May, 1977, Charles Misner interview of Hugh Everett, III (46 yrs.)

Charlie Misner: Well, it's been a great evening. I enjoyed spending our ~~—ahs~~ 18th anniversary with you, Hugh. Why don't you lead on (after your drink) by telling us how you got started with John Wheeler. Hugh: Well, I got started....

C- What ever made you decide to pick him for a thesis advisor?

H- Well, actually, I didn't. Somebody assigned him to me, I think, and I needed one to get my fellowship renewed.

C- Right, so it was all bureaucracy.... H- That's correct. My first year was actually spent in the Mathematics Department. C- When did you get on to, ah, weird Quantum Mechanics? H- ~~X~~ Oh, it was because of you and Aage Petersen ← No marks (from Denmark), one night at the Graduate College after a slosh or two of sherry, as you might recall. You and Aage were starting to say some ridiculous things about the implications of Quantum Mechanics and I was having a little fun joshing you and telling you some of the outrageous implications of what you said, and, ~~as~~ as we had a little more sherry and got a little more potted ...in the conversation. Don't you remember, Charlie? You were there! C- I don't remember that evening actually, but I do remember that Aage Petersen was around - that's entirely possible. H- You had too much sherry. C- Was that after I was starting on the "Rainich Theory"? (Sounds ~~like Range or Rains~~ or Rienish or Reins or Graves or Grange - nge) Rainich which was known as the Rainich Theory at that time because .... H- Oh, I remember that... yes, that was that same .... C- You read his book and told us, "Look, this was a great idea - why didn't he stop there instead of going on to finish the job?" H- I do remember that, yes. Whatever happened to that, I wonder. C- Well, we eventually decided to go on and finish the job. H- How did it come out? C- Well, only many years later we discovered - well, actually not so many years later, but actually Peter ~~Berman (sp/?)~~ Bergmann wrote us a letter and said, "Look, it's not in his book, but actually in some other publications, he did all this stuff that you wrote and had in your thesis, Misner." H- laugh - Why didn't he publish it? C- He did, but in some obscure place.

H - I see. C- So I had to do something else for my thesis instead of Graves? Theory.

H - I never knew that. C- Yeah, I spent all those years on that and eventually had to go back and turn out something on Feynman quantization ...

H - I had to study for Generals - that's what happened to me - I had to study for Generals, so I couldn't follow any of that up. C - Hmm, didn't you take generals when I did? H- No, I took them a year later. C- You did; H- I think, let's see. I see. Yeah, right. It was the Army-McCarthy hearings as I recollect ... I did not that year, I remember, I was freely watching them & C- Oh I/watched them all, spent all my... H- but you had to occasionally study and couldn't watch all of them, right? C- Oh, I .... in the morning .... when I went to class. Yeah,. C- I must have gone atleast once a week to Bargmann's Barton's class. H & C laugh. H-Once a week! All right, yeah. Oh, goodness.

C- that's just to show you that Notre Dame is so much better than Catholic U, I had all I needed to pass generals from Notre Dame, so I had to study. H- That's true, I had to I guess, or atleast I thought I had to. Laugh. Sigh. (Nancy or Suzanne? ask about Wheeler.) H- How did Wheeler get into this? How did You pick Wheeler? C- How did I pick Wheeler? Well, I picked Wheeler because after spending the Army-McCarthy hearings studying for generals, or the other way around, I decided I should, because they told me I should, find a thesis advisor, and I had been working with Wightman; H- hmmhum. C- so I first went to Wightman, and he unfortunately was an honest man and said "I'd be delighted to have you for a thesis student; I have a lot of interesting things to do, but you should probably take notice that of my last three students, none of them has got their PhD in less than seven (7) years." H- You know Charlie, much the same happened to me : Now I forgot who gave me advice like that but somebody said something as much the same like that - "You can get out quicker with Wheeler" (laugh.) Let's see, I wonder, who was that, hmm. C- So anyway, when I went around to talk to John Wheeler he had all kinds of wonderful ideas, all of them focus, nebulas, going off into the mysteries of the universe , and anything that I wanted to do was just so exciting that he couldn't possibly restrain himself and they all it seemed that everything's possible and I might as well do it quickly and get finished and solve the problems of the universe easily at the same time!

H - What year was Ooah there? C- I don't remember/ H- Was that our first year? I/ C- My first year was '53 -'54. H- We were both there/the same year. C- That's right. We were roommates together. H- That's right. C-/For some reason ... H- well, that was later/ Let's see, at first ... C- We had this luxurious room, remember, a whole suite, two (2) bedrooms, a bathroom and a little sitting room in the Graduate College - I had never lived in such luxary before in my life. We were down on the first floor in the Graduate College someplace. H - That was you and Harvey (Arnold). C- Oh, was that right? Yeah. C-Oh, that's right. H- It was me and Hale (Trotter). C- So the four (4) of us all got mixed together...H- right, that was in the third year. C- Yeah H-Right ...so that's the second and first year... C- So then we had...O.K. Yeah, you were.... H- I keep trying to pin down when Ooah was there, 'cuz that's ...boy by hmm, C- well, ... trying to bring back ancient days ...H- I know, I know. We can probably pin it down. Well, anyway, the whole business started with those discussions, and my impression is, I went to Wheeler then later and said "hey, how about this, is this the thing to do," I walked up to Wheeler. C- You already had some Game Theory going, is that right? H- Oh, yeah. I had to do that to get my NSF ...C- I think you had some publications coming up...H- ...I had no hope in the Physics Dept. in my first year because nobody knew me, so I did something in mathematics...well, I got it renewed. C- Yeah. H- Well, hmmm. Gosh! C- I don't know how much I did with Wheeler the first year, I can't remember that at all, but I must have seen him occasionnally - I don't know whether I took the relativity ... he was... (I know) the year before I came he taught a Relativity course and he took all his students, including Eric Komar, (H- Yeah, I heard about that.) to Spain to visit Einstein (him) and I missed that and I always thought that was one of the great catastrophes of my life. But I suppose he must have taught relativity again. Did you have relativity from him that first year you were there? H- Humm. C- He taught it that year ...I suppose he taught it the next year, but I'm not sure. H- I think it was all about GEEONS or something like that. C- Oh, of course it was about GEEONS, yeah. We certainly heard enough seminars about GEEONS and whatnot. H- and WORMHOLES, we certainly heard about WORMHOLES. C- Yes, and I was learning all kinds of

mathematics from Hale Trotter. Of course we always went to Mathematics Tea - well there only was one ... H- There only was one Tea... C- everyone went there, and that's where I learned all kinds of fancy mathematics. Of course I had a big start at Notre Dame from Arnold Ross who was the mathematics chairman there. He had me through half of Boor-Bocky Bourbaki and things like that while I was an undergraduate. But I remember Hale and various mathematicians were helping me with ultrapraved algebraic topology and this, that and the other thing. H- I remember the day when we thought/elementary particles would be obviously the way different knots would be knotted in multiply-connected space and we went over there and said/all we've got to know is got to know the classification of knots and we'll have the answer. They were'nt able to help us. Remember that? C- I don't remember that, but I do remember lots of discussions about knots,.... H- Hale got into that. C- Wasn't Milner ? Milnor solving some knot problems in undergraduate ... shortly before or after that - various people were full of knot theory. H- Yes, whatever happened to knot theory? C- I think all the problems got solved. H- Oh. I thought they were undecidable or something. C- Oh well, that's a solution, you should know with your word problem work ...H- Oh yes, right. C- The word problem got solved while I was there. H- My problem was solved? C- Yes/..... H- There was also this Russian who ... I think it was parallel solutions or something like that. Goodness. I am trying to remember the exact history of that and I can't. I know that it really stemmed from that night with the really fun discussions with Adje - flushing out the paradox. C- I don't really know which year he was there. H- I believe it was our first year. I'm not sure of that: could have been the second. C- When did Einstein give his seminar, was that about our third year (was last year) there? no,,,. H- I don't recollect. C- Cuz that was an occasion,-remember that?...when we arranged for Einstein to give a seminar at the University and I don't think he'd given one before ?. H- I don't think I attended. C- Sure you did , I remember you were there. H- Really, what did he say? I don't remember it. C- Well maybe that's true - maybe I had to take notes and try to tell you - no , I would have thought you were there. H- I sure don't remember it, and I think I would have. (Laugh)

(Change of reel or something) C- .....

H- I know nothing about this whatsoever ! I'm outraged! Ha! Where was I? Was it on a weekend? C- I can't remember, I doubt it. It was a Tuesday night or something like that. H - Maybe I was in Trenton, I don't know. Whatever that one was, I don't know. I was somewhere else. C- I doubt I have any notes on it, maybe I actually was trying to remember a few of the things he said to carry them on to you because he made some remarks about the ~~temptations~~ limitations (?) of quantum mechanics - he wasn't quite as determined about classical interpretations as he had been in the famous debates and things like that. You know, he admitted that quantum mechanics was certainly correct in all its predictions ...H- cleaned. C- Yeah, but he was shaken from the kind of unclearness he worried about in his debates with Bohr and he felt that he had a basic solidity , anything that he did to it would have to recognise that some of the great things he said were verifiable. H- Hmm. Right. Somewhat restricts your possibilities of getting out . Well, I don't know. C- Which year was it that I went to Leyden with Wheeler? Was that our second year there, it's right. problably was. I would think that H- I don't remember - oh, I do remember you're going to Leyden. Were you ~~a senior~~? C- It was a spring term and Joe Webber, Peter Putnam and I all tagged along with John Wheeler for a semester when he was visiting ~~or~~ Lorentz Professor at Leyden (~~Belgium~~) H- Well, hmmm. What was I doing during that time? C- Maybe you were studying for generals. H- Maybe he wasn't even my professor then. C- That's possible. H- Who was? I had somebody else in my first year. For the life of me I can't remember how the hell I got connected with Wheeler. Somebody advised me that I ought to get connected to him. C- You problably already had these quantum mechanical ideas and just needed someone to talk to about them and he was obviously the kind of person who ... H- I have that slight impression, but I can't be sure. C- We may have started - no - in Leyden I was already working on these ~~Reinish~~ Rainich sp. ideas which you had proposed. You found ~~Reinish~~ Rainich's book and he said that algebraically the Maxwell tensor can be expressed in terms of the.... H- O.K., that was indeed in our second year I think, I have that feeling. C- That's probably true. H- I remember that

1954-55

Christmas vacation that I was home I played around with that and then I had to drop it I felt because I really had to work on the generals for that spring. So that was the second year. C- ~~Xx~~ you talked to me about it so I began taking it up with Wheeler and/followed it out at Leyden, which would have been my second year, spring '54-55. H- O.K., O.K., so maybe it was that I wasn't doing anything...oh, all right, so that started in the second year, hmm. C- So that would be ...H- Cuz I think that pre-dated me, quantum mechanics, ~~xx~~, uh, I think. C- Fall of '55, maybe, when I was back...uhm... H- Uh, noooo, no, no no - cuz I had the whole thing written by the fall of '55, that whole document was done, (C- garbled) H- Yeah) C- at the end of your second year? H- Yeah. As a matter of fact, it was somewhat embarassing because I had most of it written .... the real embarrassment was that Wheeler at one point was threatening to get me my PhD before the third year had run out, and as you remember, the draft was still in force in those days and the last thing in the world I wanted to do was do that. No, that thing was written in the winter of '55, or at least the first draft of it was. No, it was third year, '55-'56 was third year. He was threatening .... end of/tape.

So anyway, he was threatening to get me out in mid-term of the third year and ~~h~~hat did not coincide at all with my plans, especially given the draft situation at that time. So that was in the third year... C- so that was ... your involvment in the spring of '56. H- Uhh, somewhere in/~~there~~ I got involved with ~~it~~;/no involvment whatsoever in my first year. C- That was the same year I was in Leyden. It was the late part of the year that you must have been talking with him because ..... H- Maybe it was...it very well... in fact it probably was because I did nothing but study for generals and things like that in the second half of that year ('~~55~~ 54) so, I... C- ... second half of that year you were probably talking with him. H- Well, maybe so. C - Because I certainly was talking to him a bit about the ~~Stranger~~ Ranich sp. stuff, altho I.. H - O. K., so when did the quantum thing ...cuz I must have talked to him some, and, I/ you know, that summer ~~was~~ is when I wrote really really when I was writing that first thing and Nance was typing it and everything else (?) and the whole thing was ready by that autumn and that winter, which is what caused the threat! C- Did we spend only one year in the Graduate

College, then? H - We spent two years in the Graduate College. It was in our third year that we were in Linden Lane. C- But then, I have to get that straight, because it was certainly our year in Linden Lane that I started taking Dutch lessons with Renée Franklin, remember, a Dutch girl. H- Yes, so maybe you didn't go to Leyden til then! C- That's right. H- A ha! That makes alot more sense. C- O.K. So that's how it was. H- All right, so it happened in the second year and the only question is where and what . That must have been when Ooah was there. C- Did we room together in the second year, is that possible? H- Ahh, no! The first year I roomed with an Englishman and you were with Harvey Arnold, down on that first floor by the passageway. H - Maybe you were in the second year too. In the second year I roomed with Hale. And in the third year all four of us roomed together in Linden Lane.

H- All right, so what exactly happened in that second year? I guess we conclude that that's when Ooah was there. C- Yeah. must've been. One of those summers, probably Wigner had arranged for me to get a job at Bell Labs. H- Yeah. C- One summer I had a job at Bell Labs. Whether that was the first summer or the second, I'm not sure. H- All right, the Reinich business was the second year. C- Probably got straight the second year. H- I remember working one Christmas at home, actually calculating Christawful symbols. (Guffaws) C- I would allow that for me the second year to have had a course with John on relativity. H- O.K., and I don't think I had that course, that year, or C- or maybe I never took it actually, because I had a course at Notre Dame, so I may have thought I didn't have to take one at Maryland (sic) (Freudian slip) I might have just joined his lunch group, you know, and talked with people in his office. He used to have playihg for discussions or in his office brown bag lunches or for/something. I might have joined that group without partaking taking part in the .... H- I was very much out of that group, I remember ....that's probably why I didn't get invited to the Einstein thing. (Laugh) . Well, it went something like this: We had those discussions with Ooah and all that, and somehow, I don't yet know, I got connected with Wheeler or whatnot. "The question is of the thesis topic, you know, what about looking into this mess here, you know, there's an obvious inconsistency in the theory or whatever I thought of it then.

C - It's strange that he would be so interested in it - all in all, because he (it) certainly went against the normal tenants of his great master, Bohr.

H - Well, he still feels that way a little bit, even as recently as last month in Austin he was a little bit that way....

C- How'd he work that out, because he certainly had great respect for Bohr.

H - Oh yes, indeed. C- But he was always intrigued by his advocacy of ideas - He tried to get you and Bohr to agree. H - Yes, I spent six weeks, as you know, you were there (in Copenhagen), and that was a hell of a ...doomed from the beginning... C - ?)

H - ... the battles of 1925 or something. C - You didn't get the chance to say something that you would relight his pipe three times,-that was marvelous and he seventeen that you could make that attempt - I don't know how old he was at the time - (1960?)

H- Well, you know what really came out of that trip to Copenhagen was the invention of the LaGrange Multipliersx C- For what - H- No reason - it's not relevant to Physics ....why it was on the record ? - It was the truly great accomplishment of that Copenhagen trip, though; it made Lambda Corporation and several other things.

C - Which year was that Copenhagen trip? H - That was 1959, six weeks, the year we (Charlie and Suzanne) married, because we went over on one of the earliest Pan Am jets

H - Oh, my goodness. C- Well, Wheeler certainly kept at it once he got into it.

H - Yuh. C - I'm sure he would have been happy if he had heard his professored (?)your viewpoint, or at least not have to have used listened to favor/disagreeing.....

H- Yes, well you should have been in Austin a month ago. This was on human consciousness - whether computers are conscious and so on. His work was quite relevant- Wheeler actually read it before the assembled multitudes and all that. Then, at your place last week, he confessed, he actually now believes it, (pause) except on Tuesdays, once a month,-he said/he really has to reserve one day a week to disbelieve in it and so he ..

C - I see, well that's a good perception. Most things that he's in doubt about he has a Monday, Wednesday, Friday .... H - Ohhhhhhhhh, O.K. Yes, right. Yes, he believes in being very conservative I really think, for some body with such far-out ideas as Wheeler has, to call himself a conservative. C - Oh, well, at first, Dynamic Conservatism,-wasn't that his battle cry when he was trying to sell GEONS originally?

C - The only thing revolutionary about this is that I want to ~~leave~~ (believe?) the equations and switch to see what they. H - Yes, that's right... C - What are you going to do about it? H - That's right. Yes, marvellous concept. Well, that's what I did in Quantum Mechanics, too - perhaps that's where it came from, that same idea. Let's just believe these basic equations - what's this extra jazz for? So you do get a weird and funny picture. C- That's certainly what he was doing when he ...well, you recall ~~KU-KU~~ Kookle-blintzes the year before I came there, maybe my first year there - H- Oh, yes. C- He gave a presidential address about ~~KuGoo~~ Kookle blintzes to the Physical Society but then they eventually became ~~GEEONS~~ Geons, and that even got threatened shortly thereafter when he got a letter from the General Electric Company saying that the GEON was their trademark for Freeon (H- Oh-oh! HA, ha!) C- and if he wished to use the word FREEON would he please acknowledge their copyright. (H- Back to ~~KUGOO~~ KOOKLE BLINTZES) C- I guess that was somehow ~~xxx~~ resolved without extensive payments from the Friends of Elementary Particle Physics. Did you ever benefit from the Friends of Elementary Particle Physics? H - Not knowingly. What.... C - Well, they were a Princeton benefactor... H- A subversive Mafia-like organization? C- Oh, no, various people who always seemed to be students of Wheeler's. H - Uh huh! C- I must have gotten sent to a Physical Society meeting from Leyden or Dutrech or the like or I don't know what... H- I never went anywhere! C - Two persons from Italy came up to visit Wheeler in Leyden after their generosity and ~~with~~ there were various other people who benefited from the Friends of Elementary Particle Physics which seemed to be an account at Princeton that Wheeler.... H- Now you tell me! I never got any of this largesse, that I know of. C - Maybe he figured your father was too rich.... H- My father was an Army Colonel, ~~xxxxx~~ not rich! C- But suspicion gradually dawned on most graduate students that the Friends consisted primarily of John. H - Oh, really? C- Yuh. H- Ah, Huh! Gee whiz. Well, I didn't know anything about that. C - He was preaching this idea that you ought to just look at the equations and if ~~there~~ there were the fundamentals of physics, (then) why you followed their conclusions and give them a serious hearing. He was doing that on these solutions of Einstein's equations like Wormholes and Geeons. H - I've got to admit that; that is right, and might have very

well have been totally instrumental in what happened. C- He encouraged you to follow up on his, uh H- obviously ridiculous! C- argument that was only intended to shut up obstreperous friends like me (and Cole Moore) and Gage Petersen. H- Yuh, right. C- I can't think I ever had very many serious thoughts about basic quantum mechanics, but of course Petersen ... H- Yeh, none of us really took it seriously at the time, except for Gage, of course, . C- Oh, actually I went through a very strange experience ... I don't know whether you went through it, but I certainly did, as an undergraduate getting taught by people who had learned quantum mechanics in the thirties. And to them, quantum mechanics was really a big philosophical change, and they were shocked by the whole ideas and so forth. And somehow we were H-didn't seem all that funny ... and felt that every new course in Physics you get some new kind of nonsense which seems to make sense later, well, you know, so, Q. M. is no worse than Electro-magnetic fields, or F = MA, or whatever it might be. H- Yuh, electro-magnetism is still mysterious. Laughter. Well, goodness, I don't know. C- Well, how did John pick you up; I mean, you had these ideas stirred up in that general conversation & you began to work out more of the detailed mathematics of it. Where did John begin to play a role in the whole affair? Did you have a whole thesis written before you talked to him? H- No, no. That's the part I can't quite bring back. I mean, we did have a conversation or two, and uh... Yeah, I guess...no, uh, he did indeed play a role; it's coming back now. You know, I said 'there's obviously something wrong here.' I showed the paradoxes and whatnot; that 'something should be done to change it.' He did keep saying 'Why?' you know, his ultimate conservatism, as he put it, kept coming through, you know, 'Why, why?' C- He kept saying "Well, maybe it's right," ? or H- Well, he kept doing funny little experiments with balls running down inclined slopes or something, I never quite got the gist of what they were but ...I can't put my finger on it on where or when... C- At least a very important influence was to always point out possible opposite solutions that were so far fetched that you felt you had to put Johnny on the straight and narrow track and sort of ...(Hugh's laughter) catch...and show him how this was the way Physics really was done...H- Yes, uh, huh. C- and he was always off in the wild, blue yonder... that was stretching your imagination and not allowing

you to ever do any mundane problems. But, you evidentally eventually might have had a chance of being one ahead of him on this kind of stuff. Did he have the same attitude towards you? I mean, did he try to make you think more exotically, or was he helping you focus down towards the real test of the questions/text H- Well, I don't know what to say about that. In any interaction both sides focus and do... very, very hard to untangle.

"We're going to run out"

"End of this tape." Continued?

Mark's drum in background must have been distracting.

1953 - 54
54 - 55
55 - 56
} 3 yrs at Pr. Grad Sch.

I met H. III summer of 55 (2nd yr)
He was looking for a cheap typist!

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PS ? moved to Tulane Tipler - Spring 1977 (46 yrs. May - 1977 (Year Hale Trotte marries!)

(Testing, 1, 2, 3, 4, 5 - testing, testing, testing
I've got to get a drink before I(~~do this~~) can talk with you)

→ Charlie Misner: Well, it's been a great evening, I enjoyed spending our ah 18th anniversary with you, Hugh. Why don't you lead on after your drink by telling us how you got started with John Wheeler. H- Well I got started...

C- What ever made you decide to pick him for a thesis advisor?

H- Well, actually, I didn't. Somebody assigned him to me, I think, and I needed one to get my fellowship renewed.

C-Right - so it was all bureacracy... H-That's correct; my first year was actually spent in the mathematics department. C- When did you get on to ah weird quantum mechanics?

H- Oh, it was because of you and (Ööah sp. Aäge Petersen, (from Denmark) one night at the Graduate College after a slosh or two of sherry, as you might recall. You and Aäge Ööah were starting to say some ridiculous things about the implications of quantum mechanics and I was having a little fun joshing you and telling you some of the outrageous implications of what you said, and ah we, as we had a little more sherry and got a little more potted ? in ? the conversation. Don't you remember, Charlie? You were there! C- I don't remember that evening actually, but I do remember that Aäge Ööah Petersen was around- that's entirely possible. H- You had too much sherry.

C- Was that after I was starting on the "Range Theory" which was known as the Rains-Rienish? Reins? Range Grange theory at that time because ... H- Oh, I remember that...yes, that was thatsame...

C- You read his book and told us, "Look, this that was a great idea - why didn't he stop there instead of going on to finish the job?" H- I do remember that, yes. What ever happened to that, I wonder, ~~do you know~~? C- Well, we eventually decided to go on and finish the job. H- How did it come out? C- Well, only many years later we discovered...well actually not so many years later, but actually Peter Bergman? ~~Petersen?~~ wrote us a letter and said "Look, it's not in his book, but actually in some other publications, he did all this stuff that you wrote and had in your thesis , Misner." H- laugh, Why didn't he publish it? C- He did, but in some obscure place.