Oral History Interview with Dr. George R. Carruthers
Selected Excerpts

Interview of Dr. George R. Carruthers by David DeVorkin on August 18, 1992, Niels Bohr Library & Archives, American Institute of Physics, College Park, MD USA, [http://www.aip.org/history/ohlist/32485.html](http://www.aip.org/history/ohlist/32485.html).

Principal Investigator Dr. George Carruthers (right) and Project Engineer William Conway with the Apollo 16 far ultraviolet camera/spectrograph instrument. Naval Research Laboratory (NRL), courtesy AIP Emilio Segré Visual Archives, Ronald E. Mickens Collection.
Excerpt One: On His Family and Growing Up

Carruthers:
My father was George Archer Carruthers, and he was a general engineer by training. He went to the University of Illinois, like I did. In fact, that’s probably part of the reason why I went to the University of Illinois. I don’t remember a whole lot about what kind of work that he did, but the earliest that I can remember was that in 1947 we moved from Cincinnati to a farm near Milford, Ohio, which is about fifteen miles from downtown Cincinnati. At that time it was really out in the boondocks, you might say. So from the time I was about seven till I was twelve, we lived in the country, so to speak, in rural surroundings.

DeVorkin:
Who did your father work for?

Carruthers:
He worked for the Wright-Patterson Air Force Base in Dayton, Ohio, so he had to commute quite a bit.

DeVorkin:
That’s quite a distance. Why did you stay in the Cincinnati area if he worked over in Dayton?

Carruthers:
Actually, I think that he changed jobs after we moved to the country. He was originally working in Cincinnati. I don’t remember exactly when he changed jobs. It might have been as late as two or three years after that.

DeVorkin:
Tell me a little bit about your mother, her name and what she was like, what her training was.

Carruthers:
My mother’s maiden name was Sophia Singley. Both my father and mother were from Chicago originally, and they moved to Cincinnati, I guess just before I was born. I don’t really remember what her background was in terms of the occupational specialty that she studied in school. It wasn’t science or engineering, but I don’t remember exactly what it was.

DeVorkin:
Let me go a little farther back in your family. Your father had an advanced degree?

Carruthers:
No, just a bachelor’s.

DeVorkin:
Was he the first in your family to go to college, to your knowledge?

Carruthers:
No. Well, I don’t really know. My uncle actually was about three years older than my father, and he had a Ph.D. degree, but it was in non-technical field. I think it was romance languages or something like that.
DeVorkin:
What was family life like for you in Milford?

Carruthers:
I'm trying to remember now. It was certainly different from when we lived in the city. I guess that's later when we moved back to Chicago. But living in the country was quite different in the sense that you didn't have nearly the amount of contact with the outside world that you do in a big city. The school library was probably the only source of information that I had access to other than whatever books my father had. My interest in astronomy first came about by chance. Actually, maybe we're not to that stage yet.

DeVorkin:
That's okay.

Carruthers:
But I guess my interest in science and technology came about first through science fiction. When I was about eight or nine years old, I got a Buck Rogers comic book from my grandmother, and that was, of course, long before there was any such thing as a space program. Since it was science fiction, nobody took space flight seriously in those days, back in the late forties, early fifties. But then I came across a book on astronomy that my father had. Actually it was not an astronomy book per se, but it was an encyclopedia that had a section on astronomy. The combination of that plus the science fiction magazines really sparked my interest. My father's background was in civil engineering and general engineering, so to a large extent he served as a role model in terms of giving me advice on studying math and science, although the particular area of astronomy and space flight was not really his area. Needless to say, most of the teachers and students in school were not supportive of me in that type of thing.

DeVorkin:
Were they accepting of you generally, as a black youth in what must have been essentially a white school?

Carruthers:
I don't recall that there was a whole lot of overt discrimination. It's certainly true that there were only a handful of black students among those at the school, and every once in a while I do remember that some of the kids would give me a hard time, but I don't recall any instances of discrimination on the part of the teacher or the principal or anything like that.

DeVorkin:
What was "a hard time" in your elementary school?

Carruthers:
Well, every once in a while they would make racial comments and things like that, and pick fights and things like that, but there wasn't a whole lot of that that I recall, at least not specifically racial in nature.

DeVorkin:
How did you deal with it?
Carruthers:
I don't recall that it was a real problem. Actually, there was a lot more of it in Chicago than out in the
country. Actually, I'm getting ahead of the story, because we moved back to Chicago when I was
about twelve.

DeVorkin:
I see. So you really barely got to something like junior high school in Milford.

Carruthers:
Right. I left there when I was in the middle of eighth grade.

DeVorkin:
Let's talk about your early schooling in Milford and then move to Chicago. Were there any teachers
or adults who served as role models in science?

Carruthers:
Not that I can recall. In fact, one thing that I do recall was that a lot of both teachers and students
thought my interest in astronomy was strange.

DeVorkin:
At Milford?

Carruthers:
Yes.

DeVorkin:
Is there anything else to talk about during Milford, or should we move to Chicago?

Carruthers:
I guess among the things that I did in Milford was to build my own telescope. I saw advertisements
in magazines that you could buy lenses and stuff to make telescopes, the same sorts of things that
Edmund Scientific has done in recent years. I don't think it was Edmund Scientific, but it was the
same kinds of companies that were selling parts to make telescopes.

DeVorkin:
What type of telescope did you actually build?

Carruthers:
The first one I made was just a simple refractor which had an objective lens and an eyepiece lens.

DeVorkin:
How did you learn how to build it?

Carruthers:
They gave instructions in the kit on how to do it.

DeVorkin:
When you built the telescope, what did you do with it?
Carruthers:
I went out and looked at the stars, the moon, and the planets and that sort of thing. Of course, it was a very crude telescope. I didn't have a mounting for it or anything like that, so it was not something that anybody would be interested in these days.

DeVorkin:
Was it just handheld, then?

Carruthers:
Just handheld. Relatively low power.

DeVorkin:
If this was your first telescope, when did you build your second one?

Carruthers:
It wasn't until I moved to Chicago that I started to build anything bigger than that, because then I had access to the Adler Planetarium, and they had telescope-making classes and things like that.

DeVorkin:
Wonderful. We'll get to that in a minute. Why did your father move the family to Chicago?

Carruthers:
Actually, the story about that is that he didn't. My father passed away when I was twelve, and my mother moved the family to Chicago.

DeVorkin:
Was it natural death?

Carruthers:
Yes, it was sudden, but it was natural.

DeVorkin:
You would certainly say this must have been a very traumatic experience in your life.

Carruthers:
Yes.

DeVorkin:
Do you recall having any goals in life at the time of your dad's death that changed you or that changed themselves?

Carruthers:
I don't think that anything changed in terms of my career goals, because the interest in astronomy was there before that happened, and I did seek a career of being in astronomy at that time. My father was sort of pressuring me to go into engineering, and I guess that's part of the reason why my academic background is a little unique in that I have almost equal amounts of involvement in both science and engineering, except that I was in aerospace engineering rather than civil engineering. That's the only difference between what I pursued and what my father pursued. But the interest in astronomy was always there from the time I was nine years old.
Excerpt Two: At the University of Illinois

DeVorkin:
Let's concentrate, then, on the University of Illinois for a little while. It's quite clear why you went there, what you went there to do. As you started taking basic courses, and I assume you had a curriculum in physics, chemistry, mathematics, did your goals, your aspirations remain the same?

Carruthers:
Pretty much, at least through my undergraduate years.

DeVorkin:
Is there anything about your undergraduate years you feel we should talk about to better understand the development of your interests?

Carruthers:
I guess one of the things that came as a shock to me when I went to University of Illinois, which I also warn students about nowadays, is that the transition from high school to college is not a trivial transition. In other words, what gets you an A in high school will get you a C or a D in college simply because the level of competition is an order of magnitude stiffer.

DeVorkin:
How were your grades in high school, and how did they change in college?

Carruthers:
When I was in high school, at least certainly in the science area, I did very well. When I went to college, it came as quite a shock, because first of all, the level of competition was much higher and also because the professors were very impersonal in comparison to what it was like in high school, because I went to a mostly black high school and suddenly went to a mostly white university in which I was competing not with inner city kids like myself, but guys from the suburbs. I remember that because my mathematics background in high school was not adequate, not because I got bad grades, but because they just didn't have the courses that were required. I had to go to summer school the first year that I was in college and make up mathematics courses. I wasn't very good in mathematics, at least my first year in college, and I remember calculus being a very difficult course, and even physics was not all that easy when I took it in summer school, because they required calculus to be used in physics. That was quite a difference from what I was used to in high school. So my first year was relatively rough, but things got easier later as I got more attuned to the process, let's say.

DeVorkin:
Did you have science teachers or teachers at Englewood who were black, or were they white?

Carruthers:
There were some that were black. My physics teacher was black and my general science teacher was. The chemistry and biology teachers, as I remember, were white, but I don't really recall any specific differences in the kinds of advice they gave me or anything like that. In fact, I even remembered that the physics teacher really was not a physics teacher in terms of background and experience and, to some extent, was not a very good teacher of physics. I had to learn a lot of it on my own.

DeVorkin:
Was there ever a time then or even at Illinois when you began to wonder about your goals and maybe it was futile?
Carruthers:
No, I don't think I ever thought it was futile, even though there were some times when I was sweating courses like calculus and things like that. But I don't think I ever felt that I was considering changing fields or anything like that.

DeVorkin:
How do you think you managed to keep true to your goals when you didn't have, then, a personal mentor or role model who was encouraging you to do it?

Carruthers:
Just the influence of what I had read in libraries and things like that. I think it was really just the outside influences more than anything else, not the personal close-up influences that kept me going, because I could see from what I was reading, not as part of my course work, but on the outside, the books by Willy Ley and things like that that you mentioned, that there really was something to be done out there, and I wanted to take part in doing it, even though I didn't have any direct support from teachers and certainly not from fellow students.

DeVorkin:
Where do you think you get this inner conviction? Are members of your family like that?

Carruthers:
Not that I can say. I don’t think so. I guess the only person in my family who might have had that kind of influence was my father, but he passed away too early in my career for that to have had an influence on me in high school and college.

DeVorkin:
But is it possible that he set such a strong imprint on you in your early life that that could be a reason for it being sustained?

Carruthers:
That’s a possibility. Certainly at least in the early stages it was.

DeVorkin:
Anything that you’d be able to expand on considering your father’s influence at this point?

Carruthers:
Not really. The thing is that since I was only twelve years old when he passed away, it’s not likely that that would have had a whole lot of effect on me, certainly not at the college level, because the other major thing was the major change in my environment, moving from the country to the big city, because most of the reading that I did on my own was after we had moved to Chicago, because I had access to the libraries and things like that, the Adler Planetarium, all those kinds of things that I’d never had access to in the country.

DeVorkin:
Were these public libraries that you're talking about, or a school library?

Carruthers:
Public libraries for the most part.
DeVorkin:
What was your thesis topic, actually?

Carruthers:
It was "An Experimental Investigation on Atomic Nitrogen Recombination." It was sort of a joint project between the aeronautical and astronomical engineering department and the electrical engineering department. It was a study of the spectra of atomic nitrogen recombination which actually was something that they had been working on in the gaseous electronics laboratory, but was relevant to aerospace engineering, high-speed reentry vehicles and things like that. The thing that I found interesting about that was that the assessing techniques, the spectroscopic techniques, were very similar for that kind of work as they are for astronomy.

On Being a Role Model

DeVorkin:
Is this something that you would, in your interest in being a role model for younger people looking to a career in science and technology, recommend to them?

Carruthers:
Yes, if they are inclined the same way as I am. Of course, some of them may be theorists, some of them may be not interested in engineering, but specifically interested in science, and some of them may be interested in engineering and not interested in science. So it depends on their inclination. If they have interests in both areas, then certainly small projects offer the opportunity to be involved in both areas.

DeVorkin:
Indeed, given your experiences and your interests, how do you see yourself as a role model?

Carruthers:
I think that since I have a broad background, at least relative to many people in science and engineering in that since I have some experience in both engineering and science, I feel that I can at least give some general guidelines to students, maybe not specific ones for particular career options other than those I’m directly familiar with. But a lot of people do call on me to come to schools and give talks, participate in programs. In fact, almost every other week I get a call from a teacher somewhere wanting me to come talk to her students.

DeVorkin:
Do they ever ask you how you overcame the possible discrimination that people must think you must have had in your life, like any young black man growing up on the south side of Chicago or going to a white university? Do you ever discuss this in terms of your own experience?

Carruthers:
Yes, I do. Most of them are surprised to hear that even though I went to school in the fifties and sixties, that I really didn’t experience that much in the way of overt discrimination, although there are certainly some aspects of being a minority in a white university that makes it inconvenient to some extent, not that people discriminate against you, but they don’t want to actually socialize with you, either. So if you have study clubs that all get together and exchange notes, you’re left out. Not that they would prevent you from coming, but they just don’t invite you.
DeVorkin: Were there any other blacks in physics or engineering at the time you went through?

Carruthers: Yes, but very few. In fact, so few that it was almost very rare that there was anyone else in the class besides myself.

DeVorkin: What about at NRL when you got here?

Carruthers: There was one other person, Randy Taylor, who was working here at the time. He was a chemist who was working in the space science division. He wasn't a Ph.D. level scientist and what he was doing was mostly development of ultraviolet and X-ray detectors. Certainly I got some good experience from working with him from time to time, even though we weren't on the same projects. Certainly he was a good person to talk to.
Excerpt Three: On the Future of Science Education

DeVorkin:
I think for now we've gone far enough with your history. Let me just end by again returning to some of the things we talked about in the beginning. These deal with Project SMART and science education. These are straight-out questions that possibly might be helpful in planning the video. How would you respond to the following kind of question: must science education somehow change to reach black youth?

Carruthers:
I think that the real lack in science education at the present time is not race-specific; I think it's true in science education in general, is that many of the teachers of science are not really trained in science specifically. They certainly aren't trained in the practicalities of it. So one of the best ways of helping out that situation is to have practicing scientists and engineers work with the teachers to supplement what the teachers do, and programs that supplement classroom experience are very important. I'll get to some aspects of that in a second, but one of the things is based on my own experience, is that classroom teaching is often boring and often doesn't relate to practicality, both because of the way in which it's presented and because the teachers really aren't versed in the practical aspects of it anyway. So if you can supplement that by having demonstrations, hands-on activities, having students go to places like NRL [Naval Research Laboratory], where science is actually being done, like the Summer Science and Engineering Apprentice Program as one example, where students come here and work for eight weeks during the summer, those kinds of things which they didn't have when I was in school, I think are very helpful supplements to the classroom. Another aspect of that is that we can help the teachers themselves by working more directly with the teachers, make suggestions about things that they can do in the classroom. Of course, we can't get around the board of education's rules and regulations. Their bureaucracy is just as bad, if not worse, than the bureaucracy of the Department of Defense or any other agency. Just because we want to change something doesn't mean we can change it. But certainly if we work one on one with the teachers and just don't tell the higher-ups what's going on, we can make a difference.

DeVorkin:
You've been able to do that over the last several years to your satisfaction?

Carruthers:
Not to my satisfaction as yet, but I think that we're starting to make some progress. One of the big learning experiences we face on our side is, like I said about the bureaucracy of the schools themselves, sometimes I get the impression that teachers and school administration are not enthusiastic about us helping them because they feel that we're tramping on their turf or they're doing things that their regulations don't allow for, and what's best for the students may not be obvious to the teachers anyway in some cases. For example, if we tell the teachers that we would like to come over and give a talk for the students, you might think offhand that they would say, "Oh, yeah, why don't you come on over and we'll tell you when." But sometimes you never get a call back.

DeVorkin:
Why do you think that's the case?

Carruthers:
I think, like I said, it's partially because they feel that we're doing something that they feel is their job. That's getting back to my experience with the technicians here at NRL back when I first came here. The teachers might think that we're making them look bad if we do something that the students really get more out of than what they teach in class. Certainly I'm not trying to put down all teachers.
There are quite a few teachers who really appreciate and look for our help. The other thing is that we have to get the word to the students and encourage them to participate in activities, because one of the things that I found out the hard way is that you can announce something to the students, like, "We're going to have a workshop on such and such a date at the Air and Space Museum," and nobody shows up. We tell them about it, but they don't come. When you stop and think about why they don't come is because it's something that's above and beyond what they are doing in school, and there's no incentive for them to come unless they are already specifically interested in it. They don't get extra credit for it. So we have to come up with some way of providing some incentive for them to participate in these kinds of things, especially off-campus kinds of activities. So we have to get with the teachers and see if we can arrange some way for them to receive extra credit or, at the very least, at least for the teachers to actually actively encourage students to take part in things that are off campus and outside regular school hours.

DeVorkin:
So is it correct to say at this time you're looking for those incentives?

Carruthers:
Yes.

DeVorkin:
And that the videos that we are planning might be one type of incentive that would be shown in the classroom?

Carruthers:
Right. In fact, that's another area that we've been trying to pursue, is getting videos shown in the classroom. The obstacle that we have to overcome there is that the classroom schedule is already full, and teachers are not usually inclined, or at least they find it difficult to find the time to show videos and have guest speakers in classes that already have a full agenda. So somehow we have to find times in the school schedules where these kinds of things can be accommodated, and since we're not educators ourselves, it's difficult as outsiders to make that kind of judgment.

DeVorkin:
Are you ever treated as an exception to the rule in the black community, given your background, your interests, and your pretty unique career?

Carruthers:
Well, to some extent, but on the other hand, black scientists and engineers in general are relatively rare.

DeVorkin:
That's what I'm trying to get at.

Carruthers:
Right. Now, I should also point out that it's not nearly as rare as it was when I was going through school, in that I had no black scientists or engineer role models at all when I was in school, because they probably existed, like George Washington Carver and others certainly existed, but they were never brought to our attention. Certainly white teachers would never tell you about it, at least not in those days. The few role models that did exist, we weren't aware of. But nowadays there has been a great deal of improvement in both the number of examples that people can point to and also the fact that people are more actively pursuing that kind of thing, to bring the role models to the attention of
the students. So in summary, I would say the students have a much better opportunity now than they
did back in the fifties and sixties, but we still need to pursue it further. We’re still a long ways from
having a satisfactory situation, I would say.

DeVorkin:

Thanks a lot. I think that we’ve had a very good first session, so I’ll end it here. Thanks.