonstrations and all the rest. Now it was about at that time that I ended up getting a new job, having been in this World Trade job for I guess a little over four years plus the seven or eight months before that where I had that accounting machine thing at Endicott. And I had been doing so doggone much traveling and in fact for idle interest, I checked back to my expense accounts one time and I found out I had made 42 trips to

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Europe in about four and a half years and total timewise I had spent , you know those trips had added up to about forty per cent of my time for the four years that I was overseas with my family living over here in Rye. So in any event, they came along and said. . . . I wasn't in on how they happened to select me for the job or the reason, but my personal view was that I had had FSD experience and they apparently felt they needed a new lab manager in Kingston lab which was FSD at the time. So they offered me the opportunity to take that job. And having gotten sort of up to here with all this overseas travel and stuff, I took it. It probably turns out that that was a mistake in hind sight, because the 3000 wasn't totally out of the woods yet. They hadn't reached the point of shipping the first machine and all the rest. I kind of regret not having stayed with the doggone thing till the moment of truth, so to speak. But in any event, I didn't. So the next I knew about the 3000 was some months later when I heard from one of the fellows in Europe that they had put the first machines out. They were I guess kind of pilotwise models. They weren't really in full production. They put them out into a couple of little banks right in the Stutgaard area with the idea that they would have them close at hand and they could observe them and back them up real well if there were any problems and kind of feel their way along, before they went into full shipment. And it was in one of these banks that they suddenly really ran into this problem of the card reading accuracy. The things

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apparently were making errors and they were totally unacceptable in their frequency. I remember the spec where we could make one card reading error in some several hundred thousand cards and they were apparently making I don't know the exact number but let's say they were making an error every thousand cards, something like that, which would drive the customer out of his mind because it screws up all his totals. In a bank in particular, he could be off all over the place. So of course that caused a tremendous fire alarm. They pulled the machines back and went into a crash engineering re-evaluation, redesign to try to find out how they could fix them.

S. What was the source of the unreliability?

M. Well it apparently was this. was associated with this slime trouble.

S. With the U. S. stock?

M. Well I don't know personally whether they had the U. S. stock or whether that was forgotten along the way and I don't know personally whether there was in fact even something more to the trouble like something basic in the pin sensing and it wasn't slime. Well all I really do know is that the card reading error rate was just out of this world and it apparently wasn't helped and couldn't be helped by special attention by the FE's preventive maintenance, frequent cleaning or that kind of thing. It apparently didn't do it.

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Well it turns out apparently that everybody had been fooled during all these demonstrations and the rest. They had run all these marvelous demonstrations and shown typical customer jobs. They had a team of guys who were really experts like DP always does. They can really razzle-dazzle you with a machine demonstration. And apparently when they went back and dug around, they had been experiencing some problems of this type all along.

S. Strictly with this card reader?

M. Apparently strictly with this card reading question, yes. But nobody had really spoken up about it or if they had spoken up about it, they spoke to somebody in Engineering and the Engineering guys hadn't run up the red flag. They just said, well you know that's a model machine so when we get the real parts why it won't do that and they sort of rationalized it away to where apparently the management side of things hadn't been aware of this trouble. So anyway, Ganshorn and those guys he was running the German laboratory, went into a hundred hours a week kind of a schedule to try to fix the thing. And I am told that they did, that they finally succeeded. It took them several months, seven or eight months I guess, to make changes mixes and then test them out thoroughly to be sure to have it. So it was sort of like the Spring of the following year . . . what year would that be? '62? I don't know. But anyway,

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they had the thing cranked back up to the point of having an acceptable product. But by that time, because there had been enough kind of rethinking and re-assessment of the whole program and of course it was tainted by this kind of engineering disaster, and it was finally decided that they would leave it in its grave. They weren't going to go ahead any more. It was dead. Well that's what I know of the history of the 3000.

S. Who were the guys in the German laboratory?

M. Well as I said, when I first went in World Trade, Walter Scharer was the head of the laboratory and that was his kind of pet project. Besides that it was more involvement on his part than a normal lab manager would have. He was the main guy. Then of course Ganshorn was put in charge of it when I made him the lab manager a couple of years later. So going through the final testing and getting into announcement and and then all this big problem trying to save the thing and all. This was under Ganshorn (?) and I must say he really worked himself trying to make it run. But these other factors, the profitability and all the other sort of stuff, kind of came in and won the day I guess.

S. Did anything else ever replace it?

M. No, nothing has replaced it yet. But the 3.7 is a replacement.

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People say well it is different. Yes but it is not all that different.

In fact it has a small card. The same idea there, a nice compact machine, all new. Every piece of 3.7 gear is new from the ground up. It has a small card. and it generally tends to get it cheap enough. Larry Wilson out in San Jose, who has always had a very good communication and did especially in those years with Ganshorn, is another of those who has a strong motivation to try to do something for getting down lower into the product area again, to get down into the broader based small customer. And that's the whole name of the game, just like it was with the 3000.

S. Well we've still got the same problems.

M. Well we have the same kind of problems that exist in the marketing problems of how you go about getting effective sales support for it when it is a small, low-priced machine. The same argument about the profitability and all that stuff is there still.

S. The same thing happened with Lentz's small computer in 1953.

M. Oh yes. Everybody that tries to go for the low, low end, below where we are today, always runs into this damn trouble. That's why the average guys in the computer racket are much more motivated to go bigger. It's a lot easier to go bigger, bigger and faster. The heroes though ought to be the guys who succeed in driving the thing down because that's a tougher job.

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It's a lot tougher. Now the 3.7 has taken advantage of some technology which we really didn't have in the old days with the 3000 series. A. It's an electronic machine whereas the 3000 was not. It was electro-mechanical with electro-mechanical counters and all the stuff conventional to the old school of accounting machines. So because it is electronic, there are some games that can be played to get the performance and all that hopefully at the cost. From the card viewpoint, there some of the same darn problems that existed, a smaller hole and a smaller card and the accuracy in registration and all those kind of problems are tougher because of it. But they don't have the pin sensing. They have gone to a photo cell system of sensing these holes. Because of that, they are not pressing on the card with pins like we were and therefore they don't have these problems of slime and the possibility of card damage and all that kind of thing. So there they ought to be okay. They ought to be able to be completely reliable in the card reading aspect of the thing. We were fooling around with some alternative card reader approaches back in '59 and '60 on the 3000. We had a radio frequency type of card reader that employed radio waves and the presence of the card stock acted as a dielectric in the hole. It wasn't a dielectric. It just had air so you could detect this with diodes and that again didn't put any pressure on the card. But it was there from a reliability

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viewpoint. In fact the Endicott Product Test Lab tested a robot for us and made the statement that it was the most reliable card reading technique we had had to date. Unfortunately it wasn't there from an economics viewpoint for a machine like this. But now photo cell sensing had gotten cheap enough so that 3.7 can fly with that and probably won't have any trouble.

S. Does the 3.7 derive from anything like the 3000?

M. I don't think you could say it did except in concept you know. except in concept you know. The concept yes. The concept of trying to get in to the small customer and give them a package of machinery which can do all the functions for his job. The idea of the small card, I don't know whether you'd say but I'm sure a lot of the selling points that Larry Wilson uses are the same we had for the small card. It is one-third the amount of card stock so the cards themselves ought to cost the customer less per thousand. So the small guy doesn't have a lot of room and these filed cards these cards when in the filing drawers will take up a lot less drawer space for a given number of documents and all those kind of arguments. They are all still applicable. I am sure that the 3.7 people, many of whom know of the 3000 program and the eventual demise of the thing, I can just be sure that those guys are devoting special attention to the question of the cards and the accuracy of card

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reading and that kind of stuff. Because boy you know, if the engineers in the States fall on their faces on anything related to that, based upon the knowledge of the few years' previous experience, there's really going to be blood on the moon. So I think they must be okay. I'm sure Product Test is looking after us crosseyes and all,

S. Is the 3.7 a separate machine or is it called a model of the 360?

M. Oh boy, I don't know whether it is going to be or not. It is incompatible with the 360. From a programming viewpoint, from an architectural viewpoint, the cards are a different format and all the rest, the code on the cards isn't standard or anything like that. So although they have somehow or other screwed up their courage and put their tongue in their cheek and called the Model 20 part of the 360 family, which it really isn't, I just can't believe that it would have the sheer guts to call the 3.7 part of the 360. But you know funnier things have happened. So you'll have to ask the guys that have the 3.7 about that. I know there's been a lot of talk about the fact well it won't be very long before we are going to have to provide 3.7 card readers on the 360. Because 3.7's aren't only going to be used by little guys, they are going to be used by the little sub-offices and branches of big guys and they are going to be able to

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or want to be able to feed decks of these cards into headquarters and get them run on the Model 65 or something.

S. A converter.

M. Well not a converter but take a 3.7 card reader and put the proper electrical interface on it to plug into a 360 and there will be some programming and all kinds of problems with the software to get that going.

S. It wouldn't be any fun otherwise.

M. No, that's right. So I'm sure the bigger systems guys have already done that. I don't know whether they have stood up and said they were going to do it on some particular schedule but the pressure is going to be there. It is inevitable. And of course the other thing is that even the big customer, the big guy, is going to want those cards for his big system, regardless of whether he ever owns a 3.7 or not. Because the big guy can certainly see the benefits of (a) more characters in one card, you know there are 80 characters in the Hollerith card and this has got 90, if I remember the number rightly. So that's an advantage. And all this question of the smaller space for storage of all these card files and stuff, this is attractive to him too and where you are shoveling thousands of cards per hour through a big card reader, the sheer weight being handled by the operators is substantially less. Larry Wilson now has all kinds

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of facts and figures that he likes to throw at people about if you sit there and an operator feeds a thousand cards a minute card reader all day long and keeps it busy, that he has done a job which is equivalent to shoveling several tons of coal in terms of just sheer physical effort loading those decks of cards. So I think the 3.7 card is going to spread like wild fire in the bigger machine area because those advantages are obviously attractive to those guys.

S. And the small card came out of Germany?

M. Well except the card they have now is a little different. It isn't exactly the dimensions of the 3000 and it doesn't have the same hole punching pattern as the 3000. It's a small card approximately the same size but if you wanted to say..... you couldn't do it. The code is different. The punching pattern is different and the physical dimensions are a little different.

S. Who developed the 3.7?

M. Well the 3.7 was done by Larry Wilson of the San Jose Lab. He's now a Fellow and Roy Harper I believe is still working with him. Roy Harper is his electronic right arm and he has a fellow named Greg Tobin I believe who works with him and does mechanical stuff for him. Then they transferred that thing over to the Rochester lab when it was finally concluded that it was a good enough thing to really go with it as a real project, because the San Jose lab would be absorbed by it and they are already dedicated to disk files and the rest..... Larry Wilson lives there as a Fellow and has a few people and keeps inventing new things. So Larry went to Rochester for several months

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at the time of transfer. He was there most of the time for several months helping the guys in Rochester get on board and take over. Now they have and he's more or less out of it.

S. Well what about the British lab?

M. Well the British lab was a whole different breed of cat from the other labs. The thing all started by virtue of a fellow named Bill Elliott, who had worked for a couple of different computer companies in England. He apparently somehow got in touch with Jack Brent and I guess with Dick Watson too. This was before I went with World Trade but only shortly like you know six months or a year before. And he kind of talked them into the idea of starting a laboratory in England and putting him in charge, hiring him and putting him in charge, which they did. And at the time I came into World Trade, that laboratory was just in its very infancy. There were 20 or 30 people that had been hired over a period of months. Some of them I guess were ex-colleagues of Bill Elliott's in some previous company he'd worked in. They had a corner of one floor of the IBM UK Headquarters building downtown London and were beginning to get up enough speed that they were getting anxious to find a place which would allow them to really have a laboratory, which they didn't have. This was just a kind of office space. That's when I got on the scene and there was a considerable

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amount of looking for places to put the laboratory. Bill's personal desires were to be around Cambridge, one of the university towns. The British Government had a different idea. Like so many of those countries, they were trying to plan their economy and plan where they would locate things. (phone interrupts.)

Well the British Government as you know, were trying to push the development of industry and the rest in what you could call the under-developed parts of England. And I understand that's the reason for instance that the factory over there is in Scotland, the IBM plant. The Government made it attractive to us. I don't know just which way, whether by some tax incentives or something.

But anyway they very much wanted us to go up into Scotland and we did. But for a laboratory we didn't want to do that because we felt that we would not be able to attract the hot shot electronic engineers and so on to a place that was as far out of the way as that. So we wanted to stay in the south of England.

Cambridge of course was not too far out of London. But the British Ministry in charge of this kind of business was very negative about that. They didn't want us to be in London and really didn't want us to be around Cambridge, although very reluctantly they did bend over on that. So finally there were a lot of these formalities you know, and very much at arm's length dealings between the British company and in particular Elliott and the British Ministry and I got into the

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thing one day in the typical American way, I said why don't you and I go over and see the fellow at the British Ministry. So Bill was a little bit surprised at that kind of a direct approach because you sort of don't do that thing you know, but we did it.

S. In England?

M. In England, yes. Anyway we did it and we had I thought a very worth while, frank discussion which cleared a lot of the air on both sides actually. I think the guys in the Ministry also felt that way too. And I think we kind of sold them on the idea that we were out to really do something in the field of electronics and computers and that there would be benefits to the British Government by virtue of our having a lab there. I kind of alluded to the "Brain Drain" sort of thing which the British are very sensitive to and were then. And by virtue of our having a lab there and the interchange with the U. S. labs and all the rest, that we'd be able to then attract goodly numbers of British electronics guys who might otherwise leave England and come over here and work in our Poughkeepsie lab or something. Well in any event, to make a short story of it, we finally got their agreement to go down to Southampton. Now that was kind of my idea more than it was Elliott's. He wasn't all that hot on the thing. I just took the attitude that it doesn't hurt us a bit to be in a good location from a climate viewpoint and where we had room to grow and reasonably good general

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surroundings for the purpose of places to live for people and all the rest.

The Southampton area, the South coast of England is looked upon as one of the

more attractive parts of England from a climate viewpoint and all the rest.

So I kind of pushed that a little bit. We found this big estate outside there in

Hersley, which had during the war been taken over by Vickers and was operated

I guess as a combination laboratory and aircraft partsmaking and that kind of

stuff. They had some old shed-type buildings built during the war, and this

big mansion, a great big stone mansion and a large amount of acreage, a couple

hundred acres if I remember rightly. We were able to lease that. Vickers

had no longer any use for the place. So we moved down there and started the

lab and eventually were able to acquire the thing and were just starting with

the planning of the laboratory buildings and in fact just shortly before I left

World Trade, we had to go ahead from Headquarters to spend the money and

build the buildings. This was almost a skyscraper kind of a thing. At least

it looked like one in terms of the buildings in the area in the countryside.

Well from a technical viewpoint, we got off the ground pretty good. They had

started out to develop a small computer a small computer.

S. Was this to fill local market needs?

M. Not that specific at that time, being a brand new lab. . . .

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S. (cannot hear your question.)

M. No, in fact I don't know that T. J. Watson was ever near the British lab. Didn't he die before that?

S. Well I don't know. When did that start in '54?

M. About '55.

S. Well anyway

M. There wasn't some specific thing. There wasn't something like this WWAM deal with the Bull competition, you know. It was a brand new lab with a whole bunch of new people, many of whom had had experience before in other British companies in developing small computers and the like. They were just naturally interested in working in that area. So we thought well one good way of getting a lab up to speed is to have a project of this type and let them go ahead but without necessarily any immediate urgency to build some product. So they were exploring with a number of ideas and eventually came to the read only memory control business which was not an IBM invention. I guess it was first discussed by someone from one of the British universities I believe, who was working in computers. But in any event, they picked the idea up and went quite far. There was nobody in IBM at the time that I know of anywhere else in IBM that was working on this particular approach. They

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carried this thing down to the point of winding an equivalent of it, "tross" (?) memory. Now "tross" memory is as you know maybe, used in the 40 and the 2841 control unit, a magnetically coupled type of memory for control. Now their first approach involved not the printed circuit tapes that they used in the "tross" but an automatic wiring process where you had a punched card controlled machine that threaded wires through cores and it had some advantage in that you could go in and actually modify the wiring and contents of memory by hand if you had to. An FE could take a piece of wire and thread it through these some 60 or 70 magnetic core units by hand if he needed to but on an RPQ or an engineering change out in the field. That's not possible at all with the "tross." You have to take the thing apart and take the tape out and make a new tape and put it in and all that kind of thing. Well in any event, they had this machine and it was called a Scamp. I can't remember what that stands for. Anyway it was the Scamp machine -- SCAMP. And in fact I think you'll find reference to it in that FORTUNE article about the history of the 360, you remember a year or so ago? Well they had that machine and they were hot to move forward with it and there was enough there in the way of a computer and control principle and all, that the thing could no longer be kind of ignored. So it got to the attention of the Product Planning people in World Trade and

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it got to the attention of the computer guys in Poughkeepsie and I can remember several meetings in New York with guys like Fred Brooks and others, where there was kind of a competitive jurisdictional dispute going on between the Poughkeepsie people and the guys in the British lab. Fred Brooks being one of the more levelheaded participants in the thing, who was more willing to see the merits and admit the merits of this approach than some of the Poughkeepsie guys, where all they wanted to do was throw rocks and the British lab ought to get out of that because that's our God-given "pervue" there there and we're going to put in that size machine.

Well eventually two things came out of it. First, the read only memory control approach got picked up by the domestic people. The Model 30 went with read only memory control, although not the same particular memory technique and the bigger machines, the 50 uses read only memory, the 40 of course uses read only memory and so on. The Model 20 has it too. That's right, the Model 20 uses the "tross" as well as the other one. So I am convinced that because of the work in the British laboratory, we were in the read only memory area sooner than we might otherwise have been.

S. What is the virtue of read only memory?

M. Well it has a number of virtues and I guess it's probably still a good subject for argument a good subject for argument over a beer. You will really probably find two schools of thought in the computer business

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on this. One point was that you could more readily use a design automation approach to design the control circuit in the machine with the read only memory. Secondly, you could make changes in the control part of the computer, add instructions to the computer and that kind of thing. Make changes in the way certain instructions operate and so on, without tearing up a lot of electronic logic. Because what you really had to do most of the time was to just modify the bit pattern that was stored in this read only memory rather than physically moving wires and rewiring old pieces of logic and so on. And of course for features, I understand this is the Model 30, that they made a very careful study of all the RPQ's and features and so on that ever got used on a 1401 with the idea that in most every case those would eventually be mounted on the Model 30. Then they exercised the design of each of these features to see whether they could in fact do the feature in the bit pattern stored in the read only memory rather than by physical wiring. And I think I have the right number in mind, it was somewhere like 80 or 90 per cent of even the RPQ's that people had asked for on 1401's could be implemented in the read only memory without other changes to the hardware and so on. So that's great. So there were all these virtues and you could do some very, very fancy things with read only memory. This is in terms of the power of instructions and so on. Because a single instruc-

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tion can cause the read only memory to run through a whole series of instructions of its own in the operating machine. So it was thought to be an economic virtue. Read only memories themselves are not cheap but the very large amount of logic normally required for the control function isn't cheap either and because of its added flexibility and simplicity in making changes and all the over-all benefit to have it. It does another thing, in particular the Model 30 sees this. It is possible to put a bit pattern in the read only memory which will allow the Model 30 to behave like a 1401 and run the 1401 customer programs without any change on the part of the customer to his program. So he doesn't have to reprogram it. If he's got a good running application for payroll on his old 1401, he can just run it cold turkey on the 30. That's called emulation. There was a big argument about that. I wasn't part of it but I heard all kinds of things. This FORTUNE article talks about it too. There was a school of thought that said, the hell with the customer. Let's not provide this emulation capability. That in effect would be saying to the customer, if you want our machines, you've got to reprogram all your existing applications to do it and convert it somehow. The customer is much more interested in spending whatever money he does spend on programming to program new jobs and why thinker with good old faithful that is already running like the payroll. So they bought the emulation lock, stock and barrel, the customers did. That was feasible, again economically

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feasible by virtue of the read only memory which could change the whole character of a machine by virtue of whatever bit pattern you put in it. So the customers that wanted to emulate, bought an extra box of read only memory, in addition to the standard box, which had normal Model 30 360 kind of operations. You'd plug in another box just like buying more core and the extra box had extra rental and contained the bit patterns required for emulating. It was thought originally of course that these customers would gradually convert and we priced that extra box of read only memory on the basis that we would make it kind of give the customer an incentive to quit emulating and we put the price up pretty high so that he would have an economic incentive to get converted gradually. But the fact seems to be that they aren't converting. They are just happy as hell to keep paying this xetra rent for the emulation ad nauseum really. So we did the right thing, after an awful lot of blood and sweat about that and the read only memory which started with Scamp was really a major factor in making that feasible.

S. Scamp was aborted, right?

M. As such it was, yes. It was replaced with the British lab having the job of doing the Model 40. The Model 40 is a British lab machine, the successor to Scamp. It has a lot of the same ideas and stuff in it I'm sure,

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S. What was the reason for Scamp going?

M. Well it was a little small and I guess I can't tell you all the reasons because again I was out of World Trade at the time. But from what I understand, sort of second or third hand is that they figured they needed a machine more of the Model 40 size. And Scamp wasn't quite it. And at the same time you had this powerful group up at Endicott that had originally done the 1401, Ernie Hughes and all those guys and they are a bunch of computer development guys that are not to be denied you know. They are very experienced and very powerful. So they glommed on to the machine which was the closest replacement of the 1401, namely the Model 30. So they had that as their sphere of responsibility and the British lab took the 40. So we ended up very well I think, this thing in the British Lab which was Scamp. They got the company into read only memory and made it feasible to do this emulation business and eventually the competence developed by that team got us up to the point where they were able to do the Model 40 and come out with a very good successful product.

S. (Cannot hear question.)

M. No, Bill Elliott left the business I think in about '61, somewhere like '61. He was kind of an unusual person who I always ;personally got a big charge out of as a friend. But kind of a controversial character from a business

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viewpoint. Didn't get along too well with quite a few people and I guess didn't really have the confidence of some of the top management in World Trade and so on. So they eased him out. I wasn't there so I don't know exactly all of the details.

S. Do you know who some of the people were who worked technically on Scamp?

M. Yes. I guess probably the key guy was John Fercroft (?) who again is in that FORTUNE thing and became the Lab Manager in England. There was an interim period after Elliott left. We put in Fritz Trapnell, who was there oh I would have to guess three years or four years. He was an American, a fellow that I had gotten over to work in World Trade and I had a couple of people working for me in the Paris Headquarters. One of them was Hal Martin who is now in ASD in Los Gatos and Fritz Trapnell. Fritz came there, I got him there because he had a lot of experience on the Systems Engineering and programming side of the air lines and World Trade was a real hot and competitive situation on air lines. So I got him over there and he turned out to be just the right guy too. He ran the British lab for two or three years until they could clearly see that they had the right guy, the right British guy to take over and that turned out to be Johnny Faircroft. Meanwhile Johnny had been very keyed to the

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Scamp business. There were a number of others. A fellow named Owen, Charlie Owen. He was an older guy. He was a kind of senior fellow, must be somewhere up in his 50's. A very inventive computer guy, a career computer inventor. He was a part of this group and I am sure made many contributions to the internal guts of the Model 40, some of the clever things that are in there. But I think the driving force behind it was Faircroft. Well he was the big one. And of course separately in the British lab they had the development of the "tross". The "tross" memory was developed and that grew out of this first approach with threading the wires automatically. They controlled the machine to do that in the etched tape, punched covered tape and they carried the development and the laboratory even built up its own model shop facilities which allowed them to do etched wiring work and all the rest. They got quite a capability in what we called wet process laboratory. So that all led up finally to this "tross" eventually becoming a product and the actual hardware design of the "tross" as a physical thing is a British lab thing.

S. Who is the guy who did that?

M. Well that's where my memory fails me. I can't tell you.

S. Well I'll find out.

M. I'm sure it will be easy enough to find out. I really don't know.

There were always several guys pushing the thing but who carried the thing through to a product I don't know.

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S. Well very good. Anything else that you want to add?

M. I don't know what all we've talked about. I've forgotten what we talked about on the other one. Did we cover all five laboratories?

S. Well we never touched that.

M. I don't guess there's anything else at this time.