

Question B15: John D. Rockefeller, Jr. & Rock. Foundation;
Job of Dean of Engineering at Columbia Univ.

I only had one conversation with John D. Rockefeller, Jr. That was when the Rockefeller Foundation was looking for a new president and he invited me to lunch with him at his club in New York. [X-REF BACK TO P. 74] When we talked over the phone I said I wanted to have it very clear in my mind what he wanted to talk to me about; that if it was in connection with the presidency of the Rockefeller Foundation I'd be happy to advise, but that I most certainly was not a candidate myself. He thoroughly agreed and we lunched. In the course of the lunch there wasn't any doubt whatever that he was looking me over as a possible candidate in spite of that speech. [EH QUERIES: APPROXIMATE DATE?]

1) BUSH's LUNCHEON WITH
JOHN D. ROCKEFELLER,
JR. re PRESIDENCY OF
ROCKEFELLER FOUNDATION

Now there's nothing that makes me madder than that. I've had it happen to me more than once. When he finally approached the question directly, I told him flatly that I'd much prefer the Carnegie Institution to the Rockefeller Foundation, and I'm afraid I was fairly impolite in the way that I said it. I didn't get as rough as I did out in Pittsburgh one time when they played the same trick on me [X-REF BACK TO P. 74] and I told the group I wouldn't be found dead in their damned institution. I didn't go to that extent certainly. But Rockefeller really annoyed me by that kind of thing. I guess that's about the only time I ever had a private talk with him.

Now this story about Dean of Engineering at Columbia needs quite a bit of telling to get the whole thing clear. After Compton^[?] came to MIT I was still just a professor of electrical engineering and there was in the department a chap by the name of Joe Barker. Joe was my junior in the hierarchy of the department but he was playing for position rather heavily and so was his wife. He played up to Jackson to beat the band and the whole department was alert to it and didn't think much of it. I told Joe one day that I trusted that he understood that if Jackson retired I intended to succeed him. He didn't make any contest of it personally and that seemed to put things into proper position.

[X-REF FORWARD TO P. 620-B]

After Karl came to MIT, Gerard Swope was still driving from the back seat. (Apparently the play on Compton was Loomis to Swope to the Executive Committee.) The first thing we knew, the story was all around the place that Joe Barker was being offered the vice presidency. We got the whole darned story before we got through in one way or another. It seems that Swope had assured Barker that they'd build him a house on the campus and a few things like that.

As a matter of fact, Joe wasn't playing for that, he didn't want to be second-in-command at MIT with a young president just taking over. He had in the meantime moved from the electrical engineering department at MIT down to Columbia where he had become Dean of Engineering. [X-REF BACK TO P. 590 AND AHEAD TO PP. 620-D]

- 1) FLASHBACK--BUSH AS PROFESSOR AT MIT
- 2) GERARD SWOPE, JOE BARKER & POWER PLAYS

[VB ADDS: HE WENT FIRST TO LEHIGH I BELIEVE. WHO'S WHO WILL TELL.] What he was really looking for, what he hoped for was to succeed Nicholas Miraculous and he was playing the game down there very hard. He thought he was on the inside track and he thought that Butler was about to retire. As it turned out, Butler didn't retire for many years and when he did retire Joe didn't succeed him. But at that time he was pretty sure he had the thing in the bag, I think, so he declined the post at MIT. [EH to VB: BY NOW I AM CONFUSED: WHAT POST?] [VB to EH: VICE PRESIDENT, THE JOB I TOOK AFTER HE DECLINED IT.] If he had accepted and it had been announced to the faculty, some of the top professors on the faculty would have promptly left. I would have been one of them without any question. The whole crowd knew Barker and nobody would have felt happy about serving under him.

However, they put into effect, just before I became Vice President, (and again this was Swope's game) a plan under which anyone who was on the staff and was doing consulting would be obliged to turn over half of his consulting fees to MIT. [X-REF BACK TO PP. 50-51] When that was announced it caused consternation. It wasn't a thing that had been taken up with the faculty; it was simply a ukase from headquarters. Of course Karl hadn't really gotten his feet on the ground by that time and he really didn't realize what was going on.

The thing was announced and when it was announced I promptly went to see Compton and told him I was leaving. He wanted to know why and I said, "Look, when I joined this

- 1) FLASHBACK--BUSH
AS PROFESSOR AT MIT
- 2) JOE BARKER AT
COLUMBIA AS
DEAN OF ENGINEERING
- 3) SWOPE'S UKASE ON FEE
SPLITTING BY FACULTY
DOING CONSULTING

outfit, I had an agreement and it was put through Professor Jackson. Under that agreement I was allowed to do a certain amount of consultation while I carried on my MIT affairs." (I even had that in writing in a letter from Jackson.) I said, "I just won't work for an outfit that abrogates its obligations unilaterally." "Well," Compton said, "of course there could be exceptions." I told him that his whole damn fool plan was going to dissolve in a welter of exceptions. That was the first time that I became acquainted with Karl Compton. [I also got acquainted with James Bryant Conant by having a row with him. Maybe I should tell it if I haven't.] [X-REF BACK TO PP. 361-A and 362]

There were others who felt as strongly as I did. One of the best teachers in the place, Louis Young, read the notice, put on his hat and walked out the front door and never came back in. He was one of the best teachers in the place. He became later the chief engineer of the Gillette Company. [EH to VB: I'LL BET YOU DON'T KNOW WHO INTRODUCED LOUIE YOUNG TO THE GILLETTE COMPANY: I DID!] [VB to EH: WHY, YOU SON OF A GUN!] A few others blew up.

What happened to me was far more interesting because Compton called me in a little later and began talking to me about the vice presidency. When I showed real interest, he said, "I thought you wanted to be a research professor." I told him, "No, I've done some research and I like it, but I'm interested in the administrative end of

- 1) FLASHBACK--BUSH AS PROFESSOR AT MIT
- 2) BUSH THREATENS TO RESIGN BECAUSE OF SWOPE PLAN
- 3) FIRST CHAT WITH KARL COMPTON
- 4) BUSH IS OFFERED MIT VICE-PRESIDENCY

things fully as much." The result was that I was recommended by Karl for the post. [X-REF BACK TO P. 51]

Well, Swope and I had a little talk in which I told him that I knew that he had offered to build Joe Barker a house on the campus, and that I thought it was a fool idea; that they could pay me a salary and I'd take care of my own housing; at MIT we didn't want any sideshows. We wanted the main tent to be the principal attraction and we didn't want any vice presidents fooling around with houses on the campus. So that disposed of that.

I became the vice president whereupon I found myself in the sweet position of administering the rule that had caused me to tell Compton that I was going to leave the place in a hurry. But the rule didn't last very long.

It wasn't very long before Swope pulled another one of some sort of dictation to Compton and Compton blew up. When Compton blew up, he blew up so that it would scare you. He was one of these fellows that never showed ill nature, never seemed to be angry, was always calm. But when those fellows blow, they are terrible because they have no intermediate safety valve. [X-REF BACK TO P. 376] Karl blew up and I'd like to have been present at the session between Karl and Swope. From then on Karl ran the show and Swope no longer interfered. I'll hand it to Swope; he didn't go off in a huff. He continued around the place and he gave a lot of money to

- 1) BUSH BECOMES VICE
PRESIDENT OF MIT
- 2) COMPTON SETS
SWOPE STRAIGHT

set up a loan fund and so on. [EH to VB: QUERY: THE FIRST SWOPE LOAN FUND CAME IN THE 1920's.] He was a good loyal alumnus but he was too much used to running things his own way.

The final chapter of this rather long story was when some other outfit, and I've forgotten which one it was now, there were several of them, came after me to take a college presidency. They approached Karl before they approached me in order to be polite. Karl raised the question with me one day and was evidently a little worried about it. When he raised it I said right off, "Why you know, that's the next to the last position in academic circles that I'd ever take." And he said, "What's the last one?" I said, "Dean of Engineering at Columbia University." So that's how the story came about that one of the lousiest jobs around is Dean of Engineering at Columbia University. I don't think that it's true today, but it certainly was at that time. [EH NOTES: i.e. IN THE 1930's]

Joe and I have seen one another since. He became President of Research Corporation in New York. I was one of the board and I got off the board as soon as he took over. Again it was the kind of thing that you don't like to see. Poillon had been president, and he had a stroke [?]. The board was looking for a new president and asked Joe if he'd take the job temporarily. Another chap and I asked him. Joe said yes, he'd take the job temporarily but he wanted it

- 1) BUSH AS V.P. OF MIT
- 2) DEAN OF ENGINEERING AT COLUMBIA A LOUSY JOB
- 3) BUSH & JOE BARKER MEET AGAIN AT RESEARCH CORPORATION

understood that he would not take it permanently; whereupon he turned around and took it permanently and I got off the board. [X-REF AHEAD TO P. 620-E]

Joe Barker, incidentally, was a strong supporter of McCarthy. I haven't seen him for quite a while. When we meet we're always very cordial, of course, in accordance with custom among people in Washington in particular.

[HERE FOLLOW TWO ADDITIONS BY DR. BUSH THROUGH PAGE 620-E: LETTER OF FEB.17,'65 and STORY OF KEITH THEATRE MYSTERY.]

[You have mentioned the Hawthorne experiments, and I think I have put something on this on tape. [X-REF AHEAD TO P. 666] But I think I ought to make my small part in it clear. The matter has been written on by Stuart Chase, George C. Homans, Professor Mayo, T. N. Whitehead and others, and I think the origin got lost in the shuffle.

[The National Research Council, jogged no doubt by the electric light industry, set up a committee to investigate levels of lighting in industry. My boss, D. C. Jackson, was chairman. J. W. Barker and I, of his staff at M.I.T. did the work. As a start I talked with Thomas Edison, who was a member of the committee, and learned nothing except some impressions of Edison. [X-REF AHEAD TO P. 667] I visited the River Rouge plant of the Ford Company, and learned nothing except something about Henry Ford [X-REF AHEAD TO P. 667] Then we went to work at the Hawthorne works of Western Electric

- 1) BUSH & JOE BARKER
MEET AGAIN AT
RESEARCH CORPORATION
- 2) THE ORIGINS OF THE
HAWTHORNE EXPERIMENTS

and had excellent cooperation. The accounts seem to be accurate from then on, although they do not tell when we stopped and the company itself went on. We put in a report to Jackson and it said in effect that it did not make any difference what the light level was, so long as operatives could see to work, and there were no dark corners in which to fall over things. I do not think this report was ever published. I do not even know whether D.C.J. modified it, or sent it to his committee or what. He was at the time consultant to several Edison companies, and I always thought utterly insistent on unvarnished facts.

[The accounts of course bring out some very important matters. They do not, as far as I know, go into one aspect I think is important. When we set up the work and control groups we made everything the same for the two groups as far as we could, including supervision. So each group got a new set of supervisors. These were hand-picked after interviews and divided equally. Now in every large factory there are bound to be some foremen that are sadistic, or let us say amourosly motivated or the like. We may not have eliminated all these, but the supervisors themselves were also under supervision. And shenanigans do not start right away when a foreman gets a new assignment. I think this was an important factor, and I am sure the company did, for they multiplied efforts to find and remove bad foremen. It may be written up somewhere.

- 1) THE HAWTHORNE
EXPERIMENTS AT
WESTERN ELECTRIC
- 2) SELECTION OF FOREMEN

[We pulled out as soon as we had data for our purposes. But we did go far enough to work with the four girls in the special room. Two of them told us they thought they could assemble relay coils blindfolded, and they did. Their actions were entirely reflex, while they thought or talked of something else. Of course any task that can be fully reflex can also be automated, but it does not always pay to do so.

[The relations between Joe Barker and myself were peculiar. Life is peculiar, said Jeremy. As compared with what? asked the Spider. Well, compared with my relations with the rest of my colleagues at M.I.T. He joined after I did, and played up to his boss so hard that I had to tell him that when the boss retired I intended to succeed him. Sometime after that he went to Lehigh, where I suppose he judged the competition might be less. When I joined up Jackson told me he did not want me to join his staff unless I intended to take it seriously. I replied that I certainly would not join unless I intended to succeed him, which probably surprised him a bit. As a matter of history I did not. I jumped over his head which made for some complications.

[X-REF BACK TO P. 615]

[Joe and I did a number of things together. One was amusing. Some chap was tossing chunks of iron into the audience at Keith's Theatre during performances. We solved that one by a bit of applied ballistics. [[EH to VB: PLEASE TELL.]] [[X-REF AHEAD TO P. 670]]

- 1) HAWTHORNE EXPERIMENTS
- 2) JOE BARKER AT MIT
- 3) BUSH & BARKER AT KEITH'S THEATRE

[[VB ADD: That show at Keith's was a dilly. For some weeks, in the middle of a performance, scraps of iron would be thrown into the audience. Several people got head cuts, and they had to settle. Word got around and audiences dropped off.

[[They had put on, a bit before this started, a show that made fun of the spiritualists, the mediums. They thought perhaps some of these people were getting back at them.

[[Somehow they got in touch with me. The first time they told me nothing and asked questions about gadgets for projecting small objects, noiseless and concealable, which I didn't answer. The next time they put their cards on the table.

[[I then got Barker to join me and we went at it. We followed up various leads into blind alleys.

[[Then Joe had an idea (it was his not mine). Lots of the objects had hit the varnished wood of chairs. In many cases they had labeled the pieces and where they hit. We made a diagnosis of this and it came out a fairly good ellipse. We even got some ideas of velocities, by trying to make objects make dents similar to the original ones.

[[This told the whole story of where they came from. So we told them "watch the left passageway in the first balcony, where it is out of sight of the seats." They said, "Why we have a loyal employee watching there who has been with us for years." So we said, "Watch him."

1) BUSH & BARKER SOLVE
THE KEITH THEATRE
MYSTERY

[[After a bit of persuasion they agreed. Before employees appeared for the night show we stuffed a detective into a ventilator, where he must have been a bit uncomfortable, but where he could see what went on.

1) BAKER & BUSH SOLVE
THE KEITH THEATRE
MYSTERY

2) JOE BAKER AT MIT

[[In the middle of the show, the loyal employee took some iron pieces out of his pocket and tossed them into the audience.

[[With a warrant his house was searched. Here were found a pile of similar pieces, and some cast iron pipe ready to make more.

[[I forgot just how the psychiatrists labeled it. Offhand I should think most any chap that had to watch a vaudeville show every night for years would go nuts.

[[I believe we didn't send them a bill -- on the basis that it was hardly what we wanted Jackson to think we considered professional consulting. I know they gave us each a permanent pass to the show. Unfortunately I can't use it, for I lost it long ago, and the theatre no longer exists. It might make a good detective yarn, if Erle Stanley Gardner wanted to expand it and get someone killed.]] [[END ADD]]

[Later Joe became Dean of Engineering at Columbia. Then, just after Compton came to M.I.T., Gerard Swope offered Joe the vice-presidency at M.I.T. Joe did not take it. If he had, a number of professors, including myself, would have left in a hurry. He was playing for the job of Nicholas

Miracalus [?], and got all sorts of concessions at M.I.T. before he declined, which made my job easy when I took it. Old Butler outstayed his play, as he did of a number of others. [[X-REF BACK TO P. 590, 616, 618]]

[Then Joe became president of Research Corporation. He and I were on the Board, and the president died. So, on behalf of the Board, another chap and I asked Joe if he would take the presidency temporarily while we got straightened out. He said he would, but he would not take it permanently. Then he turned around after a bit and took it permanently, of course without saying anything to me. I thought queer things might happen, so I got off the Board. They did, but it is not part of this story. [[X-REF BACK TO P. 619]]

[Joe was a strong supporter of Senator McCarthy. [[EH REMARKS: !!]] I did not invite him to join O.S.R.D., nor did anyone else. He was quite an operator.

[Now who was really responsible for getting that job at Hawthorne really hitting on all six? Joe was, primarily. He had all sorts of drive, and he had good judgment on lots of things. I was there of course; he provided the real steam. That we dropped into a very important aspect of management was luck. The credit for picking it up and running with it belongs to the engineers at Western Electric.][END OF TWO ADDITIONS BEGINNING AT PAGE 620.]

Question B16: Retirement from CIW and Return to MIT;
Jim Killian

I can't give you this whole story in chronological detail and be sure of getting it right. I retired from the Carnegie Institute of Washington at age 65 (in 1955). Soon after I'd joined the outfit I'd gotten that retirement age put into the bylaws definitely and I adhered to it. I thought then and I still think that it's wise at age 65 to drop executive work. Executive work that requires drive and determination and push begins to soften up a little as a man gets older; it is then time that a younger fellow should take over. The man who retires at 65 has got a lot of good things he can do if he wants to, but that doesn't include in my opinion, executive work. So I pulled out at 65. When the executive committee wanted me to go on I told them, "No, we were going to adhere to the bylaws." One of them asked me what I was going to do after I retired. I told him I was going to raise hell and I told him, "I'm not telling anybody that." As you know I became a pill maker and had a lot of fun.

When I retired at Washington the executive committee at MIT formally voted (I believe) to offer me an office, not a laboratory, but an office in the building. Jim Killian transmitted that to me and I accepted it with a good deal of gratitude. I thought it was an awfully nice thing for them to do. I told Jim, "Look, I'll do anything I can for MIT if

- 1) BUSH ADHERES TO BYLAWS & RETIRES FROM CIW AT 65
- 2) MEN SHOULD DROP EXECUTIVE WORK AT 65
- 3) POST CIW BUSH IS GIVEN OFFICE AT MIT

my advice is any good. I'll be around, I'll take up odd jobs and so forth. There're only two things I don't want to do. One of them is raise money. I don't want to try that because I'm no good at it. And I don't want to get caught making a lot of speeches to alumni associations. Otherwise I'll be glad to be around." I've been around ever since and on that very informal basis.

Then Jim Killian got called to Washington to be the adviser to Eisenhower. Jim was both President of MIT and Chairman of the Corporation as Karl Compton had been before him and had been the practice. [EH to VB: VAN: IT WAS MY RECOLLECTION THAT UP TO AND THROUGH MACLAURIN THE MIT Presidency and the Chairmanship of the Corporation were wholly separate, the latter job being held by a State Street type. Then, when Compton was brought in as President, with S. W. Stratton still around, the Corporation offered him the Chairmanship in the fervent hope he would decline and quit, because he was being superseded and he knew it. But instead SWS accepted -- and thereafter "things" were not as before. Although SWS was thereafter a "presider" only and KT was Chief Executive, this was the beginning of a change. Am I wrong?]

[VB to EH: I THINK YOU ARE PROBABLY RIGHT, BUT I can't confirm it from my own memory; I do know that I never saw S. W. Stratton after Karl came.

[I believe Swope brought SWS to MIT, which was the dumbest move ever made in the academic system of the country.

- 1) BUSH TAKES OFFICE AT MIT AFTER RETIREMENT FROM CIW
- 2) KILLIAN GOES TO D.C. AS ADVISOR TO IKE
- 3) HISTORY OF MIT PRESIDENCY AND CHAIRMANSHIP
- 4) S. W. STRATTON

[I could tell some tales about SWS. Jackson went away for a year, and I was acting head of the department. Getting a budget settled with SWS was something. One time he altered one of my recommendations and gave a chap a cut. I told him he couldn't get away with this, as the chap would leave. So he altered it again. This time he gave the chap a whale of a boost in salary, and his office sent a copy to the man involved. So I saw SWS again and called it to his attention. He started to alter it a third time, but I explained he could hardly do that as he had made a contract. This jarred him, and I told him I'd try to fix it. So I saw the chap (Murray Gardner) and we laughed over it. I then fixed the records where they belonged and reported to SWS who was very grateful to me. [X-REF BACK TO PP. 47-49]

[My office was instructed to say, when the President's office called that I would be right in. One day I was downtown on a consulting job, when a call from SWS was relayed to me. I took a cab and a few minutes later walked into his office and said I heard he was looking for me. "Oh yes," says he, "in my private shop I have a lathe run by a three-phase motor, and it runs the wrong way. How do I reverse it?" "Interchange any two leads," says I, whereupon I got back in the cab and went downtown on the job. How dumb can you be.

[The trouble with writing on some of these things is that I suspect I have already put them on tape.] [END ADD]

- 1) S. W. STRATTON
- 2) REPEAT OF SALARY MISTAKE STORY
- 3) BUSH LEAVES MEETING TO ADVISE SWS ON HIS LATHE

Let me interpolate here that when I left MIT to go to the Carnegie Institution in Washington, Karl offered to move into the Chairman's post and recommend me for the presidency which was the kind of a chap that he was. At any rate, when Jim went down to Washington, the board elected me as Chairman and I acted as Chairman until Killian's return. [?]

We had quite a puzzle at that time because we had two very good men at MIT: Jim, who was magnificent, and Jay Stratton, who was equally good, but very different. Jim, at one time in discussion with me and I think also with Jay, had said that when he came back to MIT he didn't want to handle the dual job. [X-REF BACK TO PP. 76, 77] This gave us a rather interesting possibility because we couldn't have held Jay much longer in the second-in-command post; I knew, for one thing, that the Rockefeller Foundation had offered him a fancy salary and very pleasant circumstances. Some of us got together and worked out the organization which now obtains. When Jim came back, I resigned as chairman: Jim was elected chairman and Jay was elected president. When I stepped down they elected me honorary chairman.

The whole thing was done very pleasantly. I wasn't sure at the time that Jim was entirely happy. But the way it's turned out since, I'm sure he must be because there's been no difficulty between the two men. The bylaws were revised to make it very clear where things stood. Jay is the chief executive officer of the organization; Jim handles

- 1) BUSH BECOMES
CHAIRMAN OF
MIT CORPORATION
- 2) KILLIAN RETURNS
AS CHAIRMAN
- 3) JAY STRATTON
ELECTED PRESIDENT

primarily board affairs which includes outside relations to a considerable degree with Foundations, with government and so forth. Jim went to work on the raising of money and did a job that couldn't be matched by anyone else anywhere. The thing has worked out nicely and it's been very pleasant.

- 1) KILLIAN RETURNS TO MIT (Continued)
- 2) HARVARD TAKES CREDIT FOR AIKEN'S WORK

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This is a digression. I've been looking over the press release from Harvard University about Aiken's work and I just wish that Jim Conant was still President of Harvard University so that I could kid him about it. It's quite interesting to find Harvard claiming credit for a job done by a professor who was undoubtedly at that time consulting for a commercial concern. This was ordinarily thought to be rather beneath the dignity of Harvard as I remember it.

The basis for the credit is also interesting. It's based on a memorandum. In that memorandum were some statements about how a computing machine ought to operate. You'll find all of these things in Babbage; you'll even find most of it in Pascal. Then the release finishes up by saying that Harvard built the first large machine. Well, in that way, they ducked the fact that the machine with all of the characteristics that Aiken talks about was built down in Philadelphia, I believe, called ENIAC, before Harvard got going. I think if Jim were around still at Harvard that would cause a bit of an explosion.

[EH to VB: VAN: I HAVE XEROXED, BELOW, A RECENT story from TIME (April 2, 1965) which, in a long discussion of computers jumps directly from Babbage to Howard Aiken and ENIAC, thus misleading [†] 2.5 million readers. BBS must set such records straight; it's its duty and function.]

1) HISTORY OF COMPUTERS

[VB to EH: I DIDN'T KNOW BABBAGE INTENDED TO USE steam power. Quite an idea.

[Weapons don't have trajectories, their shells do. The first mechanical computation of trajectories was done at Aberdeen before the war on a model of the differential analyser based on the one at M.I.T.

[The digital development was gradual, not abrupt. After all the keyboard calculating machines were digital. So were accounting machines and even some cash registers.

[A real history of such machines should include the first embodiment of a memory (I think in accounting machines) the first automatic multiplying and dividing (I had a secondhand European machine way back in the early twenties that did this) the first logic devices and so on.

[I think ENIAC was ahead of Aiken on most of this sort of thing. I'm pretty sure that when I first heard of ENIAC it was a surprise to me, not on account of new ideas involved, but rather because of its extent and speed.

[Speed made the digital machine, coming first through tubes, then through transistors.

[Also the people that showed how to program machines to solve differential equations should have a lot of the credit.

[I hope you didn't think I was going to read that whole Time article. I never read anything in Time, except when it mentions me, and then I read it for defense purposes.]

[END ADD]

- 1) EINSTEIN LETTER
- 2) BRIGGS COMMITTEE

* * *

To digress on one other thing -- the story in the Sunday Times (Summer 1964: Ralph Lapp) about the Einstein letter. I think I've commented on that enough. After the news broke in this country on fission, hundreds of physicists were digging into it assiduously. [X-REF BACK TO PP. 125, 553 and AHEAD TO P. 794] Dozens were testing it out and extending the idea in their own laboratories: there was a general furor about it. There was no need of government funds and no need of correlation at the moment. A bright bunch of chaps saw an opportunity to get some credit for the whole thing so they got Einstein to write a letter. [EH to VB: WHO WAS THAT "BRIGHT BUNCH"?]

[VB to EH: I don't know who the bunch was, and I don't even know there was a bunch. This is surmise only. One could readily get the names of those who were involved, I suppose. It has been written about often enough.

[The Briggs Committee may have left some records. Unfortunately Briggs died a while ago. He was a fine chap, and we were good friends. The Committee may well have formed a place where men could exchange ideas on fission. At the time, and under the circumstances, that was about all any committee could do.

[Have I told the story anywhere of the time I gave Einstein an appointment on some NDRC affair. Some friend of his urged me to, as Einstein was anxious to help. He contributed nothing, I believe, and this was almost certain to be the case, for his great talent was not of the type then needed. I can't give details, but some of my records may do so.

- 1) EINSTEIN VOLUNTEERS
FOR NDRC WORK
- 2) BRIGGS COMMITTEE

[Doggone it, having written the above I see I had already taped it.] [END ADD]

I never knew what happened to that letter and I'd be interested to find out. I suspect the President never saw it because he never mentioned it. It may have been just referred over to the Navy for I think it was the Navy that set up the Briggs Committee. It would be interesting to take the membership of the Briggs Committee as it was set up and compare it with the names that are mentioned in this article as being behind the Einstein letter. I don't think we'd find much correlation; but it would be an interesting thing to know about. [EH QUERY TO LEE ANNA EMBRIE] [AM to EH: THE MEMBERSHIP & HISTORY OF THIS COMMITTEE IN CHAPTER III OF MY SMYTH REPORT.]

Quite a lot later on during the war some friend of Einstein's talked to me and said that the old man was quite disturbed because he wasn't helping out on the war effort. Whether this was true or not I don't know, but at his instance I appointed Einstein on some committee or other and as far as I know he never contributed anything. Of course not. The

type of physics that he handled was hardly of use in connection with applications. I never met the old man in that connection. In fact, strangely enough I never met him.

1) ARTHUR GORDON WEBSTER
STORY TO COME LATER

While I'm digressing, I don't think that I've told the full story of Arthur Gordon Webster. [JK to EH: THIS IS MENTIONED ALSO ON P. 555, BUT DO WE HAVE IT ANYWHERE?]
[EH to JK: NO] It's rather an interesting one from the standpoint of the way in which chaps in science can get themselves into a serious snarl. It might be worthwhile to open it up a bit more if I haven't already said enough about it. [EH to VB: YES, PLEASE OPEN UP.] [VB to EH: I'M ALMOST SURE I HAVE PUT IT DOWN SOMEWHERE, AT LEAST IN OUTLINE. MY FELLOWSHIP AT CLARK, WHICH I RESIGNED. WEBSTER AND KENNELLY. FINALLY WEBSTER'S SUICIDE.] [AM to EH: VERY BRIEF REFERENCE ON PP. 25 & 32]

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Question B17: Chimpanzee Colony at Orange Park, Florida

There really isn't very much more to say here. There was formed a laboratory at Orange Park, Florida, with a chimpanzee colony under Yerkes of Yale. It was supported by Yale and the Carnegie Corporation and I think various others. When it came to renewal of grants the Corporation was very doubtful whether the thing was worth anything. They asked me if I'd look it over and if I'd kind of steer it for a bit. It wasn't hard to do. I went down and looked the thing over, of course, and I talked to the people that were on its board and so on. Some of them persuaded Yerkes to retire and we got a new director. The thing came back into form where the same people that had supported it before were apparently willing to continue to support it.

The new man's name was Lashley. Where the experimentation had been rather trivial, Lashley turned it into a show where some real serious work was done on the brain with a type of operation that couldn't be performed on humans and so on. I don't think that any of it that Lashley did was comparable to the stuff that was done up at McGill. But it became a serious effort at least. [X-REF BACK TO PP. 79, 549 & 550]

Then I went down there and roamed around. The chimps were amusing cusses all right. There was one that had learned to make change for purchasing a banana. There

- 1) CHIMPANZEE COLONY
- 2) LASHLEY REPLACES YERKES AS DIRECTOR

was another fellow that worked in the back of his cage for hours until somebody approached the cage. Then he'd gallop up and shoot a mouthful of water at them. Apparently he was content to sit with his mouth full of water for hours for that opportunity. There was another chimp that took great delight in slamming his cage door and showing how much muscle he had.

1) CHIMPANZEE COLONY

They're interesting beasts, of course, but I never felt that the experimentation with them yielded very much fundamental information. For example, there was one chimp that was raised in a family and handled exactly as a baby would have been handled. Out of that came nothing to appeal to me except that it showed pretty definitely that a young chimp lacked that portion of the brain that the man has that would have enabled the chimp, had he had it, to learn to talk.

* * *

Question B18: Mount Wilson Incident when President of CIW

When I joined the Institution, of course all of the scientists everywhere were looking me over and wondering what kind of a guy I was going to be and all that sort of thing. This was intense because the retiring president had held all authority centralized. A department couldn't do a doggoned thing without his approval. I had to get the directors in the frame of mind where they'd take their own responsibility and go ahead on their own and not bother me. [X-REF BACK TO P. 380]

The incident at Mount Wilson was one worth reciting. I was dining with the staff out there and after dinner they were quizzing me and I was quizzing them in a pleasant sort of a way. I knew that the Director of Mount Wilson, Adams, was going to retire before very long, and I also knew that Harlow Shapley was being urged for the post. There was a good deal of expectation that he'd get it and, I imagine, a good deal of the urging was done by Shapley himself. I was pretty sure that it would come up. Of course the staff wouldn't ask me directly, but they'd hint around on it. So they hinted around to the point where a fellow said something about Harlow Shapley and his visit to the observatory and the fact that he had a large program that he'd like to carry on there. There was a silence and everybody looked at me and I said, "You aren't hinting that Harlow might be considered

- 1) FLASHBACK--CIW
- 2) BUSH AS PRESIDENT DOES NOT INTERFERE WITH DEPT. HEADS
- 3) MOUNT WILSON

for director, for Christ's sake, are you?" That changed the attitude of the whole staff of Mount Wilson overnight.

I was perfectly honest about it. Harlow Shapley would have been perfectly terrible as the director of that show. But the mere fact that I spoke in the vernacular I think helped. Also the fact that the crowd around the table gathered that I was going to name the director also helped and of course I did.

I named in due time Ike Bowen as the director. Ike was really not an astronomer, he was a spectroscopist and a very good one. It was just before Alamogordo. In fact, I had a session with him at the Huntington Hotel I think on the evening before Alamogordo. I told him at that time that I was going to recommend him and so forth and he accepted.

Now with Ike Bowen, and in other cases, I followed a procedure. Everybody knew that I'd pick the director: Of course the director was elected by the trustees, but everyone knew that that was a formality. I talked to everybody concerned, not merely at the staff of the laboratory involved but elsewhere. I talked to trustees, I talked to staff members and I talked to people outside the institution. I was exceedingly careful not to give anybody the slightest hint as to what I thought myself. I listened, prodded, and listened. Then suddenly out of the clear sky the appointment was made and announced. This was the way to do it. No

- 1) FLASHBACK--CIW
- 2) BUSH TELLS MOUNT WILSON THAT SHAPLEY WOULD NOT BE DIRECTOR
- 3) IKE BOWEN
- 4) THE BUSH METHOD FOR CHOOSING A DIRECTOR WHILE AVOIDING RUMORS

rumors got going. No political shindigs started moving. Everybody was waiting for something to occur so that they could start.

When I announced Ike Bowen's appointment the astronomers had a fit -- not the ones at Mount Wilson, but generally. They had a fit because it was a sacrilège, a heretical move to appoint to the greatest astronomical post in the world a man who was not an astronomer by profession. But Ike was a very savvy fellow and it wasn't long before everybody was glad he'd gotten the appointment because he handled things with great skill particularly the relations with Cal Tech.

[EH to VB: PARALLEL CASE: WHEN FDR NAMED ARCH Mac LEISH LIBRARIAN OF CONGRESS THE PROFESSIONAL LIBRARIANS HAD A FIT -- AND NEVER STOPPED.] [VB to EH: MacLEISH AND I have been good friends although our interests are far apart. I don't understand his poetry, and I fear I never tried too very hard. But once he recommended me to FDR for an important post. And once, just before he became Librarian of Congress I explored with him a possible association with C.I.W. I had some ideas on a publication program, and thought he could help on it as an associate or in some way. But he wasn't interested. Probably had the Library of Congress on his mind. It probably wouldn't have worked anyway.]

There are a couple of other stories and they might as well come in here. The relations with Cal Tech. The obvious thing was to have one astronomical show in Southern

- 1) FLASHBACK--CIW
- 2) BUSH APPOINTS IKE BOWEN DIRECTOR OF MOUNT WILSON
- 3) ARCHIBALD MacLEISH
- 4) CAL TECH

California, not two. Yet the Rockefeller Foundation in giving money for the great telescope gave it to California Institute of Technology and not to the Mount Wilson Observatory. They did that because the fellow running the Rockefeller Foundation at that time didn't like Brother Merriam who then was President of C.I.W.

This had in it the seeds of a lot of trouble. The program went ahead, and all the work of design was being done by the people on Mount Wilson. All of the experimental work and all the business on the grinding of the mirror and all that affair which was quite a responsibility was handled by the Mount Wilson people. So we had the beautiful situation where Mount Wilson was doing all the work and taking all the risks and Cal Tech was sitting back to get the telescope and get the credit.

I tried to work this out with Millikan and I didn't get to first base. Max Mason was helping me on it. There was one instance where Max called me up with great glee in his voice and said that he had at last got an agreement with Millikan, a proposal that he was sure would satisfy me, and he wanted to come and see me and so forth. Max worked this all up. I agreed and then Millikan repudiated it. Max said that Millikan double-crossed him. I don't know whether he did or not. I do know that it was impossible to get anywhere with Millikan on that kind of an affair.

After the war when Millikan retired and Lee DuBridge took over as president, it was quite simple. Lee and I

- 1) FLASHBACK--CIW
- 2) ROCK. FOUNDATION MONEY GOES TO CAL TECH FOR THE GREAT TELESCOPE
- 3) MOUNT WILSON DOES ALL THE WORK AND CAL TECH GETS ALL CREDIT
- 4) MAX MASON TRIES TO GET AGREEMENT WITH MILLIKAN

promptly made an agreement and it's worked ever since. It was easy enough to make the agreement because it relieved Cal Tech of some twenty-five thousand dollars a year cost in overhead and they didn't have any too darned much money. We made it a joint show. Everything is announced under the joint names, and the astronomers at Mount Wilson teach astronomy at Cal Tech and so on. So it's a workable, peaceful solution.

Of course Lee DuBridge had headed the radiation lab at MIT and when he went out to Cal Tech (oh incidentally they tried hard to get me for a while) I recommended him strongly for the post. Incidentally, I told him that he'd probably have a bit of a jam with his trustees. He did, but it worked out all right and he's made them a very good president indeed. So that whole thing worked out beautifully.

[EH to VB: In my opinion your recounting of the CIW-Cal Tech relationship makes so many presuppositions of knowledge the reader doesn't have that the account is very obscure to anyone not an insider.] [VB to EH: You will find reams on this in the correspondence, if anyone is going to be interested in it.]

* * *

To come back to the story, when you're going to make an appointment in a university or a scientific institution that's a really important one, you'd better hold it pretty close to your chest or the rumors will get going. The exact opposite of the show that I've just recited occurred

- 1) FLASHBACK--CIW
- 2) BUSH CANNOT GET AGREEMENT WITH MILLIKAN
- 3) DuBRIDGE SUCCEEDS MILLIKAN AT CAL TECH
- 4) BUSH GETS AGREEMENT WITH DuBRIDGE
- 5) ON MAKING IMPORTANT APPOINTMENTS
(Continued)

Reel 10-A
Page 630-A

at Columbia before they got Ike as president where they had
a committee of the faculty and a committee of the trustees.
If one didn't announce something, the other one would. They
got themselves into a whale of a mess.

1) FLASHBACK--COLUMBIA
UNIV. CHOOSING A
PRESIDENT

* * *

Question B19: First Appearance Before a Congressional Committee

This is question B19. If we went into the whole business of appearing before the Congressional Committees there are any number of incidents and stories to be told. The last time I appeared before the Appropriations Committee is already partly in the record I think. [X-REF BACK TO P.]

[AM to EH: IF THIS WAS ABOUT NSF IT'S AT PP. 217-218.]

The first time I ever appeared was after I'd taken over the chairmanship of NACA before the war. I went up on the Hill before the Appropriations Committee of the House and of the Senate to get the appropriations through for NACA. I was accompanied by the Secretary, John Victory who, as I've said, coached me a great deal in regard to the way in which Washington operates. It was exceedingly helpful. And also by the director of research who was Lewis.

In the House it was pretty much of a formality, it wasn't bad at all. But over in the Senate, I ran into McKellar for the first time as the Chairman of the Senate Appropriations Committee. He promptly pulled off some things that made me mad as the devil. I blew up and we got into a real hassle. I thought I'd get thrown out of there. We finally cooled down and agreed to cancel the record up to that point and start all over again. [VB to EH: THIS NEEDS TO BE CHECKED AGAINST THE RECORDS. I MAY HAVE IT [REVERSED ?]] [X-REF BACK TO PP. 71, 72, 262, and AHEAD TO P. 697] It didn't

- 1) FLASHBACK--PRE WWII
- 2) BUSH HEADS NACA AND MAKES FIRST APPEARANCE BEFORE APPROPRIATIONS COMMITTEE
- 3) THE ARGUMENT WITH MCKELLAR

do any good at all. I was just young and inexperienced on that sort of thing. Later on I learned how to handle that kind of thing. I think probably the experience I had in NACA before the war in the technique of working with the Appropriations Committee was quite important. It enabled me to get along well with the House Appropriations Committee after the war started. We really got on a very friendly basis before we got through.

Perhaps it's worthwhile to get in some stories about appearances before Congressional Committees and maybe it's worthwhile to get something in about techniques that are involved. You and I thought about writing a book on this subject at some time. [EH to VB: I REMAIN STRONGLY IN FAVOR OF THIS! THEN, IN FUTURE YEARS IT BECOMES PART OF BBS -- SECOND EDITION!] The question is, is it worthwhile opening up the subject that has so many ramifications when it can't possibly be fully treated in the amount of space that we will probably allot to any such matter.

- 1) FLASHBACK--PRE WWII
- 2) BUSH'S FIRST ENCOUNTER WITH CONGRESSIONAL COMMITTEES GAVE HIM GOOD EXPERIENCE FOR LATER APPEARANCES

* * *

Question B20: Anecdotes about Father: pool-playing, etc.

This is question B20. My dad went as cook of a mackerel fisherman when he was fourteen years old. He earned his way through Tufts largely by running a coal business because all of the rooms in the dormitories were heated by individual stoves. He had to lug hundred pound sacks of coal up three flights and so on. [X-REF BACK TO PP. 2, 4, 5]

He grew up in Provincetown where his family were strict Methodists and where religious strife was intense. I remember my grandfather telling me about how one crowd wanted to build a church, and brought the lumber in by ship. One of their competing Protestant faiths proceeded to burn up the lumber. So the next time they sat over it night and day with shotguns until they got it framed in. After it was framed in, setting it on fire would have been arson, so the church was built. [EH to VB: WHAT A MAREVOLOUS STORY!]
[VB to EH: MY SISTER MIGHT BE ABLE TO PIN IT DOWN.] Well, strife had undoubtedly simmered down some by the time my dad grew up.

When he left Provincetown and went to Tufts College to study for the ministry and became a clergyman in Universalist Church it took some courage. He was hence not unacquainted with some of the seamy side of existence and he'd had to struggle to get himself anywhere. He had a whole lot of sympathy for anybody that was struggling with any kind of

- 1) BACKTRACK--BUSH's FATHER's BACKGROUND
- 2) RIVAL CHURCH BURNS LUMBER STORY--VB's GRANDFATHER's TIME

a difficulty. His sympathy never got expressed to a woman except with gentleness, or to a man except with forcibleness. He hit a hard punch when he got going. I was scared to death of him when I was a kid which, of course, was what I should have been, although he never laid his hands on me.

[EH to VB: WE ALL KNOW WHAT HAS HAPPENED TO THE American Father since your father's day -- he has gone down the drain. WHY this has happened is a baffling question. But I think it's very bad. Kids themselves want to know how far (but no farther) [further ?] they can go, and they test constantly. My father was a very gentle person, but if he lifted an eyebrow at me this was serious -- and if he frowned at me, this was hellfire. So I was scared of him, but I also loved him, and whatever he requested of me, in his quiet voice, he got -- on the double!

[I have some notions here which I'd like to add to yours Comming up later....]

[VB to EH: YOU AND I COULD GO QUITE A WAYS ON THIS. I think the heart of it is this. Kids are a bit afraid of the complex world they are dumped into -- and careful not to admit it. When things are tough they want someone to lean on. Not to explain, just to decide and lay down the rules. They get deprived of that in various ways (the wives often having something to do with it) and then they lose their respect.

[I don't believe in the father laying on hands, it isn't necessary. I did once. My youngest son John was a

- 1) BACKTRACK--
BUSH'S FATHER
- 2) THE CHANGING ROLE OF
THE AMERICAN FATHER

Reel 10-A
Page 633-A

tough egg (has changed since). One day I came home unexpectedly and quietly. His mother was in a room saying "come here" and he was in the doorway saying "I won't." He didn't know I was within miles. So I picked him up by the back of his shirt and scaled [?] him in a few fast. It had a good effect.] [END ADD]

The story about the pool playing may be apocryphal. No, it isn't apocryphal but it may have been elaborated before it got to me. But my father was an extraordinarily good pool player and also a very good billiard player. This was a little strange, because around the house he didn't show any mechanical knacks at all. In fact I had to do all the little repairs around the house. If a window got stuck and he tried to open it, he'd be very likely to put his fist through it. My mother would get me to put up the curtains and so on. But my father could play pool and billiards to beat the band.

He played in a place called the Alter Ego Club. He played pool first until he got to be so good that he began to attract a crowd when he went in to play a game. This wouldn't do if the story got around among his parishioners so he cut it out. But he played three-cushion billiards well enough so that he could play that against my straight billiards and trim me, of course at a time when I couldn't play worth a darn. Nevertheless that was going some.

- 1) BACKTRACK:
BUSH's FATHER
- 2) POOL PLAYING STORY

On pool, the story is this. A woman in his congregation had a son who was sowing some wild oats and generally raising the devil. She wanted my father to talk to him, so she invited him out to dinner. The young fellow was there (I judge in his twenties, I don't know). He was quite contemptuous of clergymen and rather showed it of course, although still remaining formally polite.

After dinner he invited my father down to play a game of pool with no idea apparently that the old man had ever played the game. They went down to the billiard room, so-called, and they set up the balls in the triangle. The old man broke them and knocked them all in. The youngster said, "I've seen miracles in my time and I'll still see more, no doubt, but I'm perfectly sober and I can't understand this." The old man, my dad, said, "There isn't any miracle about it." He put them again into the triangle, set them up, again broke them and put them all in.

They ended the evening without the old man broaching a single word about the young fellow's performance or morals or anything else. They chatted about pool. When he left, they left as good friends but that was all. Sure enough the youngster looked him up after a bit and he gradually got to be a good friend of his. The youngster straightened himself out largely on his own, as I take it from dad. At any rate it's a good story.

- 1) FLASHBACK--BUSH's FATHER
- 2) POOL PLAYING STORY

Another interesting yarn, a very short one. When my dad was alive I joined everything in sight in Masonry. I was a Shriner and I went to these shows principally because it was the only place I ever saw my father after I got going; we went together. After he died I dropped out of all of them except the Blue Lodge which no one ever drops out of and where I'm a Past Master and all that.

We went to a Shrine meeting at one time, and there was some kind of a gathering beforehand. I was sitting beside a fellow named Morrison who was either the Potentate of the Shrine at that time or a past Potentate. They passed the drinks and my dad took one and I took one. Morrison took a ginger ale and said to me, "I can't ever drink, that damned father of yours won't let me." I thought he was kidding me but I found out later that that was literally true. Morrison had got to drinking too much and the old man had told him to cut it out.

* * *

One more story since I'm going on this and I could string this out I suppose forever. [EH to VB: PLEASE ENCOURAGE YOURSELF TO!] When I was working at the General Electric Company as a test man, my dad went to Canada as the chaplain of the Ancient and Honorary Artillery Company on some kind of a visit. He came back through Schenectady, and I got him to stop off for a night and visit me. When his train was about to come in, I went out through the front gate of the

- 1) BACKTRACK-- BUSH's FATHER
- 2) POTENTATE MORRISON's DRINKING
- 3) BUSH's FATHER VISITS G.E.

works and the guard there wanted to know where I was going. I told him across the street to get a beer. Then I went down and met the old man. To my surprise, he got off the train in his full equipment of plug hat and Prince Albert or whatever it was that he wore as chaplain. At any rate he was quite a sight. I took him back to the works and of course we went through the gate without any question. The fellow at the gate merely saluted. He thought he had one of the board of directors or something. [A MARGINAL NOTE BY PAGE EH SAYS "SEE PAGE 636A". THIS DOESN'T APPEAR IN ANY OF MY COPIES. IS IT LOST? OR ABANDONED?]

1) FLASHBACK--BUSH's
FATHER VISITS G.E.

We went down and I showed him the test area. I remember we were walking down through the main aisle of Building Sixty; coming from the other direction, hung on a crane along the main aisle, was a casting weighing perhaps a hundred tons and moving magestically up the aisle. My dad looked at it with a little trepidation, I judge, and I said to him, "You don't need to worry about that." We kept walking along and sure enough the crane man moved his casting over into a side aisle 'til we'd gone by. Then he brought it back and went on his way.

I took my dad up to dinner that night at the boardinghouse. The boardinghouse was filled with mechanics, of course, who came directly from work and nobody else, maybe fifteen of us. Remember at that time my salary was eleven dollars and twenty cents a week. So the boardinghouse wasn't very expensive although the food was pretty good. It was

Reel 10-A
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run by an old gal and her two daughters.

When I first introduced my dad to the crowd you should have seen the faces around the place. They didn't know what in the devil they'd got into. Well I won't recite the whole thing but before the evening was over they were all sitting around telling jokes, the old man included, having a wonderful time. The fact that he, thus dressed, could mix with a group of mechanics and within the first hour or two get on the basis of understanding with them where all embarrassment had disappeared is really something.

1) FLASHBACK--BUSH's
FATHER VISITS G.E.
(Continued)

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Question B21: Scientific Aptitudes in the Bush Progenitors

I think I've already said it about my father. I don't know whether there was any scientific aptitude in the family. My sister, it's true, became a professor of mathematics at a women's college, but that doesn't mean anything in particular that I know of. My grandfathers, both of them, were sea captains. In fact, my family for, oh, eight or nine generations, goes back on Cape Cod and is all therefore a seagoing crowd. I don't remember anyplace where there seemed to be particular aptitude -- and scientific aptitude is a very strange thing in any case. If they'd had it, I don't think it would have been detected. In fact, I'm not sure that it exists aside from more general aptitudes. In other words, I'm not sure that you can say that a man's talents are adapted for science and not for the law. After all the nature of logical processes employed is identical in the two cases in many fields. [X-REF BACK TO P. 1 and AHEAD TO P. 713]

I'm a little skeptical of this whole business of pinning down sets of talents and lining them up with probable effective careers. All I've seen of the business of what's the name Johnson [EH NOTES: MEANS JOHNSON O'CONNOR, I THINK. OF HOBOKEN.] [VB to EH: THAT'S THE GUY.] , who will get some youngsters and get them to fit some blocks together and end up by telling them one was destined to be a doctor and another one an engineer, has always given me a

- 1) NO "SCIENTIFIC APTITUDE" APPARENT IN BUSH FAMILY BEFORE VB
- 2) BUSH MISTRUSTS TESTS (as Johnson O'Conner's) TO DETERMINE MORE THAN GENERAL APTITUDES

Reel 10-A
Page 638

pain in the neck. The talents, the aptitudes, if you will,
are far too subtle to be sorted out by that sort of hocus-
pocus.

1) BUSH MISTRUSTS VERY
SPECIFIC CONCLUSIONS
FROM APTITUDE TESTS

* * *

Question B22: Stanley Steamer; Anti-cow Apple-propellant Gas Engine; "That bull's afraid of me." etc.

Oh, there's any amount of stuff along these lines that can be put on film and I don't mind doing so but I hope you won't bother Patty to type much of this kind of junk.

As I've said many times, the old steamers were great stuff. They out-performed the gasoline cars of that time and they were really quite remarkable. They did have one difficulty. If you were climbing a hill with the old engine going chug chug, of course it would go right up the side of a roof as far as that's concerned. You could put the nose of a steamer against a post and slip its wheels on a dry road. It had plenty of torque. [X-REF BACK TO P. 495]

But if you hit a patch of ice going up a hill the wheels would spin and they'd take all of the steam out of the line from the boiler on; the pressure at the engine would fall way off and the car would slide back again before it recovered any steam pressure. So when you hit a patch of ice there was a whirr and then you'd stop and slide back. The only way you could beat that was to get the old car moving fast and every time you saw a patch of ice coming, close down the throttle and coast past it.

Going downhill wasn't so bad. Going downhill you just made darned sure you didn't put on your brakes while traveling over ice and that, of course, you do in any car.

The old Stanley engine was regular two-crank affair with a Stevenson-link valve arrangement and a variable cut-off.

1) FLASHBACK-- STANLEY
STEAMER--DRIVING
ON HILLS

Your throttle operated the cutoff as well as doing the throttling (that is, through operating range it was merely varying the cutoff). You were supposed to run six hundred psi in the boiler. I actually ran eight hundred which was a foolish thing to do because it made the boiler leak every little while, and I probably spent more time under the car than I did in it. I bought the car for three hundred dollars, ran it for a couple of years and sold it for three hundred dollars.

1) STANLEY STEAMER

But I never collected the three hundred dollars. The guy who bought it from me left it parked outside his house and some kids got into it. They pulled down the throttle, jumped out and the car wrapped itself around a post. The new owner was paying me five dollars a week, but at that he quit paying. I got an order of the court to tell him to keep it up and he disappeared. So I never did get my money on the old steamer, and in those days three hundred dollars was a lot of money.

I had some interesting times with the thing. It would be going along the road and for some reason or other (probably because there was a leak in the boiler that squirted a little steam out around the edge of a tube) the pilot would get blown out. The controls would turn on the main kerosene line and it'd flood the whole thing with kerosene. When that happened, you stopped aside of the road and waited until you felt that the fumes had blown away. Then you touched a match to the pilot again. If you touched it too

soon it would blow up. I remember it blowing up one time when it sent the top of the hood thirty feet in the air and blew all the asbestos off the boiler. Just as I was about to touch a match to it, there was a fellow, one of the kibitzers who was leaning down and looking in, I told him that he'd better move back. Fortunately he did, a few feet, but the blast blew his hat off nevertheless.

If you touched the burner too early you just got a fire. One night along about midnight I was coming back along the Revere Beach Boulevard towards Medford and the darned thing got afire. It was a pretty blaze. So I pulled over to the side of the road and sat down on the curbstone to wait. A Park cop came along and said, "Is that your car?" And I said, "Oh yes, that's my car." He said, "If you want to burn it up, why there's a good dump right over here." I told him, "No, I'm not going to burn it up; it'll be all right in a minute or two."

He stopped with me and after a little while the fire went out and he said, "What're you going to do now?" I said, "I'm going to drive it home." He said, "The hell you are." I got in, pulled down the throttle and off I went. After the fires went out the boiler would hold steam enough to drive you six or eight miles. So I had no difficulty of getting away that evening, much to the surprise, I'm sure, of the cop.

Talking about engines, I told you the story about Phoebe's Uncle Walter who lived up in the country, who was a

- 1) STANLEY STEAMER
ON FIRE
- 2) UNCLE WALTER

chap you would have been glad to meet, I'm sure. He had rather an unusual sense of humor and a very pleasant one. I was on a camping trip one time and my friend and I dropped in to see Walter. He told us that he had an old gas engine that hadn't run for years. We dragged it out and took a look at it. It had a cylinder that was probably eight inches in diameter and a similar stroke and a couple of fly wheels, oh three and a half feet in diameter I guess -- heavy things. It was one of these old-time engines that they used to use for sawing wood. We tried to start it and we had no luck at all. We had a dry battery for it but that didn't please it any.

It was quite a while before we tumbled that that was made in the days of highly volatile gas and it didn't like out heavier gas. It was one of these things that didn't have any carburetor or anything like that you know. You just squirted a little something into the cylinder. So we went downtown and got a bottle of ether, and gave the old thing a shot. It not only fired, it pretty much jumped off the ground. After that it went very well.

It fired hit or miss. It had a little fly-ball governor, and when it got up to a certain speed, that would cut off both the gasoline and the spark. Then it would just sit there and go chug-a-chug-a-chug-a-chug-a for quite a while. Then it would go bang from another explosion and then it would go chug-a-chug-a-chug-a-chug-a.

- 1) UNCLE WALTER'S
WOOD-SAWING ENGINE
- 2) VB REVIVES IT
WITH ETHER

This gave us a nice idea. It had an exhaust pipe three inches in diameter, I judge, and perhaps six feet tall. While it was sitting there chugging we got the bright idea of dropping an apple down the exhaust pipe. When the engine next fired, that apple went clear out of sight. Whereupon we stood around and covered our heads and waited for it to come back. It came down smack on the ground and that was that.

So we tipped the exhaust pipe over, Walt helping us, and took a crowbar to train it, and began to shoot apples at the cows down in the field. We'd shoot an apple, it would go over a cow's back and we'd take the crowbar and tap the exhaust pipe down a little and take another shot. We finally hit a cow on the rump and the cow went galloping across the field. This was fine sport.

We dragged the old engine back into the barn and told Walter that it was all right to cut wood with it. I don't think he ever used it again. But it was a good old engine in its day.

Walt was quite a guy. I was visiting him one time and when I got out of the car his collie dog started after me. I got ready to kick her if she closed in and she circled around me and gave it up. That night when Walt was milking out in the barn, I came out of the house and the dog grabbed me by the calf of the leg. She had pups; she thought I was

- 1) UNCLE WALTER'S
ENGINE CONVERTED TO
APPLE SHOOTER
- 2) UNCLE WALTER'S COLLIE

after them, I suppose. I went out and I said, "Walter, I'm afraid I busted a rib or two in that dog of yours when I kicked her off me." He said, "Did she get you?" And I said, "Yes." He said, "Ho, ho, I thought she would before she [you ?] got through." He was apparently tickled to death. We got ahold of the dog and found that I hadn't done any damage and also that the dog hadn't broken the skin on my leg, so we went on about our business.

1) UNCLE WALT'S BULL

One night (I don't know whether it was the same trip or not, probably it was) after he got through with his milking, he went and cleaned out the bull stall. He had a great big Jersey bull, a wicked looking cuss with these rolling eyes, you know, and all the rest of the equipment. [X-REF FORWARD TO P. 791] The bull lived in a box stall. Walt opened the door to the farmyard and the bull charged out into the yard, which was pitch-dark. After Walt had cleaned the stall, he went and yelled out in the yard and said, "Come bull." Got no response. The first thing I knew, he picked up a short length of board and walked right out into the dark. I didn't think much of that idea. The only place I could see that was probably safe against bulls was the feed box so I got up on that.

I heard him out in the yard talking to that bull. Pretty soon, wham! I heard him hit the bull over the rump with the board. Then the bull came in through the door on a regular gallop and here was Walt holding the bull's tail.

Reel 10-A
Page 644

When they got inside, Walt braced his feet and the bull dragged him across the barn floor and went into the stall. After Walt had closed the stall gate I said, "Walt, doggone it, you pull that kind of a stunt and that bull's going to kill you someday." "Oh, no," he said, "that bull's afraid of me." That's the kind of a guy he was. I wish he were still around.

1) UNCLE WALT'S BULL

* * *

Question B23: Oppenheimer: Poem he Translated from Sanskrit;
Chinese Restaurant Before Alamogordo

I think it was two nights before Alamogordo and a group of us dined at Trader Vic's in Berkeley. There was quite a group of us, Jim Conant I know; I can't remember the rest, but all concerned with the tests. I think probably Groves was not there. We chatted about everything under the sun except the coming tests. Of course the atmosphere was tense, but everybody in the group refused to show any tenseness or worry. There was no discussion that I remember at all about what size the bomb would be, although incidentally the group at the site had put together a pool on the size of the explosion; Isador Rabi won it, as I remember.

At Trader Vic's Oppenheimer and I were chatting and we got onto the subject of his explorations in Sanskrit. He had learned to read Sanskrit for the fun of it. He had gone back into some of the early stuff that hadn't been translated and browsed around -- which was typical of Opp. Toward the end of the evening, he quoted me a poem. I wrote it out afterwards from memory and put it into my wallet. Later I lost it and I got again a translation from Oppy. I don't think the second one was as good as the first one. I'm sure that Oppenheimer could improve it now, but the way it goes as I have it now and as I've carried it in my wallet ever since is this:

- 1) WWII
- 2) DINNER AT TRADER VIC'S
TWO NIGHTS BEFORE
ALAMOGORDO
- 3) OPPENHEIMER AND
THE SANSKRIT

In the forest, in battle,
In the midst of arrows, javelins, fire;
On the great deep sea,
At the precipice's edge, in the mountains;
In sleep, in delerium, in deep trouble:
The good deeds a man has done before defend him.

1) OPPENHEIMER'S
SANSKRIT POEM
(3 Versions)

Now I'm sure that the first copy I had had the same sense but read a lot more easily. For example I know it was "at the edge of the precipice, in the mountains" which is much easier to say than "precipice's edge." We ought to get a better translation for many reasons. In fact, I'd like to have a better one to keep in my wallet.

[EH NOTES: OPPENHEIMER TO V. BUSH, FOR THE SANSKRIT.

EH REC'D. 5/11/65:

Neti satahu 99 Bharhihair

In battle, in the forest, at the precipice in the mountains --
On the dark great sea, in the midst of javelins and arrows;
in sleep, in confusion, in the depths of shame,
The good deeds a man has done before [,] defend him.

VARIORUM EDITION, NOT THE ONE PREFERRED BY VB.

(EH 4/65)

In the forest, in battle, in the midst of arrows,
javelins, fire,
Out on the great sea, at the precipice' edge in
the mountains,
In sleep, in delerium, in deep trouble:
The good deeds a man has done before defend him.

[END ADDITIONAL MATERIAL]

Trader Vic's at that time was a fascinating place and I suppose that it still is. I've been there many times. They have Chinese girls as waitresses. We used to go there when I went to see Ernest Lawrence and Don Cooksie. [EH to VB: NAME?] [VB to EH: DONALD COOKSY, I THINK. SEE AM. MEN OF SCIENCE.] Now that was a very interesting combination. Ernest Lawrence was a good physicist, sure he was, excellent, none better in his way. But he also was a promoter and a darned good one. He built the first cyclotron as you know. He was backed in doing so by Research Corporation. Research Corporation was then being run by Poillon who did a number of things, backing things that later turned out to be very important. But Don Cooksy, who never gets any credit, was the sidekick of Ernest Lawrence and Don made the show go. He did the managing of these projects.

Alfred Loomis and Ernest Lawrence were great friends and during the war at times it got to be embarrassing. You remember that Loomis was the cousin of Henry Stimson. Loomis had never taken an order from anybody at any time until he got into the OSRD and then he didn't take many. He was head of the section that ran the Radiation Laboratory under Lee DuBridge. [X-REF BACK TO]

Ernest Lawrence did many things; most importantly, one method of separating the isotopes of uranium by what amounted to a mass spectroscopy stunt and which worked. It was set up on quite a scale and was one of the important methods. But Ernest had no sense of organization and he

- 1) TRADER VIC's 2 DAYS BEFORE ALAMOGORDO
- 2) ERNEST LAWRENCE's CYCLOTRON
- 3) DONALD COOKSY

didn't have the slightest hesitancy in galloping right around me and going after the Secretary of War, the Congress or somebody. I don't think he ever tackled the President without my knowing it, but he would have been perfectly capable of doing it. I was very fond of Ernest Lawrence but his lack of sense of organization and chains of command and so forth could have raised the devil if he hadn't been such a nice fellow.

The money for building the cyclotrons was obtained to a very considerable extent after that first one by Alfred Loomis. [EH to VB: WE NEED MORE DEPTH OF DETAIL HERE.] Alfred, for example, set up a show on Pebble Beach where he hired a whole darned hotel and gathered all sorts of people who had control of the money. He put on a show to back up Ernest's next venture, quite successfully, it goes without saying. I think that Ernest put in a lot of his own money, and I think Alfred did. Alfred could well afford to because you remember he made his money in Wall Street^[back] in the times when it was considered a polite thing to do to put together various companies in a holding company and so on. He did this with great skill and it's said that he came out of Wall Street with fifty million dollars. [EH to VB: NOT SUFFICIENTLY CLEAR. TRANSCRIPT?] [VB to EH: SEEMS CLEAR TO ME.]

I don't know whether he did or not. But I do know this, that he's probably the only man who ever on the one hand took the guys down in Wall Street for a ride and made

- 1) ERNEST LAWRENCE
DURING THE WAR
- 2) THE CYCLOTRON
- 3) ALFRED LOOMIS' SHOW
AT PEBBLE BEACH &
HIS WALL STREET DAYS

a lot of money out of them; and on the other hand got elected to the National Academy of Sciences on the basis of his accomplishments in physics. And this, Alfred did accomplish. He made the most precise clocks that have ever been made and with them showed for the first time the lunar effect on gravity. It was a good job, done in a pit dug down some two hundred feet into solid rock and all that kind of business. [EH to VB : AGAIN, NOT SUFFICIENTLY CLEAR. REFER ME TO A SOURCE, PLEASE.] [VB to EH: I DON'T THINK YOU NEED ANY OF THIS, BUT, IF YOU DO, THERE ARE PUBLICATIONS BY LOOMIS THAT CAN BE FOUND.]

Alfred's always been a close friend of mine but a tough egg to work with. I think probably during the war when he occasionally changed his direction of action at my behest, it was about the only time that he ever paid any attention to anybody over his head.

Well to get back to the story. We separated after that dinner. I went down to Mount Wilson and then joined the gang out in the desert and the rest of the story I think you know.

* * *

- 1) ALFRED LOOMIS TOOK WALL STREET & ALSO WAS ELECTED TO THE NAS
- 2) PRE-ALAMOGORDO DINNER

Question B24: Teaching; Oppenheimer's Comment & Bush's

I suppose that the key criterion in regard to teaching is this: if a man really enjoys teaching then I think he is extremely likely to be a good teacher. Now this has some secondary aspects. For one thing, a man can't enjoy teaching unless he likes youngsters and likes to work with them; that is, he enjoys the stimulation of young minds. Also, a man can't enjoy teaching if he's afraid and many teachers are afraid for a variety of reasons.

One is that they are doubtful whether they are competent in the subject and don't dare to open up for that reason. Another reason is that they are lazy. They don't want to put in the strenuous hours that ensue if they give the class a real chance to get moving with them. Laziness among teachers is I think a bit more prevalent than is generally thought.

Oppenheimer's comment is excellent. "To teach a mistake is unfortunate; to teach indifference is a crime." Teaching indifference occurs, of course, only if the teacher himself is indifferent; if he is not really and genuinely interested in the subject.

Now I've run into all kinds and I think in my undergraduate days I encountered some of the worst teaching and also some of the best that I've seen at any time. The worst was in the hands of men who really didn't care: they

1) CRITERIA TO BE A
GOOD TEACHER

just collected the salary and went to classes. They didn't have any real interest in either their subject or their students. They hence had no fire whatever. The best were the teachers who met students on their level and worked things out with them. I had great experience with both.

The inclination of teachers to crawl into holes is always very disturbing. I remember one instance when I was vice president at MIT and Dean of Engineering. I was working with the mechanical engineering staff, which was in pretty sad shape, I think, at that time. One day, in a session with the top men of that staff, I remarked that of course any full professor or associate professor at MIT should be ready without notice to teach any undergraduate course in mechanical engineering. I went on to say that of course this was somewhat different in graduate work where a certain amount of specialization was expected. But, if a man had risen to a professorship in mechanical engineering he certainly should be able to handle any of the undergraduate work in mechanical engineering without question.

Now, to my surprise, this caused consternation. I think that faculty thought I'd gone nuts because they had professors of thermodynamics who didn't propose to know anything about machine design and so on. Of course that amount of compartmentalization came about simply because some of the professors were thoroughly lazy and some of them were afraid. When you get a group of that sort you've got about as poor a bunch of teachers as you can possibly assemble.

- 1) FLASHBACK--DEAN of ENGINEERING AT MIT
- 2) BUSH's SESSION WITH MECHANICAL ENGINEERING STAFF

Reel 10-A
Page 651

[EH to VB: In re this whole section see underlying copies if O.K. Moore & Ralph Gerard material and the whole business of teaching/learning. Prime points?] [VB to EH: I read it when it appeared. Hot stuff!] [EH to JK: See me re these pp.] [JK to VB: I believe the Gerard piece was sent to you under separate cover a few weeks ago. Please correct me if I'm mistaken.] [VB to JK: Well, I've read it anyway.] [AM to EH: Xeroxed article on Omar Khayyam Moore and the Talking Typewriter ("What the Talking Typewriter Says" by Maya Pines, The New York Times Magazine, May 9, 1965) was among these pages and is now in the files.]

1) WORK NOTES

I guess it's about time to turn this tape over.

[EH to VB: I think I'll write a brief, ignorant little piece called "That Second Law of Thermodynamics". Will you criticise it?] [VB to EH: Only if it is brief.]

* * *

END SIDE "A"

Question B25: More About Teachers and Teaching

Well I'd modify Oppenheimer's remarks a bit. It's all right to say "I don't know" to a student or to a class provided it is in answer to a good question and carries with it the connotation "but let's find out". Then I think it's very salutary for a class to get to points where they realize that the professor is working into an area which is even for him a matter of exploration. I think it creates a fine morale among the staff when the professor says, "Well now, that's a good question, but I can't give you an offhand answer: let's see what we can work out." And starts to examine the thing in detail right before the class. I think that's great stuff because a lot of the way in which classes regard their teacher depends upon whether they think the man is honest, or whether he's just a hypocrite pulling off some kind of act. A frank acknowledgement that something has stuck him, I think, helps a great deal.

Of course a comment on the rest of your card is this. When you say "indoctrination", "training" and so forth are not teaching, I'd add that teaching isn't teaching unless the teacher is merely setting the stage and pointing out guide lines while the student learns. That is, if the teacher is merely making it possible and facile for a student who wishes to learn to do so, then I think the thing is on the right foot. In other words no teaching at the college

- 1) HONESTY OF PROFESSOR SAYING "I DON'T KNOW BUT LET'S FIND OUT."
- 2) FORCE FEEDING IS NOT GOOD TEACHING

level that is simply pushing something down the throats of the class is any good at all. Unless the class is interested in trying to find out something about the subject, not merely to pass an exam, but because they want to know about the subject, and unless the teacher approaches the matter in that sense and aids that process, I don't think we have a sound environment in the classroom.

Louie Young, as I've said, was one of the best teachers we had at MIT in the Physics Department. He'd take a class of freshmen that was lethargic, he'd walk into the class and spit on his hands and say, "O.K. boys, here we go." He'd have that crowd aroused in a minute or two to the point where they shared some of his enthusiasm, some of his determination to get at the heart of things and so forth.

Now that's an art. It's an art fully as subtle as the art of acting on the stage. It's not held by many and it's not necessary; there are other approaches. A quiet, studious, reserved approach will work provided it isn't simply deadly. I've seen teachers who had no apparent force of character whatever who are thoroughly loved by the students. Franklin in the physics department at MIT was one. He was a nice honest fellow doing a very thorough job and doing it conscientiously. The students realized that and went along with him.

I don't think anybody ever can define the art of teaching but I do think there's an awful lot of bunk written about it.

- 1) THE ART OF TEACHING
- 2) INSPIRING ENTHUSIASM
- 3) LOUIE YOUNG AT MIT
- 4) FRANKLIN AT MIT

Question B26: Education: Of Children; Set Theory;
Learning versus Teaching.

I think Jerome Bruner goes too far and of course he did so on purpose. He doesn't really mean what he says.

The fact is that in recent years, particularly in connection with the revision of physics and mathematics in the secondary schools that's been going on, a whole lot of very good work has been done in cutting out deadwood and introducing subjects that are really modern, alive and interesting. This is particularly true in physics. There's been a great deal of improvement, but it's quite possible to go to an extreme that doesn't make sense. There are different periods in a youngster's development. You may be able to teach Set Theory to a youngster but I don't think he'd really grasp it. He'd get a little idea of it. He wouldn't grasp it because he wouldn't have any occasion to use it.

[EH NOTES: DISCONTINUITY]

[EH to VB: SOMEWHAT DISAPPOINTING RESPONSE: RATHER FLAT.] [VB to EH: I THINK I HAVE A POINT HERE -- BUT NOT well expressed. Continuity. There is no sense in delving into a subject and then leaving it untouched for years. In medical education a man takes a four year liberal arts course, with work in humanities and classics and fundamental science. Then he takes four years in medical school where such things are nearly entirely absent. Hence, after getting into practice, he does not follow up on his introduction to humanities.

- 1) REVISION OF SUBJECTS
IN RECENT YEARS TO
ELIMINATE DEADWOOD
- 2) POOR CONTINUITY IN
EDUCATION esp. IN
MEDICAL EDUCATION

He would be a better physician and citizen if he did. There are moves today to cure this, by shifting subjects in both directions.

[Another aspect appears in engineering education. The engineer as I have said a dozen times deals with things and men. Even if he studies both in college, and in reasonable balance, which certainly is not the usual case, when he gets into practice he is going to be concerned with things almost entirely for a while. He will be designing or testing or the like, and it will be long before he is dealing with government, competition, public. There is a hiatus here which needs to be filled.

[I haven't studied the new math course enough for my criticism to be well-founded. I suspect that recent enthusiasm among mathematicians for the powers of set theory, have caused them to introduce it at a point such that it becomes lost before becoming useful.] [END VB COMMENT]

I think one of the places where this is done to extremes is in the business schools. They are likely to teach some of the very complex aspects of business management with a whole lot of difficult economics and so on and to rather ignore the fundamental stuff on the assumption that every youngster knows about it. [X-REF BACK TO PP. 65, 539] As an actual fact, a whole lot of the failure of management is due to a mistreatment of simple fundamentals rather than any lack of handling of the complex things. I think I gave

- 1) CONTINUITY BROKEN
IN AN ENGINEER'S
EDUCATION
- 2) SET THEORY
- 3) BUSINESS SCHOOLS
TEACH THE COMPLEX &
IGNORE FUNDAMENTALS
(Repeat)

you an example of this where I told you how some very simple primary stuff of mine caused a stir in the Merck Company and finally got into a business school course at Harvard. [X-REF BACK TO PP. 65, 513, 537-538 and AHEAD TO PP. 771-772]

- 1) CALCULUS FUNDAMENTALS CAN BE TAUGHT EARLY
- 2) FLASHBACK--MECHANIC AT MIT WHO WORKED ON DIFFERENTIAL ANALYZER

I believe this is done in other areas too. Now my own feeling is that in mathematics for example, it's perfectly easy to teach the fundamentals of the calculus to a youngster. It is a good thing to do so, and to do so very early. But it doesn't pay to go into very great depth in the calculus at first. It's much better to skip around, in my opinion, from one part of mathematics to another getting at fundamental interesting things in each place and then later beginning to dig in deeply in some one or two of them. This is for the reason that while a youngster can use very fundamental parts of the calculus at once, he can't use the more subtle parts until he gets much further along in many other subjects as well as his mathematics. [EH to VB: NOW WE'RE ON AN INTERESTING TACK.]

As an example of how easy it is to teach fundamental calculus, when I built the differential analyzer up at MIT I had a mechanic. Well, I hired him as a draftsman and as an inexperienced one at that. He had had a high school education. He showed great aptitude and before he got through with the program he was managing the little group of mechanics that we had building the thing. He was assembling it and he was maintaining it and so forth. In fact when the Army wanted

a man to aid them in the design and construction of their own machine which they built at Aberdeen as a copy of mine and which they used for ballistic calculations, I loaned them Frost. They wanted to pay him mechanics' wages and I assured them that when they called in a man to consult on the construction of an important machine they'd better pay him consultants' fees. They did, very much to the surprise of Frost.

The point that I'm getting at is this. I never consciously taught Frost any differential equations of course; but building that machine, managing it, he learned what differential equations were himself. He got to the point that when somebody was using the machine and got stuck, things went off-scale or something of the sort, he could discuss the problem with them and very often find out what was wrong. It was very interesting to discuss this subject with him because he'd learned calculus in mechanical terms -- a strange approach and yet he understood it. That is he didn't understand it in any subtle sense, he understood the fundamentals.

Another thing showing how readily possible it is to get fundamental ideas across: I wrote a little paper a couple of years ago on a hydraulic machine thing for John Hastings. John also had a high school education, started in as an apprentice in a machine shop and so forth. Now he has his own machine shop, and is a consultant to Merck and Company on some of their packaging. He's regarded by the

- 1) FROST, THE MECHANIC WHO LEARNED CALCULUS
- 2) JOHN HASTINGS ANOTHER EXAMPLE OF LEARNING FUNDAMENTALS OF A DIFFICULT SUBJECT

engineers of Stewart Warner as their equal and has his own characteristics which make him one of the best instrument designers I know of.

When I gave John this short paper, he looked it over and said he couldn't understand it because there was an integral sign or two in it and so forth. I said, "What the heck's the matter with you? That's perfectly simple. You just don't understand the symbols." I sat down and probably in ten minutes showed him what those particular expressions meant. He never will be troubled by similar expressions again merely because he got a physical feeling, a feeling in terms, if you please, of steel and electrical flow of what an expression meant which he could carry over into other areas.

[EH to VB: FOGGY. TRANSCRIPT?] [VB to EH:

[Let's discuss it in terms of electrical circuits. There is a vast difference between understanding a problem in terms of equations and diagrams, and understanding it in terms of copper and iron. A physicist can work out the stresses and geometry of a harness but the farm boy understands the horse. I've known men (I had them work for me) who were rather helpless on the analyses of circuit, but who could go to a complex relay assemblage that was misbehaving and put their finger right on the fault.] [END ADD]

So I think the fundamentals of almost any subject, the simplest part, the core, can be taught youngsters that are just beginning to learn things and can be taught to them

1) JOHN HASTINGS
(Continued)

2) MEN WHO UNDERSTAND
A MACHINE WITHOUT
UNDERSTANDING THE
DIAGRAM OF IT

Reel 10-B
Page 657-A

easily. Penfield says a great deal about this and gives reasons for it. If you do that, then the student where he really has an interest will carry through to quite an extraordinary extent on his own. I don't think it is worthwhile in trying to do this to take the matter into subtleties which will not really come into the youngster's experience for many years. For a principle once learned is soon forgotten unless it gets exercise.

1) TEACHING SUBTLETIES
TO CHILDREN TOO EARLY
IS WASTED EFFORT

* * *

Question B27: Education: Unafraid Teacher.
(Aristotle to Kinsey)-- Free-Association

Quite frankly I don't quite know what your old professor of philosophy was driving at. I never had a good teacher in English or English Literature or in fact in any of the humanities that I can remember now. I had one of the worst teachers in economics you can imagine. I think probably the fact that I have a sort of a balk, sort of a block in my way when I try to get into a discussion on philosophy, or on English Literature or on many such subjects is due to the fact that I never got introduced to them in a way that made any sense whatever. In other words I never got my interest aroused early enough to build on it later and make something out of it. Fortunately I think I know that I have this difficulty, this handicap, and I wish I didn't.

In economics, for example, I was taught simply by taking a lot of things out of a book, some of which I knew perfectly well weren't so, didn't make sense and which I had no opportunity to examine with the teacher or in the class whatever. I came to the conclusion, being young and so forth, that the whole darn subject was a lot of hokum. I think perhaps I came fairly close to the truth in this impression as economics stood at that time.

I've had the same sort of reactions on philosophy because I early came to the conclusion that about 95% of classical philosophy was just a lot of tripe. I read quite

1) BAD TEACHING IN
INTRODUCING SUBJECTS
MAY PREJUDICE THE
STUDENT SEVERELY

assiduously at times, on my own, some of the old treatments and about everyone I picked up, I soon found logic being used improperly; applied to things where the definitions were not clear and in some cases where definitions were not possible. I knew that this was simply absurd and finding it about everywhere I turned, I came to the conclusion that nearly all classical philosophy writing was a hollow shell. It's unfortunate that I didn't have a teacher back there who would have taken me, with free admission that he was going through a forest where a whole lot of the trees were distorted, to some gems of thought that really amounted to something. In that case I would have continued to hunt for myself. But I never did and I undoubtedly came through with a rather distorted idea of what philosophy was.

I only got really excited about things when I read William James and I've gone back to him many times because I couldn't catch him doing that sort of thing. Hence I began to have confidence in him.

I also got the feeling, and I'm not at all sure I was wrong on this, that many of the people who have talked with me about philosophy and who spoke with admiration of some of the old fellows did so merely because they felt that it was good policy to thus raise them on pedestals. And to say that Kant or Hegel or some of these fellows just simply were talking nonsense because they were attempting to argue logically in areas where logical argument was absurd would

- 1) VB's DISAPPOINTMENTS
WITH PHILOSOPHERS &
THEIR LOGICS
- 2) WILLIAM JAMES
AN EXCEPTION

be regarded as not belonging really to the elite and the intelligentsia and so on.

Of course this goes along with my feeling that you know already that a great deal of study of the classics in the past has been due to the fact that a knowledge of the classics gave acceptance to inner circles in the same way that a degree from Dartmouth College in the City of Boston gave entrance to business groups at high levels. This sort of thing always jars me, the old school tie stuff. I suppose a good deal of my feeling about philosophy as it is usually taught in classic departments comes from this feeling that it's a bit of snobbishness in a somewhat disguised form.

1) OLD SCHOOL TIE STUFF
-- SNOB APPEAL OF
PHILOSOPHY AND
THE CLASSICS

* * *

Question B28: Academic Freedom....AAUP....Killian and
Communism in the MIT Faculty.

The American Association of University Professors is not altogether an embarrassment to college administrators. I think the way in which Karl Compton handled it was excellent. He'd have a case of an assistant professor, let's say, who was no doggoned good for some reason or other, who was getting out on a limb by some of the things he was saying publicly. Karl would call in the local representatives of AAUP and would discuss the thing with them without naming the professor, although I have no doubt that these fellows could readily find out who he was talking about. He'd put up a hypothetical case and ask their advice as to how to handle the thing. He'd have his representatives of the AAUP, perhaps a professor from Harvard and one from Tufts or something of the sort. They took the matter very seriously indeed when they were thus called in. They'd go away and discuss it among themselves and they'd come back and give advice. And it was usually pretty good advice. The real point was this: whether Karl accepted that advice or not when he acted, he didn't have immediate hostility from that group, or from his faculty.

This business of how a college is run is a very subtle thing. The real power in a college in regard to faculty matters lies in public opinion among the faculty.

[X-REF BACK TO PP. 280 & 591 and FORWARD TO P. 664] If the

1) KARL COMPTON
HANDLES THE AAUP

administration has got any sense whatever it will consult with its faculty before it takes any move whatever that has to do with their affairs. If this is done there very seldom is a jam.

For example when we adopted the patent policy at MIT, it changed in a very considerable degree the way in which a lot of professors operated in their relations with industry. The thing was first taken up with the faculty council, then it was taken up with the full faculty. It was discussed all around the place and all of this before it went to the corporation at all, with the result that when it was finally enacted there wasn't any outcry. The objectors among the faculty objected to their brother faculty members and that didn't do them any good because the sense in the faculty was quite overwhelmingly in favor of the thing. It's merely common sense to do it that way and you can by the way that things are done make all sorts of difference. [X-REF BACK TO P. 295]

Tufts College recently did about as poor a job in getting rid of an assistant professor as I can imagine. Francis B. Sayre had been an assistant professor there for some time. He wasn't paying any real attention to his work: he was galloping around the world on explorations and so forth. He really wasn't interested in his teaching. He was just using his college connection as a convenient way of having a title and a place to land. And the college dropped him. They dropped him at the end of a three year appointment.

- 1) DIPLOMACY IN COLLEGE ADMINISTRATION-- HANDLING FACULTY MEMBERS
- 2) FRANCIS B. SAYRE DROPPED BY TUFTS

They were quite right in declining to reappoint him. They didn't have to give any reasons. Yet they proceeded to give reasons that roused their whole faculty, made good copy for the newspapers and generally got them into all sorts of trouble. If they'd merely said that this was a routine matter, that they didn't reappoint him because they had better men in their judgment to fill that spot, that his term of appointment had ended, there'd have been no trouble at all. They stepped out to look for it. I've forgotten what the reasons were that they gave, but they were the kind of thing that could readily be attacked because it looked as though the college was after him for his opinions.

The chap at MIT who was a difficult fellow was handled perfectly properly indeed. I don't think there was any doubt that the fellow was a Communist in the sense that he was a Marxist by conviction. He attended lectures at Communist groups. Whether he was a member of the party I don't know, but he did not at any time bring any of this stuff into the classroom. He taught his classes in mathematics well. While he was attacked by Congressional Committees and so on, he never was convicted of anything before such a committee or anywhere else.

The faculty, all of them, knew about this. The way it was handled was merely this. The Corporation took the point of view that as long as he did his teaching well, as long as he did not misuse his professorship to try to inculcate his own political ideas in his students, the college

- 1) TUFTS' POOR JOB OF DROPPING SAYRE
- 2) KILLIAN'S GOOD JOB HANDLING THE PROBLEM OF PROF. ZELDIN

had no reason whatever for going into his political beliefs. If we were violating Federal law in any way by his associations this was up to the civil authorities and not up to MIT. Hence he continued to the time when he retired formally. There was no stir whatever. It is true that some of the Corporation were out to shoot commies where ever they could find them, but Jim took care of this without any real difficulty. All he did was to expound the principles by which such a thing would be handled and it was all O.K. [EH to EH: COMPARE COLUMBIA U. IN 1917 re J. McKEAN CATTELL!]

I think most cases of misuse of academic freedom will be taken care of by the faculty themselves in any university where the morale is good and where there's a good sound relationship between administration and faculty. The faculty won't take any formal steps, no. But the faculty will certainly make the man who steps over the line and puts on some sort of an act for the sake of getting in the newspapers feel very uncomfortable. Very few men of the type [X-REF BACK TO PP. 280, 591, 661] that would become professors anyway will stand up against the type of public condemnation that can be expressed by a faculty in a thousand simple ways.

If the fellow is pulling off a thing like that, that is, if he's getting into the press and expressing ideas which are harmful to youth, [EH to VB: UNFORTUNATE PHRASE!]

- 1) KILLIAN's GOOD JOB HANDLING THE PROBLEM OF PROF. ZELDIN
- 2) A HIGH-MORALE FACULTY WILL GOVERN ITSELF IN MATTERS OF ACADEMIC FREEDOM

[VB to EH: RIGHT.] that is that are regarded as being subversive or something of the sort, it's very seldom also that he wouldn't go right into the classroom and do the same thing. It's seldom that he will be careful enough to avoid overstepping the line. If he does go into the classroom and start to preach in a mathematics course some of his conclusions about free love or something of the sort, the faculty will know about it in a hurry. They'll know about it from the students and know about it from their conversations with him. Pretty soon there'll be faculty members going to the administration, and not the other way around, and saying something's got to be done about this guy.

When a faculty gets into that frame of mind, a chap can live a very uncomfortable life indeed. He goes to the faculty club and people shun him; he won't stick it out very long. Of course the administration has a perfectly clear case if he improperly uses his classroom to attempt to teach things that are outside of his subject. [EH REMARKS OF THE LAST TWO PARAGRAPHS: HUM.]

Why do we insist on academic freedom? One reason is that colleges and universities traditionally and until recent times have paid relatively small salaries compared to what men could earn in industry and have compensated for this by several fringe benefits. One of the fringe benefits is tenure. That is, that a professor is appointed for life after he gets to a certain stage of recognition. This is

- 1) HOW A FACULTY GANGS UP ON ONE OF ITS OWN
- 2) ACADEMIC FREEDOM AND TENURE COMPENSATE PROFESSORS FOR LOW SALARIES

valued very highly indeed by professors. So highly that in MIT for example today where there is a difference in the salary scale between the professors on the campus and the men at Lincoln Laboratory this is not resented because the Lincoln Laboratory people all are on temporary appointment and the senior people on the campus are on tenure. Tenure is regarded as a very fine and desirable thing.

In the same way, freedom expressed in a dozen ways is very highly regarded. There is no clock punching, no assigned hours. What a man does in the summer is his own affair. The extent to which a professor is bound by rules is miniscule and academic freedom is regarded as one of these privileges that is very important. A chap feels that if he was with an industrial company somewhere and did a darn fool thing, or made absurd remarks to a newspaper it would cost him, perhaps not his job, but his advancement. Whereas he knows perfectly well that in a university nothing of the sort will happen. That's one reason; not usually the one given.

The other reason is of course the one that's usually stated; that a university in its advanced work is supposed to be not only teaching but advancing knowledge. Knowledge in areas where one has to proceed upon balance of evidence is advanced only by the clash of contrasting theories and difficult and intricate discussions among equals. Unless

- 1) ACADEMIC FREEDOM AND
TENURE COMPENSATE
PROFESSORS FOR
LOW SALARIES
- 2) UNIVERSITIES NOT
ONLY FOR TEACHING
BUT ALSO FOR
ADVANCING KNOWLEDGE

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this sort of thing is going on in a university, there is something wrong in the subjects where it's applicable.

These subjects, of course, are such things as political science, if there is such a thing, economics, and sociology generally.

You will find the chap that takes a radical view, if you please, simply for the sake of being conspicuous can be a darn nuisance. I think public opinion among the faculty usually takes care of this. Unless you have in an economics department men of wide range of approaches to economic theory you've hardly got a sound situation. If all of your professors were brought up in an exceedingly conservative milieu, there would hardly be any advance made at that particular institution. This is the real side of academic freedom of course properly interpreted.

1) ACADEMIC FREEDOM &
CONFLICTING VIEWS
FURTHER KNOWLEDGE

* * *

Question B29: "Successful" and "Unsuccessful" Sciences;
Hawthorne Study at Western Electric

The illumination study that you speak of here was set up by a committee of the National Research Council of which D. C. Jackson was chairman. I did most of the work with Joe Barker as my sidekick. [EH NOTES: DATE WANTED]
[X-REF BACK TO PP. 620-620B]

We worked primarily at the Hawthorne Works of the Western Electric Company. Edison was one of the committee [X-REF BACK TO P. 620] and so I went around and discussed the matter with him. It was a kind of a tough discussion because he was so deaf you couldn't make him hear much and the great Edison would not build himself a good hearing aid. Of course at that time there weren't any commercial ones. In this connection I can tell you a story about Bernie Baruch and his hearing aid if you want to hear it some time.

[JK to EH: DO YOU??] [EH to VB: YES] [VB to EH:

[Briefly. I was at a dinner with Baruch and having trouble making him hear. "Why don't you get yourself a hearing aid?" "They're no damn good." "If I show you how to get a good one will you wear it?" "Sure."

[So I got Jimmie Jenks to meet Bernie. I gave Jenks his first job. He later became president of the Sanborn Company. He was deaf from youth. He designed and built his own hearing aids. He measured Baruch carefully, and built

- 1) FLASHBACK-- THE HAWTHORNE STUDY
- 2) EDISON NEVER BUILT HIMSELF A HEARING AID
- 3) BERNIE BARUCH'S HEARING AID FITTED BY JIMMY JENKS

one to fit him.

[When I next saw Baruch he told me he heard the birds singing in the trees for the first time in 30 years.

[When I saw him a year or two later -- no hearing aid. "Where is it?" "It broke down." "Get it fixed." "I don't know how." "Look you've got a bunch of retainers of various sorts following you around; give one of them the job of keeping it in order." "That's an idea."

[About this time commercial units began to be well designed and effective.] [END ADD]

Edison wasn't interested really and the conversation didn't amount to shucks. He had never had, I think, any real interest in scientific investigation in its correct sense.

I also went out to the River Rouge Works of the Ford Motor Company. I didn't see Henry but I got a thoroughly good conviction that the Ford Motor Company was very badly managed. I remember that I went around one of the plants out there with a manager or an assistant manager and I kept asking questions in all innocence. "Why did they use direct current on that particular floor for all of their machines with great heavy cables running everywhere and on machines where they didn't need variable speed? Why didn't they use simple induction motors and so on." When I'd asked enough of these questions the manager broke down and said, "We do it this way because we're a pack of damn fools." And that

- 1) BARUCH's HEARING AID
- 2) THOMAS EDISON
- 3) THE FORD RIVER ROUGE PLANT--BUSH's TOUR

was just about it. [X-REF BACK TO P. 620-A] He told me, of course very confidentially, that Ford would order a thing done a certain way in a detail in a shop. There was no use arguing with him, and anyone who didn't follow up immediately would get fired. The morale around was of course perfectly execrable.

I also saw there one place where they were building steam turbines for their own use--great turbo-alternators. I haven't any doubt that it cost Henry four or five times as much to build such a machine as he could have bought it for. This was probably merely a bit of spite on his part. He didn't like the prices that were given him by General Electric and Westinghouse so he built his own machines. I could say a good deal, I think, about why Henry was successful in spite of all these things and in spite of the fact that he proved himself to be highly ignorant in all sorts of ways. But that's not the subject of this particular talk. [JK to EH: WANT THIS?] [EH to VB: YES] [VB to EH: SOME TIME. TOO LONG FOR NOW.]

We got out to Hawthorne and there we had a good reception and very intelligent people and so on. We set up two groups of girls that were winding the same coils for the relays and these coils were pretty hard to wind. The wire was very fine: you wound on a layer and then you put a piece of paper on to separate that layer from the next layer. This is all done by automatic machinery today, but then a lot of

- 1) POOR MORALE AND POOR MANAGEMENT AT THE FORD PLANT
- 2) FLASHBACK--THE HAWTHORNE STUDY

it was hand work. It was apparently work that called for very good lighting conditions in order to see the fine wire and so forth. [X-REF BACK TO P. 620-B]

1) FLASHBACK--THE
HAWTHORNE STUDY

In order to get a proper test we set up an experimental group and a control group. We made the conditions of those two groups as nearly alike as possible in regard to temperature in the rooms, uniformity of temperature and, primarily, supervision. In order to be sure that our supervision in the terms of foremen was identical, we brought in foremen from the rest of the plants so that each group had a new set of foremen. These were of course picked with some care to have good foremen in both groups.

We started both groups working under these conditions and their output went up about ten per cent over what it had been. We thought this was a temporary result of people paying attention to them. [?] We waited for it to settle down a bit. We then ran the lighting levels up and down on the experimental group and it didn't make a particle of difference to their production as long as they could see to do their work and had light enough so that they didn't fall over things in the aisles and so on.

The result of the test was that the lighting levels didn't make any difference that was appreciable in the range where anyone would use lighting in any case. This was not exactly the result that was sought after. In fact while all this was written up and so forth, the report as far as I know

never appeared. It may have been connected in some way with the fact that D. C. Jackson was consulting for the Boston Edison, the New York Edison and the Philadelphia Electric Company. But it may have been merely that it didn't get published without a push from the chairman and the chairman didn't give it any push. At any rate, that ended the lighting experience.

But the people at Western Electric were exceedingly interested in this result and they went on after we got through and delved into why it made a difference to change the foremen and to select good foremen. Out of this resulted all of the fine work that came out of the Hawthorne tests which I don't need to go into. [JK to EH: SHOULD HE?] [EH to JK: YES.] [VB to EH: YOU WANT THE EARTH WITH A FENCE AROUND IT.]

Since I'm reminiscing to beat the band here, this reminds me of a very amusing experience that Joe Barker and I had when we were called in to find out what was happening in one of the vaudeville theatres in Boston, old Keith's Theatre. If I don't get completely worn out, I'll recite that story sometime. It has no significance sociologically, I'm pretty sure but it's a bit amusing. And incidentally, it shows up Joe Barker's keenness, for he was keen. [JK to EH: WANT THIS?] [EH to JK: YES!] [VB to EH: YOU HAVE IT.] [X-REF BACK TO PP. 620 B-D]

- 1) FLASHBACK--THE HAWTHORNE STUDY
- 2) NO REPORT BUT FURTHER STUDY BY WESTERN ELECTRIC
- 3) BARKER & BUSH AT KEITH'S THEATRE

Question B30: Engineers' Responsibility for Social Problems

The job of raising the standard of living in the country is one that revolves pretty largely around the engineers, and of course the financial men and the political men and so forth, but it centers in the engineers. The question of reducing the discrepancy between incomes in the country is not a job for the engineer: that's a job for the political people and so on. Don't ask me as an engineer to tell you how an engineer can do somebody else's job.

I have only one comment on this thing, I think, and that's this. The increase in the standard of living by producing new transportation, new communication, new methods of handling kitchen work and a thousand other things inevitably also reduces the discrepancy between the highest and the lowest.

Now you probably won't admit this, but on an absolute basis, the fellow that's getting three thousand dollars in this country at the present time is pretty doggone well off if you care to compare him with the world in general. The trouble is, of course, that standards of living are not compared with the world in general: they are compared with neighbors. The farmer, out in the Kansas prairies who has quite a family, a precarious livelihood and not very much income can be quite a contented fellow because all of the things he sees about him are on the same basis. After all

1) ENGINEER'S INVOLVEMENT WITH STANDARD OF LIVING BUT NOT WITH DISCREPANCY BETWEEN INCOMES

I don't know but what he lives a pretty darn happy life anyway. He's got his telephone, his lighting, his television, and so on. His work is not hard laborous work the way it was a generation ago. He drives a machine rather than working a hoe. He's doing pretty darn well and he's pretty well content about it. He compares himself with his father and his grandfather and he thinks he's doing all right. Yet his actual cash income may not be much. On the other hand the chap in the city with the same income comparing himself with what he sees about him is likely to be very decidedly discontented.

You say it's up to the engineer to do something about the discrepancies. How do you get that way? It's not the engineer at all. It's up to other things; the people who write things for the people in the country to read; it's up to the political crowd. The engineer is the fellow that can do the job to a considerable extent provided he is supported and so forth by all the people about him.

You say that I discussed the problems with poverty all too glibly. I don't remember that I've ever discussed them at all. If I have discussed them, I haven't discussed them glibly. I merely think that I've discussed them to myself at least on a far more realistic basis than some of the people that go hollering about the poor in the country who are so downtrodden and so exploited and so on. Certainly

1) ENGINEER'S INVOLVEMENT WITH STANDARD OF LIVING BUT NOT WITH DISCREPANCY BETWEEN INCOMES

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these things happen but in the last generation we've built a welfare state in this country that has been an extraordinary affair, that has done a whale of a lot of good. I've written about it in favorable terms only, as far as I know. If that's glib, I'll make the most of it.

- 1) ENGINEER'S INVOLVEMENT WITH STANDARD OF LIVING BUT NOT WITH DISCREPANCY BETWEEN INCOMES

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Question B31: Claude Shannon: Boolean Algebra; Relay Circuits

Claude Shannon of course was not only one of the most able fellows I ever knew, but also one of the most likable. He's a modest, quiet fellow, shaggy looking with all of the Irish attractiveness that you sometimes find in the quiet Irishman who's really a thinker, and who has real imagination. The Irishman's imagination gets exercised in strange ways but when it turns to science it's likely to give a very fresh approach to an affair.

When Shannon was a graduate student, he worked out a theory of relay circuits, and this was the first generalization of such circuits ever made. Before that time, the way that one made relay circuits to perform a certain complex function was by cut and try; to draw relay circuits, then find fault with them and then draw others, and so on.

Shannon systematized this whole affair. With his system you wrote down in a special language what you wanted the relay circuit to accomplish for you and this might be complex. You then manipulated the resulting equation by a special algebra. [EH NOTES: Cf BOOLEAN ALGEBRA] [VB to EH: RIGHT] [EH NOTES: & (? ILLEG.) STORY BY OLD PROF. DOUGLASS AT MIT.] Then when you had done so the equation interpreted in accordance with certain other rules described the relay connections that would perform that function. To give you an example. You could write down that you have three bells

- 1) BUSH's GRADUATE STUDENT, CLAUDE SHANNON
- 2) SHANNON's SYSTEM OF RELAY CIRCUITS

and you have three push buttons. If you push buttons A, B, A, in that order, bell A will ring and no other combination will make it do so, and so on. You can write a very complicated set of specifications and then you set up the equations and go ahead.

Shannon, as far as I know, worked this whole affair out before, and developed a special algebra for doing so before he realized that he was using Boolean algebra. I'll have to check this but that's just my impression. Incidentally, I didn't know what Boolean algebra was. I wasn't supervising this work of his as I remember. In fact, I don't think anybody did any supervision to speak of. [EH QUERIES: QUATERNIONS? PROF. HITCHCOCK] But I guess I was in charge of the graduate work when he was working as a graduate student. If he'd found the algebra and used it, that was just as much of an accomplishment as inventing it independently. But I think he invented that particular algebra independently.

He's done a lot of other things that are really great and his greatest job was when he developed a general theory of communication. That is, when he showed the criteria for determining how much information one could transmit over a specified channel in the presence of a specified amount of interference such as noise. This is a classic. This is one of the great accomplishments in theory and it is used everywhere. [X-REF BACK TO P. 372]

- 1) CLAUDE SHANNON'S SYSTEMATIZATION OF RELAY CIRCUITS
- 2) BOOLEAN ALGEBRA
- 3) SHANNON'S GENERAL THEORY OF COMMUNICATION A CLASSIC

He's a very happy fellow. He's now a research professor at MIT working on all sorts of things. I don't know of anything he's produced in recent years that has been striking. The last time I talked with him, he was working on a system for giving a man who'd lost his arm or hand a set of automatic fingers that he could operate in one way or another. I don't think he's gotten anywhere in particular with this.

Shannon's mechanical mouse was an extraordinary thing. He did it just for the fun of it. He made a little mouse on wheels. You put it into a maze and it would run around and butt its head against the walls. After a long time finally it would find its way through the maze. Then you picked the mouse up and started it over again. This time he went through the maze without making any errors. He simply remembered all of his previous mistakes and corrected them. Now this was done by a relay circuit affair which of course Shannon designed in accordance with his theory of relay circuits.

1) SHANNON'S MECHANICAL
MOUSE IN THE MAZE

* * *

Question B32: Importance of Claude Shannon's Communication Theory (or is it "Information" Theory?)

Well of course Information Theory or Communication Theory is correct. The theory as I've just stated it tells you how much information can be communicated over a channel.

[EH to VB: NOT CLEAR] [VB to EH: "Information" and "Channel" are both broad terms. A foreman telling instructions to a workman, with a pneumatic hammer heading rivets comes under the theory. It becomes precise, of course, only when things can be measured, as they can when a satellite is transmitting data to a station on the ground.]

Of course one can't compare in the absolute way the importance of advances in theory. The Communication Theory had just as much of a splash among people dealing with communication as the Quantum Theory had with people who were dealing with fundamental theoretical physics. But one can't compare importance, I think. One can compare only if he wishes to try to do so, the ingenuity, the deep grasp that was involved.

In both of these cases one has to sit back and admire. In the case of the Quantum Theory, Planck took a lot of contradictory observations in regard to the radiation of a black body. That is, contradictory if one accepted classic theory and saw a way out by putting his energy into quanta. This is a flash of genius, an insight, that I think

- 1) SHANNON'S COMMUNICATION THEORY
- 2) PLANCK'S QUANTUM THEORY

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has never been matched. Shannon on the other hand took a chaotic mess where people were working in specific instances trying to overcome the hazard of noise, trying to work out communication systems that would have tolerable amounts of error in transmitting communications. He worked out a general theory of this affair, again showing great insight and resourcefulness. The type of thinking was common with Planck's only in the fact that both used imagination, insight, and broad grasp instead of attention to minor details.

- 1) SHANNON's COMMUNICATION THEORY
- 2) PLANCK's QUANTUM THEORY

Question B33: What Will Engineers Do About Slum Conditions
and When?

[Question 31. You seem to have your numbering a little
balled-up because I just answered Question 32 and I had 31
before that. However, I judge it doesn't make any great
difference.] [AM to VB & EH: BEGINNING WITH THIS QUESTION
I HAVE RENUMBERED THE REMAINDER OF THE "B" SERIES.]

1) WORK NOTES

[EH to EH: RE-EXAMINE FROM HERE ON. 5/15/65]

[We now start a whole new set of questions and from
looking them over quickly I think I'm running into some of
the toughest questions that I've met yet, also some of the
most interesting ones at times. We'll proceed to treat them
with the same reservations we've had right along that I put
everything into the record that occurs to me knowing full
well that some of it will be discarded because it's based on
rumor only, more of it because it's neither interesting nor
amusing. Perhaps more still because we don't want to hurt
anybody.]

[My memory is full of gaps and holes as you know
and I'll get time sequences all balled-up. The object right
now is not to sort any of these things out but to get a whole
lot of junk down on the record where we can delve at it later
as we wish. With that preface I'll take a crack at your nice
little Question B-31, or rather the second nice Question B-31.]

[AM NOTES: QUESTION REFERRED TO HERE IS NOW NAMED "B-33"]

I suspect that in this particular question you are just trying to needle me. You sound like a damn New Dealer. There is a Georgia cracker living in a shack on the edge of the woods. He hasn't worked more than an hour a day for thirty years and he doesn't want anything enough to do any work for it anyway. So we have to bring him hot water because he's a citizen. He doesn't want the hot water enough to work for it so we've got to give it to him. If necessary we've got to force it on him. And all of this, why? Because he's a citizen. [EH to VB: RESPECTFUL EXCEPTION, MR. JUSTICE. SEE PP. 677-A & B] [VB to EH: I'VE WRITTEN MORE ON THIS RECENTLY.]

[EH to VB: (5/14/65) VAN: I don't have my question cards in front of me today, but I rather doubt I was advocating hot water for a Georgia cracker even if hookworm or pellagra are the reasons why he's never worked more than an hour a day for 30 years. I therefore doubt your answer was responsive.

[As I remember it, I was talking about cities, and city slums, and hot water in that context, which is a little different. God knows what causes slums; human rapacity and mendacity are involved, in addition to stupidity, "laziness" and incapacity, I guess, plus various psycho-social tensions, hates, etc. New Dealer that I may be, as charged, I am aware that no matter how much we are able to raise our standard of living there will always be comparative slums. But today's are explosive. I think that engineering precautions like

- 1) BUSH CHALLENGES
"EQUAL COMFORTS"
AMONG CITIZENS
- 2) HODGINS ON SLUMS

sand-bagging and de-fuzing in these areas is just a proposal of common sense.

[Despite that we are living in a Not-Too-Much-Welfare State, large portions of society are completely out of control; they fight in the streets, subways and self-service elevators with switchblade knives, bicycle chains or what have you, against you, me, the cops, their parents and each other. Or they escape into dope and will murder you in the hope of getting the price of a fix. Come on down and see East Harlem or Bedford-Stuyvesant in Brooklyn. These social A-bombs are in marked contrast to the Bowery where there is very little violent crime, the Bowery now being merely the home of the homeless, indigent, elderly and alcoholic.

[Hot running water will not now cure East Harlem or Bedford-Stuyvesant, nor will rodent control. I was using these illustrations symbolically, as you know.

[Yup, I remain a New Dealer, I guess, with fond memories of the accomplishments of TVA, Rural Electrification, Bonneville, Grand Coulee, the Federal Deposit Insurance Corporation, the SEC, Social Security -- and less fond memories of those who fought these things every step of the way.

[Meanwhile the mass of cities is about to go critical.] [END EH REMARKS]

[VB to EH: As a matter of fact I don't think we are very far apart in our approach to this whole tough subject. I can take your whole note without swallowing hard at

- 1) MASS OF CITIES ABOUT TO GO CRITICAL
- 2) THE NEW DEALER

any point. With all its clumsiness I believe FDR and his team saved us from catastrophe. Remember that Harry Hopkins and I hit it off well.

[Your urge that the engineer do something jars me, probably because I am an engineer. It is not his problem; it is the problem of many professions, and in fact everyone.

[Next, do-gooders raise my back hair, and they are always with us. The solution of any one of these problems requires hardheadedness, and unrestrained idealism can damage a worthy program, and does. I think it got us, along with other things, into the Civil War. If the non-slave-holding citizens had been willing to tax themselves to buy the slaves as occurred in Britain I believe there could have been a solution. A move in this direction was advocated way back in the early days of the republic. The people who jar me are the ones that want to reform someone else. I suspect in many cases this is a result of hidden sins, real or imaginary.

[Next I have always joined with those who feel that the power of the state should be used to even out the levels of prosperity, away from the extremes that would be produced by a completely laissez-faire program. In other words I'm for the welfare state. But I also know it can go too fast and too far, and wreck us. The danger of this was certainly present for a time; I don't think it's nearly so present today.

- 1) SOCIETY's ILLS ARE THE RESPONSIBILITY OF US ALL--NOT THE ENGINEER ALONE
- 2) THE DO-GOODERS WE HAVE WITH US ALWAYS
- 3) WELFARE STATE

[Also I think that in approaching this whole problem one must realize that there are wide differences in ambition to take account of. I've written a bit on this recently.

[Our population grows too fast. The concentration in cities baffles me; I can't understand why there is not a corresponding urge to disperse. These are making tough problems, and critical ones. But I think it goes deeper than this, and I don't understand it. We have unrest among bodies of students, who are a privileged group.

[This is a subject we need to pursue and one where I am far from having any answers.] [END BUSH COMMENT]

I realize that a lot of our stuff is done because all citizens have votes and so forth. I'm perfectly in favor of a great deal of the whole welfare state affair as I've said. I'm fully in favor of protecting the citizens against the hazards of nature and of rapacious men as far as it can be done by government. But I am not in favor of the idea that says all citizens have an equal right to the comforts of life: if they aren't able to earn them or willing to earn them, they are to be given to them by taxing those who work hard for what they get. [EH to VB: SORRY: ANOTHER EXCEPTION; SEE PP. 679-A & B]

I suspect this is what was in your mind and that you thought you might stir me up to some remarks on this subject. Why the engineer? When you get to your story you say that this guy that is too damn lazy to move out of the sun is to be furnished with all the comforts of life by the engineer.

1) BUSH CHALLENGES
EQUAL COMFORTS AMONG
CITIZENS BUT AGREES
WITH EQUAL OPPORTUNITY

How do you get that way? This is not the engineer's problem; this is the problem of government; it's the problem of every citizen; it's the problem of the political people in particular. [EH to VBS (Repeat) SEE PP. 679-A & B]

- 1) EQUAL COMFORTS ARE NOT A RIGHT AS ARE EQUAL OPPORTUNITIES
- 2) BREAKING CLASS DISTINCTIONS

I am very much in favor, in fact enthusiastic about the idea of equal opportunity in this country and I think we've got a long ways to go on that yet. But that's one very different thing. It has no relationship whatever to the kind of thing you introduced. The equality of opportunity means that if there is a youngster with talent and ambition somewhere we should have means for finding him. Having found him, we should be sure that he is given the opportunity for all of the education that he can absorb profitably for his own benefit and for the benefit of his fellowmen. We're nowhere near that yet and I suspect that Russia does better at it than we do. But that's a different thing.

I'm also very much in favor of anything which will enable the individual to step across what are generally regarded as class distinctions. In other words, when a chap who starts at the bench in a factory becomes an independent owner, or becomes manager of a company, and I've recited one or two such cases to you, that excites my admiration and my enthusiasm. I think we've done a great deal in this country in breaking down the artificial privileges and the artificial distinctions. But I think we've got a long ways to go. In all of that you can get my enthusiasm. But when you say that as an engineer,

I've got get busy to see [seeing?] that a guy out in the sticks who's lazy as hell gets some hot water, why to hell with it.

1) EH TAKES EXCEPTION
TO THE "LAZINESS
THEORY" OF SOCIAL
DECAY

[EH to VB: (14 May '65) Nor am I in favor of the idea that says all citizens have an equal right to the comforts of life! Where did I ever say I was?

[But I totally reject the Laziness Theory of social decay. Why should the Engineer step in to arrest such decay? Well the scientist and engineer have made possible orbital flight and moon shots, to name only them. And the public, the middle-class public, is wild with enthusiasm at having his tax money spent on putting a man on the moon -- much to your eloquently phrased alarm and disgust. Is the Engineer solely the hired man for Popular Projects? Should he not eloquently suggest to Presidents, Governors & Mayors serious problems calling for serious improvements? You have said several times in these transcript pages the young engineers must study and understand men as well as things. If you say this don't you thereby also urge the engineers to take a deep interest in the problem of men-in-the-aggregate? Kennedy tried but failed to get Cabinet rank for a Secretary for Urban Affairs. But this will come. When it does, the Secretary will have many tasks; a principal one will be to devise ways to get non-lazy [from?] men and women sprung for/today's urban traps. He will have

to draft engineers to help and advise him -- but I hope some will volunteer.] [END EH REMARKS]

[VB to EH: A long time ago I took cracks at the engineers because they did not organize in such a way as to force the public to listen. There have been various attempts to tie the engineering societies together as some sort of council. None of them have really worked. Now we have a National Academy of Engineering. The chap who heads it, Gus is a live wire. But still I doubt if this really has powerful influence.

[The fault lies with engineers, certainly, but also with the press and scientists and others. We can get a big show going in this country if it excites popular enthusiasm. Unfortunately it is easy to cause this on a glamorous affair. But I doubt if it is possible to get enthusiasm of the same sort on such a matter as air and water pollution. The unglamorous has to be promoted by other means than through public exuberance. Slum clearance. We have done quite a lot of it. We need to do much more, and there is doubt if we can keep up with population growth in the cities. This has been brought about by quiet pressure. Oh, I know some of the pressures have come from contractors and from greased legislators. But there has been honest pressure, and quite a lot of this has come from engineers and city planners and public-spirited men of all sorts.

1) PUBLIC ENTHUSIASM
FOR MOON SHOTS BUT
NOT SLUM CLEARANCE
--GLAMOUR PROJECTS
EASY TO PROMOTE

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[Should the engineers organize to increase their pressure for some such things. I have doubts. Some of these come from watching A.M.A. Such outfits tend to get into the control of permanent staff and second raters.

[It is a large subject. If we had a public intent on having good government at the state level it would be more hopeful. Living in Massachusetts I am not optimistic.]

[END VB REMARKS]

- 1) DOUBTS THAT ORGANIZING ENGINEERS WOULD HELP SOLVE SOCIAL ILLS
- 2) PUBLIC INTEREST IN STATE GOVERNMENT MIGHT HELP

* * *

Question B34: Business Executives Moving Into Government

There's a lot more to be said about this business of motor-driven toothbrushes and the point that I was making there that I might have brought up on the previous question was this. For a long, long time our industry has prospered because of the advent of new gadgetry. The most striking thing of course is the automobile, if you call that a gadget, and also radio, television, household aids and all that sort of thing. Now these things prospered and they created new industries. They gave employment and they kept a population that's increasing in numbers from bogging down. They kept us on our toes and they kept industry humming because they fulfilled wants and genuine ones. They were things that people were willing to work for to get. But what will we have next?

I realize the danger that lies in saying that all that could be done is now being done. Physicists have exemplified that many times. When I was just beginning to study physics the story was pretty well about that physics had discovered most of the fundamental things and from now on it would be merely a matter of polishing up old stuff. Look at what has happened there. There's a similar danger when one talks about what could come along industrially to make really great strides, really great progress. I don't know what it could be and I look at it from this standpoint.

- 1) U.S. INDUSTRY IS
GADGET-ORIENTED
- 2) HOW HARD WILL
PEOPLE WORK FOR
MORE GADGETS

What do men now want, or women, that they haven't got and that they are willing to work for? There's no use bringing out a new gadget that fulfills a passing whim which is so minor that people will not work overtime in order to have it, rather than to work normal times and go without it. I don't see any such thing in the horizon along the lines of human wants and possibilities.

On the other hand I do see a whale of a lot that's possible in the advance of science and particularly in the biological field where we may come to such an understanding of the human body that we can remove the hazards that now exist, that we can solve the problem of senility, that we can solve problems of mental aberrations and live a much more healthy, comfortable and fruitful life. That can come without any doubt and that's where you can get real enthusiasm.

Of course there's plenty for us to do in the advance of the biological science and the control of our environment. Inevitably as populations increase and crowd upon the land they distort the system of nature which existed before. They bring in aberrations. We have to learn a whale of a lot before we can properly control insects, fungus, and pests without at the same time knocking out the birds and so on. There's a whale of a lot to be done on water -- water supplies and so on. There's no question in my mind that there's plenty ahead to be accomplished that's worth accomplishing. This will be attacked by the advance of science and its applications and we can see great things from it. I don't see

- 1) HOW HARD WILL
PEOPLE WORK FOR
MORE GADGETS
(Continued)
- 2) MANY PROBLEMS STILL
TO BE SOLVED esp.
IN BIOLOGY

great things coming along in the field of gadgets.

1) BARRY GOLDWATER

[EH NOTES: THIS PARAGRAPH AND THE NEXT WERE
"DICTATED AUGUST 1964"] This is not at all an answer to
your question and you know my reactions to your question
immediately. I can't understand how in the devil a man like
Humphrey or Eisenhower and so on can go for a Goldwater who
is so obviously dangerous. He's inclined to shoot from the
hip, to speak before he thinks, and to be cocky as the very
devil. I'm sure he would be dangerous. As things are going
right now, I'm appalled at the fact that Johnson is vulnerable
because of the things that have happened in Texas and there
are things that he may have manipulated politically. It
looks bad. The only hope is that if Goldwater should get in,
he may be tamed by that time a bit and responsibility sobers
every man and so on. It isn't a very good hope and to my
way of thinking the worst thing that he's done in the last
year was when he picked his vice president.

However, this is not a political argument we're
getting up. In fact, I don't think we want to get into that
aspect of things at all. Long before this stuff gets into
printed form if any of it ever does, we'll know the answers
to some of the things I'm raising here. But I am appalled
as things stand. [END MATERIAL DICTATED AUGUST 1964]

In fact there are several things that jar me in
looking ahead. One of them is this political situation.

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Another one is the increased rioting and so forth connected with civil rights which I'm sure is going to get worse. (I hand it to Martin Luther King. It's fortunate he appeared.)

A third thing is the strife that I see coming inevitably between the Supreme Court and the Legislature. It's just beginning to roll now. If this move in Congress to annul in one way or another the last decision, the fool decision of the Court in regard to the makeup of state senates, becomes enacted into law I can see every kind of trouble possible coming to us from this direction. [X-REF BACK TO PP. 232-234]

- 1) CIVIL RIGHTS RIOTS
- 2) SUPREME COURT
REAPPORTIONMENT OF
STATE SENATES

* * *

Question B35: "Businessman for President"....Ford....Do
We Never Learn?

Of course the kinds of things we see about us jar us plenty and the search for the complete political idiot is a good example. I think there's one way of overcoming pessimism in this regard and that is to read history. The only trouble is that very little history really gets down to brass tacks on the kinds of things one ought to study. (I'm reading Morison and he does give a picture of thoughts and conditions.)

There's no question that today the public is better informed than it used to be. Television with all of its faults has done a great deal and is doing more. The commentators in the papers do get across the footlights and so on. We have with our great magazines and so forth a better informed and hence a more intelligent public; no more intelligence genetically or anything like that but merely more intelligence because better informed. There is also more intelligence because communications among people is much more facile than it used to be.

The real way to overcome pessimism is to read the stories of some of the old campaigns. Read about Blaine for example and some of the stuff that went on in the attack on Cleveland, oh, a whole lot of that stuff, and get a picture in one's mind of the torchlight parades and the slogans of the old political campaigns. It's a wonder that the Republic survived. It'll be still a wonder if it does survive. At least we're not quite as crude as we used to be.

- 1) AN INCREASINGLY
BETTER INFORMED
PUBLIC
- 2) HISTORY SHOWS OUR
INCREASING POLITICAL
SOPHISTICATION

Question B36: Tag Ends: WWII "Unconventional Warfare"
Section; Reasons for German Defeat.

We had a section in NDRC, Section Nineteen I think it was called, that did all sorts of things on unconventional warfare. The head of the section was a nice, mild professor of chemistry by the name of Chadwell, one of the last chaps in the world that you'd think of as being involved in various types of skulduggery. This outfit made all sorts of things for subversive warfare, things that were smuggled in to the Chinese or dropped to the Maquis and so on.

The whole story's been told in the book that was published only last spring, I think, in which Stan Lovell [EH to JK:] [EH to VB: I DON'T RECOGNIZE] [VB to EH: STANLEY LOVELL WHO RECENTLY WROTE THE BOOK HE SHOULDN'T HAVE WRITTEN.] spilled the whole affair. I couldn't really object because he got it cleared in the regular form but I didn't like the idea of a lot of this stuff being published. It's not that it isn't generally recognized that this sort of thing goes on in warfare, but I think there are too many suggestions in that bag of tricks for, oh bank robbers or something of the sort. There was a good deal of the stuff that didn't get told incidentally about methods of doing counterfeiting, some rather ingenious methods.

- 1) WWII
- 2) NDRC SECTION ON UNCONVENTIONAL WARFARE
- 3) STANLEY LOVELL's BOOK ON THIS SUBJECT

At the end of the war we made only one report. None of the affairs of this section were kept in the OSRD records; the one report being turned over to the Army. So I didn't like the idea of Stan's publishing but you will find there anything you might like to know about the kind of thing that was done. [JK to EH: MIGHT YOU WANT THIS?]

This outfit worked principally with OSS. OSS was under Bill Donovan and it was a highly undisciplined outfit. It no sooner got started than OSS wild men were running all over my shop, butting into things that didn't concern them, interfering with my contractors and generally making quite a nuisance of themselves. After a few protests that had no effect, I sat down with Bill Donovan and with his second-in-command whose name I believe was Buxton. I opened the conversation by saying that his outfit was a damn nuisance, that I'd had enough of it; that my protests had been ignored and I was pulling out; that from there on they could make their own gadgetry. I said that I'd pull out on the basis where [that?] we'd complete some of the little things that were on but that we'd not take on anything new. I was issuing instructions in my outfit that our relations with OSS were at an end. There was to be no contact with it whatever except through my office.

Of course, this caused consternation because Bill wanted the stuff and he was in no position to set up his own show. We had quite a long discussion about the thing and finally compromised. The compromise was this: Bill Donovan

- 1) WWII
- 2) UNCONVENTIONAL WARFARE
WORKED WITH UNDISCIPLINED OSS
- 3) BUSH & BILL DONOVAN
OF OSS WORK OUT
PROBLEMS BETWEEN
OSS & NDRC
- 4) LOVELL BECOMES
INTERMEDIARY

appointed Stanley Lovell as his personal assistant reporting to him and I did the same. We issued orders in both outfits that all contacts between the two organizations were to be made through Stan Lovell. I told Bill that we wanted assurance that anybody that stepped outside of that boundary would be promptly thrown out on his ear.

It worked all right. Stan had a way about him and he kept things in order. I think we stopped all sorts of possible leaks by the kind of thing that we did there. When Stan had a really tough one, he'd come to me about it. One for example when lysergic acid showed up and it was regarded as a very dangerous thing and put under wraps. I talked to Stimson about the handling of this because a cigarette loaded with the stuff would give a man the symptoms of schizophrenia for some seven or eight hours. It looked like a very dangerous affair. For quite a long time afterward, the thing was still being kept very secret. It's all known now today, of course, the whole story of these hallucinogens as they're called. But in this later conference they were still holding it very closely although it was known rather generally at the time. They didn't want the Russians to hear about it. I interrupted the discussion by saying that personally I thought the Russians already knew about it. If they didn't I thought they ought to be told about it, of course indirectly, because I was sure that if the Russians knew about it they'd be practising it on one another. Since that time the show has

- 1) WWII
- 2) LOVELL AS INTERMEDIARY
BETWEEN DONOVAN's OSS
AND BUSH's PEOPLE
- 3) LYSERGIC ACID

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turned out not to be as serious as then promised. There's been a great deal of hullabaloo about experimentation with hallucinogens but we haven't had the kind of a terror that might have come out of such a thing.

I'm now at the end of this tape or close to it and I'll go over to Tape Eleven on the continuation of this particular question.

- 1) WWII
- 2) HALLUCINOGENS

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END REEL 10

QUESTION B-36 IS
CONTINUED ON REEL 11