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Oral history interview with Cyril Stanley Smith, 1992 March 18-April 1

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Transcript

Preface

The following oral history transcript is the result of a recorded interview with Cyril Stanley Smith on March 18 and April 1, 1992. The interview took place in Cambridge, Massachusetts, and was conducted by Robert F. Brown for the Archives of American Art, Smithsonian Institution.

The Archives of American Art has reviewed the transcript and has made corrections and emendations. This transcript has been lightly edited for readability by the Archives of American Art. The reader should bear in mind that they are reading a transcript of spoken, rather than written, prose.

Interview

ROBERT F. BROWN: Well, we're starting an interview on—I'm starting there with March 18, 1992, Professor Cyril Stanley Smith in Cambridge, Massachusetts, and it's Robert Brown, the interviewer. And I'd like to begin, perhaps talk somewhat along biographical lines, but I'd like to emphasize and ask you, perhaps initially, your interest in art. I know as a full-time, or as a consuming interest, it came about only in the last 20 years or so, I gather. But I believe its roots lay way back, even in your childhood.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: You were raised in Birmingham. You were aware of not only the technological—the industry there, but also of the products, I think, weren't you? And you also knew about Sheffield from an early age, and its long tradition.

CYRIL STANLEY SMITH: Yeah. Of course, everything has its roots in something before [laughs].

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: It's quite impossible to trace the real beginnings of everything. I've been quite interested in my scientific work, and understanding the way a chemical phase change happens, or the change in structure or steel from hard materials to a soft material, depending on the arrangement of the atoms responding to the environment. And the environment is both the immediately adjacent atoms, which may or may not be the same in a certain structure, and the way in which the structural connections expand from that, and may be ordered or may not be ordered. [00:02:13] And of course order is always a very local thing. And the farther you get away, the greater the difference becomes. And it all seems to me that the difference between technology and science, on one hand, and technology and science not on the other, is a matter of what level you're focusing for the moment your attention. And really, one can't help but reach the conclusion that everything is time. But it's a question of how long it takes you to see something; how long it takes you to compare something with something else. But of course this is the whole basis of chemistry. It's the whole basis of crystallography. It's the whole basis of the aggregates of solids, liquids and gasses, and universes, for that matter. It's the time it takes and the scale of resolution that you're able to achieve. I spent a lot of time essentially doodling, playing with the different diagrams, beginning, actually, with diagrams of the supposed interaction of atoms, and then realizing you draw these lines on a piece of paper, and here's a mathematician's line on the point.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You look at them with a microscope, and you realize [laughs]that these are anything but lines and points. [00:03:54] And increasingly, I've come to feel as though like the medieval corpuscular philosophers who didn't believe in atoms, they simply believed in kind of a cellular structure, nor of the governing structures, just simply coming from the way that cells can interact into things which, for a short time, will hold together. And if the environment is not too dense or too loose, it can retain an identity and entity, and the transition between an entity and an aggregate.

ROBERT F. BROWN: Whereas the molecular approach did not explain this as well, to you?

CYRIL STANLEY SMITH: Well, that's just one stage.

ROBERT F. BROWN: One stage, yeah.

CYRIL STANLEY SMITH: When you go from whatever it is forms the atom—if there are atoms, I don't think there are—to the molecules, and then the molecule could either be something like a crystal, which had order, pretty much. Or it can be like an aggregate of soap bubbles, where you've got nothing and something.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And you've got directions. And this mixture of in-out, and odd and even, in whatever you talk about, comes in whether it's human relations, whether it's the organization of society, the organization of matter, the organization of radiation.

ROBERT F. BROWN: So you've already brought up now human relations and the like, in society.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: These were concerns you've always had as well, is that right? Or, I mean—

CYRIL STANLEY SMITH: I would say not.

ROBERT F. BROWN: No?

CYRIL STANLEY SMITH: In fact, I find I've always found politics, so just not understandable, and therefore I haven't been much interested.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Although I will say this. [00:05:58] During this absurd pre-election period, and the things one sees on TV, and what candidates are saying, particularly the absurd things the interviews with people who don't know anything about anything being asked for their opinion on TV, this has made me think a lot more about the marvelous things that human beings are, and the still more marvelous interactions between these marvelous things. In fact, any marvelous thing will always try to extend its boundaries. And it will always over-extend its boundaries, and then it will be changed, sometimes drastically, sometimes gradually.

ROBERT F. BROWN: Mm-hmm, mm-hmm [affirmative].

CYRIL STANLEY SMITH: And individual human beings can sometimes anticipate the future, and avoid catastrophe. Social aggregates to human beings seem to be utterly unable to do this.

ROBERT F. BROWN: Mm-hmm, mm-hmm [affirmative].

CYRIL STANLEY SMITH: The Chinese idea of the oscillation in society, of course every industrial concern seems to have its period of growth. You've got every nation, which I think—that's the best example of it. And it all thinks that its way is best, and tries to extend—tries to conquer the world, either in a military sense, or in an intellectual sense.

ROBERT F. BROWN: Mm-hmm, mm-hmm [affirmative].

CYRIL STANLEY SMITH: And the way in which—people would have a good understanding. And this is particularly true in religion, which is absolutely necessary. And you have this feeling of there being a certain nature of things. [00:08:04] But then you put this into words, and then you argue with somebody else, who uses slightly different words. It may be for the same thing, or it may be for different things. But practically all our attention comes when people insist on their particular view of the world, and can't accept the fact that if everybody did think the same, it would be death [laughs].

ROBERT F. BROWN: Mm-hmm. Mm-hmm, mm-hmm [affirmative].

CYRIL STANLEY SMITH: So—all this is a lot of vaporizing. I think what is underlying this, something about the interface between the precision of science within a boundary, where you can write an equation which really is true within the—

ROBERT F. BROWN: Within its—

CYRIL STANLEY SMITH: —defined condition. But it does not apply to anything outside. And this is very balanced between a bounded precision and an unbounded world outside.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. But this was where, I gather, art first attracted you as something, that through intuition or through the seeking of fun or pleasure or decoration, made a number of discoveries without knowing always what it had discovered.

CYRIL STANLEY SMITH: Yeah. I had almost no education and no contact with art as a kid.

ROBERT F. BROWN: You had—you mentioned you had access to scientific apparatus. You had an uncle who had

collections of fossils—

CYRIL STANLEY SMITH: Yeah. Yeah.

ROBERT F. BROWN: —and introduced you to crystallography.

CYRIL STANLEY SMITH: Yeah. And the crystal is a wonderful thing. I mean, you can enjoy it as a visual experience, and you can think about it in scientific terms. And actually, I think the earliest—my earliest recollection deals with what we're talking about. [00:10:09] It occurred when I was visiting the Birmingham city art museum, I must have been something like 17 years old, I don't remember. Maybe—quite late in life. And noticed an engraving, which was a portrait of somebody or other, I don't remember who. But I noticed that this transition between the general sense of shading, of light and shade. Then I looked at it closely and saw the fact it was built up of lines and spots. That started me thinking about art, and the way in which it transitioned from the small to the large, with a difference in density, producing differences of quality. And usually, of course, was something to restrain you—in other words, the frame is awfully important, as Ernst Gombrich said.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Then, a little bit later, in fact in my very first year in the university, I was introduced to the structure of metal, looking at them under the microscope and seeing these wonderful patterns. And there was a paper by a French metallurgist named Port de Vannes [ph] on the structure of eutectics, eutectics in a special form of alloy, in which World War II constituents in solid state, and the different patterns formed by these, which Port de Vannes was interested in. [00:12:04] It really caught my eye. And there again, at about the same time, though I had access to the laboratory at the university, I had my own lab, which was immensely important in my learning about the world. My parents were quite supportive. They bought me a first-rate, professional quality metallurgical microscope, and I did a lot of work at home.

ROBERT F. BROWN: That's when you were quite a young boy.

CYRIL STANLEY SMITH: Well, I was 17 or 18, something like that.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I remember repeatedly, in fact, I still feel you do a bit of work getting a specimen ready to look at under the microscope. You polish it and you chemically treat it. Then you put it under the microscope, and you focus it. This experience, of something going from a fuzzy thing to something sharp—I mean, it's a marvelous experience, both visually and intellectually. And no two are the same, of course.

ROBERT F. BROWN: So you're saying, what you're talking—the way you're talking now is, obviously, from a very early age, without saying it in so many words, you were very aware of appearances and you were charmed by them.

CYRIL STANLEY SMITH: Yeah. Yes. Yeah.

ROBERT F. BROWN: You could use that word, perhaps, as you pursued your metallurgical studies.

CYRIL STANLEY SMITH: Yeah. And all of that being motivated by the enjoyment of pattern, and the transition between pattern and structure.

ROBERT F. BROWN: Mm-hmm [affirmative]. When did you—you began—your historical writings began in the ‘30s or ‘40s, don't they? The study of the pyrotechnia, the Biringuccio?

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: That was published in ‘42, but presumably there were papers before that? These were historical metallurgical texts that you were—

CYRIL STANLEY SMITH: Yeah. [00:13:58] I—what was my first? I think almost my first—no, I just have to remember what my first paper was.

ROBERT F. BROWN: [Inaudible.] So presumably, this historical interest you had, to some degree, you mentioned in your biographical account that sort of into your essay on the history, or how you got into the metallography, that you were aware of history. You saw earlier things, as I mentioned earlier, in Sheffield and the like, as I recall, in Birmingham.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: And you were intrigued by the early evidence—well, you mentioned engraving that you saw.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Just on that.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Likewise, in metal products, had you—were you aware, or looking at them at all in terms of their design, apart from their function?

CYRIL STANLEY SMITH: Not terribly acutely.

ROBERT F. BROWN: Mm-hmm [affirmative]. So your first interest in history, then, was not so much to do with aesthetics at all, but just the—what lay behind.

CYRIL STANLEY SMITH: No, my interest in aesthetics came out entirely from my attempt to understand the way ideas on metals had come about.

ROBERT F. BROWN: Oh.

CYRIL STANLEY SMITH: Of course, I should have went through the regular literature on the history of science. It said nothing at all about anything that I was interested in.

ROBERT F. BROWN: Okay.

CYRIL STANLEY SMITH: I think it's remarkable how historians and scientists have ignored all this marvelous knowledge of the properties of matter, that went into the making of things.

ROBERT F. BROWN: Yeah. Yeah.

CYRIL STANLEY SMITH: I should have found, as far as the formal history of science was concerned, there was very little that was the history of what I was interested in. But then actually, through this business of the texture of the [inaudible], and then the texture of steel and so on, I talk about it in my book on history of metallography. [00:16:10] I followed up going to art museums [laughs], then I got interested, you see, in this marvelous interaction between the structure which the atoms was, the structure which society has made a craftsman was, and the structure that comes out with these fingers interacting with matter, while his mind interacts with his body. His whole body, not just his intellect. And then the larger level of society.

ROBERT F. BROWN: Why do you suppose the history of science has ignored this pre-experimental thing?

CYRIL STANLEY SMITH: Because since the 17th century, science has been mathematics.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: In fact, the knowledge of the natural world is not just mathematics. In fact, it begins with an enjoyment of it, then you start thinking about it. Eventually your thinking will lead you to mathematics. Then you'll find some things which can be—some things which can be put in mathematical form. Then, of course, you'll find you have a good theory, an excellent theory, a true theory within a certain boundary.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Then, of course, you find that, why, of course it's true. And if it's always true, what interest is raised? There's absolutely no interest, you see, in certain knowledge. All the interest is in uncertain knowledge. Either the fact that you didn't understand the substructure of things, or you didn't understand something beyond, on a larger scale.

ROBERT F. BROWN: Mm-hmm, mm-hmm [affirmative].

CYRIL STANLEY SMITH: So it's always beyond the boundary, either going down or going up.

ROBERT F. BROWN: So you reached that point in some aspects of science or technology, or in your metallurgical field. And thus, you wanted to go to new things. [00:18:00] You wanted to know what lay behind these tight, discrete mathematical formulations.

CYRIL STANLEY SMITH: Yes—

ROBERT F. BROWN: Or what preceded them.

CYRIL STANLEY SMITH: —see, one of the [inaudible] discrete mathematical formulation didn't relate at all to the practical knowledge of metals. I mean, you don't understand a metal unless you hit it with a hammer and you feel it, and you bend it, and you break it, and you look at the texture of it. It's that kind of direct physical interaction of the whole human body, of the things that's in the eyes and the ears, too, that gives you a whole understanding. It's a whole body reacting to something externally, on every possible level. Artists go through such marvelous tricks in playing with this relation of the small to the large, and the precise of the—and the fuzzy.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: The in and the out, and the odd, and the even [laughs].

ROBERT F. BROWN: Mm-hmm. So that the—you found that this whole experience, you can't verbalize all that, nor can you reduce it to a formula.

CYRIL STANLEY SMITH: No.

ROBERT F. BROWN: So then you point to a third thing, which would be the artistic product?

CYRIL STANLEY SMITH: Yeah. Yeah, yeah.

ROBERT F. BROWN: And you analyze that—

CYRIL STANLEY SMITH: I think that's all pretty important.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: I don't think either the scientist or the artist understands the world.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: But I think the artistic statements can be truer on a complex thing than any scientific statement. The only true thing that a scientist, a mathematician, can say on a complex thing is purely statistical, which ignores all of the interesting complexities. [00:19:50] Where an artist somehow can make use of this hierarchy of the complexity, in a way which gives a realty to it, which is always a reality of interactions between the different parts of the thing, and the way that, of course, this eventually feeds into the feeling that one has of two and three dimensions. In fact, if you go this way, you are not going that way. So it's a hierarchy of not.

ROBERT F. BROWN: Mm-hmm. Mm-hmm, mm-hmm [affirmative].

CYRIL STANLEY SMITH: Again, fairly early I found myself puzzled by the logician syllogisms. And I don't know, a combination of something which is both obvious and useless. But lately I've come to see that this analysis of not and knowing the difference between something not existing and knowing that something did not exist—precisely this business of boundaries, and something in, out or on a boundary.

ROBERT F. BROWN: Mm-hmm [affirmative]. And that's the key—

CYRIL STANLEY SMITH: That's very central to my present thinking.

ROBERT F. BROWN: Mm-hmm. Mm-hmm. Mm-hmm [affirmative]. The attempts to—

CYRIL STANLEY SMITH: I'll say one other thing. At school, I took—there was one course on drawing. And they would take it over and give me a sheet of paper and tell me to draw spheres and things. I was extremely bad at that. My grades were very poor, I was just not interested. I remember one day I was walking to school, but I sought a different route, for some reason. But I happened to look very closely at one of these English cast iron lampposts. I saw it as a shape [laughs]. I looked at it. That stuck in my mind. Then I—then we were told to draw something from memory, because I drew this. And I got good grades for that. [00:22:01] But another one, which is somewhat related, we were told to draw a teapot once. I was the only member of the class who drew a teapot that didn't have the spout coming down. My sense of hydraulics—I mean—that's again, experience. You can't tackle the art or science of anything else. It's just doing something. For a moment being interested in how you move the pencil in relation to an idea you have.

ROBERT F. BROWN: But just doing it, as you said.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Not analyzing how to put the pencil on—

CYRIL STANLEY SMITH: No.

ROBERT F. BROWN: —or any of the—it was your hydraulic sense, not your applying some hydraulic principle. You weren't stopping to, you know—

CYRIL STANLEY SMITH: That's it exactly, yeah.

ROBERT F. BROWN: Yeah. Yeah, yeah. Just went to it. Hmm.

CYRIL STANLEY SMITH: And then, of course, I spent quite a bit of time in the workshop at school, very, very early—

ROBERT F. BROWN: Well, did they have a sense of—

CYRIL STANLEY SMITH: —I felt in my little lab at home I'd gone through all of the possible reactions of essentially qualitative analysis. I learned what happened when things were put together, and the marvelous play of color that you can get simply by mixing things, and the different precipitates and crystallizations, and so on. And all of that, with a physical interaction, with the nature of the matter.

ROBERT F. BROWN: Mm-hmm [affirmative]. Now you had also access to a collection of fossils that your uncle had.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Did that expose an interest in natural forms?

CYRIL STANLEY SMITH: That somehow never crystalized—I used the word "crystalized," you see. [They laugh.]

ROBERT F. BROWN: Never gelled, or never—

CYRIL STANLEY SMITH: I never did anything with that.

ROBERT F. BROWN: What about the workshops at school? [00:24:02] What sort—was this, I mean, a scientific laboratory?

CYRIL STANLEY SMITH: Well, there was a laboratory—

ROBERT F. BROWN: Also [inaudible] you made things. You built them.

CYRIL STANLEY SMITH: —my own lab meant much more to me than my school.

ROBERT F. BROWN: What was the school workshop?

CYRIL STANLEY SMITH: It was a lathe and a milling [ph] machine, and all these kinds of things.

ROBERT F. BROWN: Yeah?

CYRIL STANLEY SMITH: Actually, the kids in school were turning out parts to win the Great War. We were taught some of the subtleties [ph] of accuracy and measurement, and this sense of the moving tool on a lay, and development of circular or flat shapes.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: It's quite foreign. I've developed a certain finger skill.

ROBERT F. BROWN: Mm-hmm [affirmative]? Were either of your—

CYRIL STANLEY SMITH: My fingers, really, are my principle means of learning about the world.

ROBERT F. BROWN: Maybe you can expand on that. It's not simply what you put down in so many words or formulas.

CYRIL STANLEY SMITH: Yeah. It's the feel of things. And the feel, the difference between the texture you feel with your fingers.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: The feeling that you put muscles in your arm behind your fingers, behind the feeling of roughness or slipperiness, and so on. All of this is primarily a physical reaction of the whole human animal to the outside world.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Of course, you then relate this to what you see with your eyes, and what you hear. But I really think that the muscular and the imagined have anticipated muscular reaction as the basis of, really of understanding. When you think about what will happen if you do something, and then you try to do something and it didn't go quite the way you expect it—but then you've learned something [laughs]. [00:26:07]

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. It's what you were talking about earlier, the gap between perceiving something, or—and then—well, this area is what most interests you now as well, isn't it?

CYRIL STANLEY SMITH: Yeah. Let me tell you, I don't know whether I mentioned it in this or not. An extremely important part of my interest in the aesthetic side of things. Simply placing the history of the structure of steel brought me in contact with the Damascus sword, which I explain at great length, you know. And then I went to the Victoria & Albert Museum when I was away on a Guggenheim fellowship—incidentally, Guggenheim fellowships are marvelous things, much better than research contracts from somebody. But that's beside the point.

ROBERT F. BROWN: You're much freer to do.

CYRIL STANLEY SMITH: Yeah. The Guggenheim people wanted you to do what you wanted to do.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: They didn't tell you what to do. Maybe you didn't know what you wanted to do, but you certainly wanted to find out. And that's what I did during my Guggenheim years. Anyway, I was running down the Damascus story for purely the history of metallurgy reasons. And then I went to the Victoria & Albert Museum to see some of these things, and I thought I'd talk to the curator and see what he had to say. So I got hold of Battle [ph] Robinson, in the metal work executive. And he was interested in what I was saying. He was surprised that a roughneck metallurgist would be interested in his works of art. But when he saw what I was after, this business of the texture, the visible texture of the sword in relation to property, he said, "Have you ever seen a Japanese sword?" [00:28:04] And I said, "Yes." He said, "You obviously haven't." And he literally took me by the hand out into the gallery and made me look at a Japanese sword. I was on the road to Damascus. But I suddenly had—really, I converted [ph].

ROBERT F. BROWN: And it was to the Japanese sword.

CYRIL STANLEY SMITH: No, it was to the art in relationship to the metal as I knew. But it happened to be Japanese, and the Japanese happened to do that kind of trick most. I mean, it was not the fact that it was Japanese, it was the fact that it was a marvelous interaction between the structure of metal and the appearance of the metal, and the shape of the whole thing in relation both to the craftsman and to the society which he was both supporting him, and he was surely—it really was a conversion. Then I found myself spending much more time in art museums, particularly looking at Oriental art, which hit me over and over again.

ROBERT F. BROWN: Mm-hmm [affirmative]. And you discovered very soon that a good deal of its decoration, it derives from natural interactions, right?

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: And you've explained that regard to the Japanese sword hill [ph], for example, in its silver on bronze example that they—

CYRIL STANLEY SMITH: Anything interesting, of course, is not uniform.

ROBERT F. BROWN: Yeah. Yeah.

CYRIL STANLEY SMITH: Of course, exact uniformity can be either ugly or present to the human eye. And the human eye responds, I think, very much to a feeling—to a feeling of how it was made. I would say how it was made in terms of the, well, the metal inter-glomeration. [00:29:57] But then I began to realize how looking at Chinese calligraphy, for instance—this marvelous feeling you get when you see these lines varying in density, and so on—all of these just scream at you. A human being doing something and interacting with matter, with the quality of the paper, the quality of the brush, the quality of the ink, and the quality of the rapid and slow motion, and allowing diffusion to occur and flow, and shoving matter around, having sharp boundaries, or fuzzy boundaries, all of which, when looked at microscopically, become simple at some stage. It's just one molecule or

another, maybe a third between them, or alongside them.

ROBERT F. BROWN: A bit more complicated is how they're arranged and the randomness at times, right?

CYRIL STANLEY SMITH: Yeah. And this transition between randomness and a kind of aesthetic order, and then ultimately a kind of scientific order, which can always be found on some level. And then when you've found it, as I say, it's always the same, and therefore, it's always uninteresting [laughs].

ROBERT F. BROWN: [Laughs.] When you had your discovery of the sword, you found something that was always very interesting, or has been.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: This would have been back in the ‘50s or so. Isn't that about when you had your Guggenheim?

CYRIL STANLEY SMITH: When was that? I can't remember.

ROBERT F. BROWN: In ‘56 or ['5]7, something on that order?

CYRIL STANLEY SMITH: No, it was ‘53, wasn't it?

ROBERT F. BROWN: It's that early? Yeah. Well, you worked in the metal—in industry in Britain before you came here?

CYRIL STANLEY SMITH: No. I left immediately after I got my bachelor's degree at the University of Birmingham, and came to the US, and to MIT, which I was advised to go to by the consul, the American consul in London. [00:32:03] And it was a very bad advice at the time.

ROBERT F. BROWN: Oh.

CYRIL STANLEY SMITH: The metallurgy department was, by no, means, the best. On the other hand, it was also very good advice, because I came here. And because I wasn't being taught, I learned. And I learned how to learn. So being essentially on myself doing what I wanted.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: It was a very good experience.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Yale was an excellent place, a marvelous metallurgist named Matheson [ph]. Most of the good metallurgists of my vintage actually were trained at Yale. Anyway, I had 15—oh, I had to get my doctorate's degree, which I did quite quickly. Actually, I got all the work done before I was 22. Then, of course, like every finished doctor, I wanted a job in the university.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I fortunately didn't get one [laughs].

ROBERT F. BROWN: Why do you say that?

CYRIL STANLEY SMITH: I looked around—I got a summer job with the American Brass Company on Waterbury. The summer job turned out to be a permanent one. For 16 years, I was in industry, learning what metallurgy was all about. Learning something about industrial organization, learning something about human structures as well as [laughs] material structures.

ROBERT F. BROWN: I'm sure.

CYRIL STANLEY SMITH: Those years were extremely formative to me. I was very much an oddball in this community. At the same time, I was given freedom by the head of the metallurgy department, which was quite unusual in those days. [00:34:00] And I had a lot of fun. I was trying to be a scientist in an industrial environment. And, of course, it was then when I intensified my familiarity with the microstructure materials. I wrote one or two papers every year it was published in the *Metallurgical Society Transactions*. I developed to a certain reputation at that time.

ROBERT F. BROWN: Mm-hmm? Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And greatly to my surprise, I was elected chairman of that division. I've never had any political or administrative ambitions whatever. I'm a very bad administrator, except for those people who don't need administration. There's another thing on the administrators side, skipping several years, I went during the war, Washington, it's a hell of an experience.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: And then to Los Alamos, which was a gorgeous experience, for that certain purpose.

ROBERT F. BROWN: Can you describe what you mean?

CYRIL STANLEY SMITH: I'll come back to it in a minute.

ROBERT F. BROWN: To it later, yeah.

CYRIL STANLEY SMITH: And then to the University of Chicago, where—I started the Institute for the Study of Metals there. Well—was director of it, I kind of founded the thing and gave the spirit of it.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: In retrospect, I see now that this was really a nucleus of one—of the few nuclei, for the development of the modern field of materials, arts, and engineering. You see, which is looking at material in a far more interdisciplinary, inter-level structured way. [00:36:04] And of course I was obsessed in, how physicists being physicists and chemists being chemists and metallurgists being metallurgists, and insisting on talking to each other. And we produced this environment which showed how you got not knowing by being interested in something, rather than by transmitting a discipline.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You don't learn anything with a discipline. You only learn things by making use of what you learn, to go beyond the discipline.

ROBERT F. BROWN: Mm-hmm [affirmative]. So you, in effect, pulled them out of the classroom and into experimental, and inter-level work there.

CYRIL STANLEY SMITH: I had been rather ashamed in myself in a way, because I had been in the university for, I suppose now it's been nearly half my life. And I'd never done any teaching.

ROBERT F. BROWN: Yeah?

CYRIL STANLEY SMITH: I'm entirely on the research side.

ROBERT F. BROWN: And in Chicago, that's what you encouraged your colleagues to do as well, right?

CYRIL STANLEY SMITH: It was the purpose of this small thing in the university to do this, which is not denying the importance, more or less, but providing an atmosphere a little bit like a monastery [laughs] where you, in a way, you're isolated. Of course, it was wonderful at that time, because you got money simply by saying you were going to do science. You didn't have to write specific proposals or any of that stuff, which is just killing science, I think.

ROBERT F. BROWN: Mm-hmm. Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: The whole university atmosphere, of course, was marvelous. I became very—I became good friends with lawyers and artists, and also I began to get interested in the archaeological side of things at this time. [00:38:02] Because archaeology and art history are very intimately mixed up.

ROBERT F. BROWN: Oh, yeah.

CYRIL STANLEY SMITH: So anyway, Chicago period was wonderful. But it hasn't had the preparatory experience in the scientific laboratory. And the scientific laboratory in an industrial environment. It wouldn't have paid off so well.

ROBERT F. BROWN: No. What was it that the industrial environment had provided you? You mentioned the freedom they gave you to wander [ph].

CYRIL STANLEY SMITH: Contact with the real world, because real metal, and making something which has some desired properties.

ROBERT F. BROWN: Yeah. Something that has to work can be replicated, and—

CYRIL STANLEY SMITH: Yeah. We would have to find out why things have their property. And then making use of what you knew about how property depended upon structure, and structure depended upon treatment, then see the history from the atom to the alloy to the treatment of the alloy, like casting and working and so on, all of this affecting the properties, which is what people wanted.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Then, of course, the largest care [ph] organization, how you organize people doing different aspects of the work, the foundry, the rolling mill [ph], the machine shop, and so on. Then somewhere up in the higher office, the salesman and the administrators, these people who didn't really know anything whatever about the nature of metals. But nevertheless were, which I didn't solely appreciate at the time, an absolutely necessary part of the whole picture. [They laugh.]

ROBERT F. BROWN: There wouldn't have been any more orders, I guess. They would have all come to a halt [laughs].

CYRIL STANLEY SMITH: Yeah. I mean, it's really fun to look at the complexities of both the natural world and the social world, from a material scientist's point of view. Because you have little structures, and little structures interacting to make big ones. [00:40:03] And you could always enjoy the transitions, both up and down. And if you're not somehow—I mean, you're always torn between the larger picture and the smaller one as, of course, an artist is, and someone looking at a work of art.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: That's precisely this tension between the large and the small, and the uncertainty of how you get from the large to the small. And then the uncertainty of direction, there's large there, large here, there's small there, small here. And if you've got five, three of them are large and two of them are small, and how do they fit together?

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: So it becomes directionality, and directionality becomes density, and density becomes time, experience, atoms, matter, photons, one.

ROBERT F. BROWN: Hmm. Mm.

CYRIL STANLEY SMITH: The human being is an entity, a cellular entity, of all kinds of things which have different purposes, or different levels, all beautifully coordinated, both chemically by the circulation of a fluid and electronically by the circulation of the electric charges, which are transmitted via the fluid, and transmitting across the boundaries between cells on all levels. And always pulsing. Pulsing. Pulsing. Circulating. But not always just circulating; bringing in and putting out, as well as circulating in between. And what does an artist do? He's doing the study for all the occasions, you see, for closed circulation, for little things throwing off, which somehow connect maybe only at the frame, or maybe something inside. [00:42:09] It's just the same as what happens in a biological entity, or a molecular entity. And you get to the thing which is called an atom, which is just something where it's always doing the same, and therefore, it's uninteresting. [They laugh.]

ROBERT F. BROWN: So these are systems, you're talking about, to some degree? Like in the analogy of the human body? The circulation, the pulsation, and then the interconnect—cellular interconnection?

CYRIL STANLEY SMITH: Yeah. You can call it "systems of systems," if you like.

ROBERT F. BROWN: Systems of systems.

CYRIL STANLEY SMITH: I tend to think of it as being structures of structures. All was with misfits being the important thing. And the misfit becoming a fit in something else.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You know, look at that.

ROBERT F. BROWN: Yeah. Yeah.

CYRIL STANLEY SMITH: Here's something that's almost crystallographic.

ROBERT F. BROWN: These mosaics?

CYRIL STANLEY SMITH: But putting these things together, you get something which is anything but crystallographic.

ROBERT F. BROWN: Yeah. Yeah.

CYRIL STANLEY SMITH: A very amusing thing is—I happened to have this when I was—I'm trying to write a paper for this, this conference on art and mathematics, in Albany next June. But the very time that the atom was first conceived in Greece, artists were doing things like that with pebbles. And obviously a connection.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You can either make that without being aware of the nature of relationships of things, or can you avoid looking at it without thinking about the nature of relationships. [00:44:04]

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: If you're human, you do both, and you oscillate between these two views.

ROBERT F. BROWN: This is a symbolic expression, though, of the intuition, or the perhaps knowledge of the atomic—underlying atomic structure.

CYRIL STANLEY SMITH: Yeah. But you look at that and think. You can see it as a picture of a warrior on a horse.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: You can also wonder about how it was made. And then, here's the essential thing, I think—if you wonder how it's made, you'll see that somebody put something somewhere, selected something and put it. So you've got the selection and the connection, and the fitting and not fitting.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And that underlies in different levels of these things. Notice the way, here, that the tesserae around the edge of the dog's leg—they're all kind of lined up because they're near an interface. But the ones out here can do pretty much what they want.

ROBERT F. BROWN: They could dance around it, yeah.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Much more around it.

CYRIL STANLEY SMITH: The frontispiece to my book—which I made when I was in Chicago.

ROBERT F. BROWN: Yes, this is the *Search for Structure*. Yeah.

CYRIL STANLEY SMITH: I mean, that tells you everything about something and nothing, which is the primary thing. And then putting bags of nothing together to produce something [laughs]. And then getting a different kind of shape of the misfit between them.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: But then the shape of the misfit itself forms its own shape.

ROBERT F. BROWN: Yeah. And if we were to step back further, those misshapes, fits, they all become a pattern of their own, don't they? [00:46:03]

CYRIL STANLEY SMITH: Yeah. The only difference between this, grossly, and that grossly, is simply orientation.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Nothing more than the direction of looking at things. And of course, the crystallographer paid a great deal of attention to how these things fitted regularly.

ROBERT F. BROWN: Oh, the regular patterns—

CYRIL STANLEY SMITH: The mathematics of crystallography is important. But people thought that was the way matter was, solids were. The metallurgist discovered all the interesting properties of metal come either from these little slight defects of change of direction, or from the bigger changes of direction here.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Whatever you look at, it's always like this. Then there are defects, things left out, on the defects, that's not one of these. That is not solid. So you've got this not solid, and you've got this not not solid. So again, it's the philosopher's hierarchy of negations.

ROBERT F. BROWN: Mm-hmm [affirmative].

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CYRIL STANLEY SMITH: —know about it. Those people who talk about things that have been made, without some awareness of the experience of making it, just plain don't understand it. And of course, it's also true that the maker of a thing doesn't know all of the implications of what he does.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: So, these tensions are inevitable. They're wonderful.

ROBERT F. BROWN: For example in art—

CYRIL STANLEY SMITH: They're both life, chemistry, and cosmology [laughs].

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: It's always the same thing, on a different level.

ROBERT F. BROWN: In several different ways and in different places mentioned the—I guess we've boiled down to saying the inadequacy of iconography as practiced, say, in history of art, for example.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: The looking at meanings and symbols and so forth, and running around finding out what they are is not sufficient. It's inadequate.

CYRIL STANLEY SMITH: Of course, all of one's thinking is in terms, really, of symbols, the imagination of shapes. And it's an essential part of things.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: But unless you get some sense, really, of how symbols interact—it isn't the symbol per se, it's the interaction of symbols. And symbols of shape and relation to society, which is a typical art historical approach, the shape in relation to other shapes, which is the details of art historical comparison—all it's realizing that from the creation of shapes, people working with their fingers learn something much more fundamental about the substructure of the world, and then began to use that sense of substructure to realize that the sense that you have, that the individual is, the substructure is something larger. [00:02:12] So the substructure, looking at the substructure is something larger, and being aware—and feeling, not initially analyzing, this relationship of metals as a substructure.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I say something like this in one chapter in the book which I wrote for Robert Oppenheimer's commemorative issue in *Physics Today*. Not commemorative, in his honor. Not—he wrote me a quite delightful letter, actually, about this paper. But [laughs] he said I sounded like an actual philosopher more than a metallurgist, which pleased me because I realized how much of science in the days when it was natural for philosophy had this kind of aesthetic quality, which has disappeared when science becomes mathematical science.

ROBERT F. BROWN: Mm-hmm. Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Mathematics is wonderfully useful. It can even be beautiful.

ROBERT F. BROWN: Well now, you mentioned you were going to say something earlier, you mentioned in World War II what you were—

CYRIL STANLEY SMITH: Oh, this is the experience of Los Alamos.

ROBERT F. BROWN: Yeah. Yeah, you were in Washington first, that was—

CYRIL STANLEY SMITH: I was in Washington—

ROBERT F. BROWN: As what?

CYRIL STANLEY SMITH: —at a desk job, looking, essentially reporting to the NDRC on what the various—the state of the various contracts they had. It was just the reporting other people's work, in this awful environment of wartime Washington, where everything was—I was completely unfitted for the job. [00:04:02] And I ought to have known better than to have gone. But you see, in World War II, the threat of what is loosely called "Hitler" was so dominant, when you had to do something. The only time in my life where I've really done my duty to society, done what society wanted, was at Los Alamos. Well, I went to Washington to try to do it, it didn't work. Los Alamos, I could do it, and it did work. And that was being a good citizen, working on the damned bomb. But on the side issue, it's a glorious landscape. One walks to work looking at the mountains. One feels the extent of the world, the beauty of the world. And then you use every bit of your knowledge toward a larger objective. But you can only reach by intimate knowledge of what other people are doing with it; in other words, the relationship between me as a metallurgist and the chemists, and the physicists, and the machinists, and the explosive people—or it was—I was intimately connected with every bit of the world at Los Alamos. You see? And this was the genesis of the idea of the Institution of Study of Metals in Chicago. But another angle, personal and extremely important, a gorgeous landscape, extremely interesting companions. In Waterbury, I was a misfit among—essentially, among the people I was working with. And at Los Alamos, curiously, I found that I could hold my own in this intellectual community. [00:06:00] And I went hiking—we worked intensely from 7:00 a.m. Monday morning to 11:00 a.m. [p.m.] Saturday night, but Sunday we almost always took the day off entirely. And we went hiking in the mountains. I went hiking very frequently with Enrico Fermi and [inaudible] particularly, and several others. And Edward Teller, a marvelous man. I was very fond of him. He was a wonderful companion on a hike. You could talk about anything, and he was both knowledgeable, and particularly interesting speculations beyond knowledge. He was wonderful. Of course, later on it got to the point where I just couldn't talk to him. I don't know how he lives with himself. He's a combination of an angel and a devil, in one person.

ROBERT F. BROWN: But you didn't sense any of that at that point?

CYRIL STANLEY SMITH: I didn't sense any at that time—he was beginning to fight a little bit with a physicist on the hydrogen bomb thing already at that time. I wasn't a bit involved. And I just found him a marvelous companion on a hike. It was very positive. Now we still exchange Christmas cards, but we don't communicate.

ROBERT F. BROWN: No.

CYRIL STANLEY SMITH: But anyway, it was this experience of hiking through this landscape with people, most of whom, incidentally, were Europeans.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And—

ROBERT F. BROWN: Why do you say that?

CYRIL STANLEY SMITH: Getting very intimate with the landscape. Looking at the Ponderosa pines, both as a tree and a texture of the park. [00:08:01] And looking at the rocks and the cliffs, and all this kind of thing, all of which, of course, was another view of the structure that I had been looking at so intimately in the—but that's really much noticed in the natural world.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I used to hike a little bit in my Connecticut days. But never very seriously.

ROBERT F. BROWN: Mm-hmm [affirmative]. Why did you mention that they were mostly Europeans? The fact they were, or because that indicates something, as Europeans during Second World War? You think they brought a special way of seeing things? Inter-relating things? These you mentioned—

CYRIL STANLEY SMITH: Of course I, myself, had emigrated so many years before, but I was essentially an American.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: But they were still fresh immigrants.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: They had a different view of the world. And it's so much more interesting to talk to somebody who has a different view of the world, and who will talk to you. If you happen to be a Christian and you're talking to a Muslim, and you're both so sure you're right, you can't talk. [They laugh.] But here with these people—this playful sensitivity of mind that a good physicist has, a good [inaudible]. I think it involves this combination of knowledge and playful extensions of this. Not insisting that when you take a step, it must be right. You take a step to see what's the other side of the mountain, so to speak. I think it's just as true in intellectual exploration, and aesthetic explorations, as it is in geographical exploration.

ROBERT F. BROWN: Mm-hmm? Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You walk to the top of the mountain to see what's the other side. [00:10:01]

ROBERT F. BROWN: What was your job there? What was—what were you sent to do?

CYRIL STANLEY SMITH: I was in charge—I was in charge of metallurgy, which involved, primarily—well, the most important stage was, we had to be ready to handle uranium 235, and plutonium. The uranium was fairly straight-forward metallurgy, and we use the normal techniques. Plutonium was a completely new metal. And we had to get ready to fabricate it when all that existed, just amounts you could see under the microscope and couldn't even see with the naked eye. Then gradually, of course, we moved up in scale. Then we discovered, as soon as we got a gram—the micro-chemical work was done at Chicago. They did extremely good work on the very earliest stage. And discovered that plutonium, a funny kind of metal, it seemed to have two different densities which was most unusual for one metal at room temperature, that indicated it was something funny. When we got a one gram amount, this went to Los Alamos, they could work on a small but still visible laboratory scale. We soon found that this density change was just part of the whole system. And plutonium has more different crystal forms than any other elements on the periodic table, which indicated something—we're going to have some awfully interesting [laughs] problems in fabricating it into the pieces of the bomb. We not only did the work on plutonium, how to handle it and its wonderful transformations, we study its alloys in such a way so as to get one phase, one crystal structure or another, which meant one density or another, which is just what the physicist wanted for their implosion weapon. [00:12:11] So the metallurgical discoveries of the alloy were quite simple to the implosion weapon, and not to the uranium one. Then discovering this, of course we learned a lot about ourselves. Then we also became authorities on any material. Again, you see, we're leading up to the current material science, rather than metallurgy and ceramics. We did a lot of very good work on ceramics, on beryllium oxide in its various forms, and got into polymers, because we wanted to combine—we discovered that uranium hydride, which was known was not UH3, but it was UH4. And the larger matter hydrogen was very useful in nuclear devices, because of the sawing effect of the protons and neutrons. Then we diluted this with hydrocarbons, to get still more hydrogen. The carbon was necessary, getting the hydrogen there. We got into the plastics business. We became experts on any material. I remember [laughs]—this is interesting today—you've been reading about the carbon 40 molecule—carbon 60 (C60) molecule, under wonderful new form called—makes the Buckminsterfullerene of structure.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Once I'd give a talk to the weekly colloquium, where every group leader, every division at Los Alamos gave a talk on what he was doing to all the others. [00:14:09] There was none of the secrecy that went within a very impenetrable finish. But then there was no secrecy among scientists. And we had these discussions each week. I gave a talk on what the metallurgists were doing, and if any of you physicists wanted any material in any shape, come and see me. And the next day, Feynman, Dick Feynman, he wanted me to make some fluid diamond. [They laugh.] But he was just pulling my leg. But he just loved pulling people's legs. And of course, darling what is science but doing that? What is life? Anyway, of course, I couldn't satisfy him. But it has come about now, in this new form of Buckminster Fuller-ine carbon, which is essentially what Feynman, bless his heart, was facetiously suggesting. Again, you see, the facetious suggestions, the science fiction which precedes the science.

ROBERT F. BROWN: Yeah. And you all—your colleagues there, you felt all of them were looking ahead, were being playful and all this, a means of exploring, opening up.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Never closing anything.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Because you were looking for a product that had never been done, right? Never been made.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Who promoted the openness? Did this just naturally occur to you all when you got together?

CYRIL STANLEY SMITH: Oppie [Oppenheimer] was a marvelous director.

ROBERT F. BROWN: Was he? Yeah?

CYRIL STANLEY SMITH: A marvelous director. I don't know how [Leslie] Groves had the wisdom to select—[00:16:01]

ROBERT F. BROWN: Groves was the army man, the general?

CYRIL STANLEY SMITH: —most of the scientists couldn't stand Groves. My industrial background made me realize we needed someone like that [laughs], because he'd take—

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: And he was immensely understanding of which scientists he should trust and which he shouldn't. And Oppie, with all of his slightly murky background, according to the FBI. Groves insisted that he be director. And he was *incredibly* good. He went around and talked to people at the bench level, and could talk to them. Another thing which—I don't know whether you want all of this Los Alamos story.

ROBERT F. BROWN: Yeah. Yeah.

CYRIL STANLEY SMITH: But part of Los Alamos was, again, the environment. At the bottom of the hill, where the old Rio Grande railroad crossed the Rio Grande river, there was a woman living in what had been a stationhouse, who—Edith Warner was her name. She put on dinners once a week, a selective group of people from Los Alamos went there first for an intimate, small dinner, in what was essentially an Indian house. And this wonderfully warm environment, a complete change from the hectic life on the hill. One day, the Oppies and the Smiths were down there having dinner. And driving back, I was talking to Oppie in the car. This was the very time when I had to make a decision about what alloy to use in the bomb, whether to use this low-density phase formed by alloy and gallium was super-secret. [00:17:58] I really couldn't make up my mind but to override my chief assistant, Eric Jette, who was an extremely conservative man, and said, "We just don't know enough to do it." I thought we did, and wanted to take a chance. See, there's a chance that it might turn into the high-density form spontaneously and stop the nuclear reaction too soon. And in talking to Oppie on the way back, we discussed the pros and cons. By the time, 20 minutes later, we reached the top of the hill, all doubt in my mind had disappeared. He had this magic quality of sort of giving a right color to one decision or another.

ROBERT F. BROWN: He would ask questions, or he would rephrase something?

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Hmm. Hmm.

CYRIL STANLEY SMITH: He understood what I was driving about, he understood what I was puzzled about. And he saw the difference, not so much—because it's what we all do. We see what amounts to the texture—no, we see what amounts to the color of one decision or another. Of course, being color-blind, I see color as texture on another level [laughs].

ROBERT F. BROWN: Right.

CYRIL STANLEY SMITH: Being color-blind is a very important part of my both scientific and aesthetic understanding.

ROBERT F. BROWN: Oh, I see.

CYRIL STANLEY SMITH: But that's beside the point. Then after the bomb test, we went to—most of us, I think, and I think I'm fairly typical on this, we made a decision in wartime that we would work on this damned weapon. It was necessary. The Germans were certainly working on it, so we thought. And it would be done sometime anyway. [00:20:02] And it would be a weapon against Hitler. It would win the war for our side or theirs. So it was a patriotic duty to do it.

ROBERT F. BROWN: For you at that time, it was distinctly clear that our side should win, is that right? I mean, you were on our—you felt that the other side was evil? Had to—

CYRIL STANLEY SMITH: Yeah. Of course, there again, the good and evil, it's this business of the sub-structural color.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: But I think most of us, essentially, stopped thinking about the broader implications of it, once we made the decision. After all, if we were worrying about it all the time, we couldn't have done our work, anyway.

ROBERT F. BROWN: Well, did you—

CYRIL STANLEY SMITH: One or two people left. I didn't really think about it until after the test. Then coming back after, from—incidentally from my fingers, the plutonium and the bomb assembly—I was there for a little bit of metallurgical trouble that brought me into the thing. Of course normally, it was just an assembly job for the physicist.

ROBERT F. BROWN: The chief of—yeah.

CYRIL STANLEY SMITH: Anyway, I would doubt the test. And then driving back the next day along the road, which was about 10 miles away from point zero—

ROBERT F. BROWN: Point zero.

CYRIL STANLEY SMITH: —and looking down in the desert, a green celadon bowl in the desert. The fused surface of the desert. It was celadon color. It looked—nothing to indicate the horror of the thing. It was just a beautiful sight. But of course we began to realize—I mean, we've seen the [inaudible]—we felt the echo, and we'd seen the flag [ph], we felt the echo of the surrounding hill for a long time after it. [00:22:01] And we knew it was important. It was immensely powerful. Then we're driving back, and we began to think a little bit about what it meant. The next step was using this, not to make a pretty celadon coat to the desert, but was to kill people.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: And then we began to think about it. Of course, and then there was the news of Hiroshima. And as you, if you read my biased book, you know practically all of the physicists organized to try and educate the public, to see that this was properly used. For a time it seemed possible, and then it seemed impossible. But that's entirely apart from the art side of things.

ROBERT F. BROWN: But you had agreed to go out—before you went to Los Alamos, you had obviously made your decision to go.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: How were you approached? Were you in—

CYRIL STANLEY SMITH: I was approached by Joe Kennedy, who was one of the chemists involved in the discovery of plutonium. He was with the metal lab of Chicago, and he was going to Los Alamos as it was being formed. And he knew that there was a metallurgical problem. He didn't know many metallurgists at the time, so he went to the February meeting of the metallurgists, which was in New York, I think. He was talking about—on a recruiting mission, and apparently my name came up, and we had a conversation. We hit it off very well, right from the beginning. Actually, I would have taken any job that would have taken me out of Washington. [00:23:58] And it was sheer luck that [laughs]—I published quite a bit, and I was a relatively well-known metallurgist. So it was clear I'd be one of the people he'd want to talk to. We hit it off well. And then he arranged for me to see Oppie, and I met Oppie on a park bench in—

ROBERT F. BROWN: Central Park?

CYRIL STANLEY SMITH: What park was it? God, I've forgotten everything. Anyway, Oppie and talked on a park bench on a nice day in spring, and it was early spring, I think late February. Then I went down to Los Alamos for the famous beginning conference. And that's it.

ROBERT F. BROWN: This was all done very—it had to be very secretly, indirectly.

CYRIL STANLEY SMITH: It was extremely secret.

ROBERT F. BROWN: Yeah. And your family went with you?

CYRIL STANLEY SMITH: My family didn't go at first, because there was no housing. But they did come after a time. They must have come in the fall of ‘70—of ‘43.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: An interesting time.

ROBERT F. BROWN: So you've already said the decision to use a bomb that would kill people, you accept it, but immediately afterward, you and many of your colleagues tried to control its future use, and make the public understand.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: And that these events—these efforts went awry, as your wife has described in her publication.

CYRIL STANLEY SMITH: Yeah. It's interesting that practically all of the people who were active in the Federation of Atomic—now American—Scientists, they actually were almost all physicists. [00:26:00] There were very few chemists, and I don't think a single engineer. And most professionals that, went over, this attempt to—I suppose it's educating the public. But how awful it would be if scientists were the only dictators of policy. They could be criticizers of policy.

ROBERT F. BROWN: Why do you say that?

CYRIL STANLEY SMITH: Because I think the scientist tends to over-simplify.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Again, it's like religions. When you've—well, so much of death and destruction has come from the conflict of religions.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You go from a wonderful idea to the propagation of a wonderful idea, and the assumption that there's nothing else. You know, the Book of Genesis, the world without form and void, God diversifying, the discovery of forms, more and more forms. Then human beings develop a monument to one way of looking at things a pair [inaudible], and God comes in again—diversify. I think there was two bits of Genesis, all the bible you need read [laughs].

ROBERT F. BROWN: Hmm. Hmm.

CYRIL STANLEY SMITH: It's a marvelous story of diversity, and a marvelous story of the catastrophe that comes if you'll over-emphasize one aspect of diversity. [00:27:57] What is art, though, that they put this on a scale accessible to individual human beings?

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And we haven't yet got a proper art of politics. And we've got to, somehow. You know, another influence I only lately realized is back of my viewpoint, is H. G. Wells' writing. At the time I was a kid, he was very popular. I read quite a lot of his things. And his sense of the necessary world view, and the evil of good government [laughs]. But of course, it isn't good. It's all—it isn't evil, it's also good, again. At every level is this angel-devil conflict.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Electrons and protons. [They laugh.]

ROBERT F. BROWN: Well, this is—when you—it was well after the war, then, that you began getting more seriously into the aesthetic matters, as you said earlier.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: It was then that you're—well, your Guggenheim—

CYRIL STANLEY SMITH: I already, of course, been interested in the history of science. My work on my publication, my translation, rather, of the work by Biringuccio was done, in spare times during my Waterbury days.

ROBERT F. BROWN: That's before you went to Los Alamos?

CYRIL STANLEY SMITH: Before I went to Los Alamos.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: I was what you'd call a history—a bit of humanism that I already tended to be a humanist [laughs]. For, of course, the wrong reasons, in the humanist term. The thing is, I was only interested in the history of science, not in the history of humanity. [They laugh.] [00:30:00]

ROBERT F. BROWN: Did this give you a new perspective, having that translation?

CYRIL STANLEY SMITH: Oh, very much so.

ROBERT F. BROWN: It must have extended this oracle [inaudible].

CYRIL STANLEY SMITH: Yeah. And one thing it did give me that I couldn't have done—is that I'm a pour linguist; all of my translations were being done in collaboration with somebody else. But the—my feeling for the way metals behave was so essential in interpreting the Italian of this earlier period. Again, I came to realize that in my historical studies, by looking at the historical record and the material record under the microscope, one could see how the thing was made, quite intimately. It's a far better record than a verbal record. After a bit of study of this, you can really relive the physical experience of the man who made it. Really. If you read what somebody has said, you can't relive his experience. But you can relive the experience of a workman making an object. I can make an object. I can't make a beautiful object, but at least I've got the essential experience of what it's like to hammer things, to handle hot metal, to change the color of things, to use chemicals, to etch services, and this kind of thing.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. But at that time, why did you translate Biringuccio, though then, as you just said in the making—

CYRIL STANLEY SMITH: That was then—I thought the history was in the written record.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: And I found that the standard history of the science talked about all the great mathematical physicists and the astronomers. [00:32:01] They didn't talk about the people who knew how to make things.

ROBERT F. BROWN: You felt you needed a break—

CYRIL STANLEY SMITH: So I went back and found what little records there was, getting back to Biringuccio, and then the earlier one. And then, of course, I found that the real record was in the objects. So I found myself going to an archaeological museum and art museums, and then using my knowledge of the way in which structure was affected by the technique of manufacturing, reconstructing the human being's knowledge of the nature of materials, and how they interacted with technique. So the history of metallurgy in my mind began by being in the written record, then the discovery that the written record was past your human mind, it was inevitably warped, sometimes usually, in fact somewhat intentionally warped.

ROBERT F. BROWN: Intentionally warped?

CYRIL STANLEY SMITH: The records that preserved and the structural objects is a real record of what was done to that object. And what was done to that object isn't all of history, but at least it's an essential bit of human experience, which is curiously transmittable in a kind of—in a sensual way, rather, in a verbal way. The language is wonderful. Words are wonderful. But there's always a distortion, always on a mission, always this wonderful aesthetic super precision on words. The aesthetic super precision—it gives a—poetry gives so much more than it says. That's wonderful. [00:34:00] Wonderfully human.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. I mean, you—

CYRIL STANLEY SMITH: But it is not an exact record of—it's not a record of nature; it's a record of one aspect of man's response to nature, which includes the response to sound as well as sight.

ROBERT F. BROWN: Mm-hmm [affirmative]. You intimated that the earlier metallurgical texts were intentionally distorted.

CYRIL STANLEY SMITH: Sometimes.

ROBERT F. BROWN: In some way.

CYRIL STANLEY SMITH: What I meant was the most-written texts—

ROBERT F. BROWN: It's in the sense you just described.

CYRIL STANLEY SMITH: —which is very different.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: This man, Biringuccio, was really trying to scribe things. He wasn't trying to put any [inaudible] on people. Of course, the alchemy, again, is a wonderful thing, where they tried to put what they knew about the behavioral matter into poetic language.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And if you knew what they were talking about, then you could see this—or admire it. It's like a poem, again.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: At first I found, as I think any scientist in my generation, found alchemy just being a lot of poppycock. But now, I can both see the interaction between the sense of—the poetic sense of beauty and the real knowledge of the way materials behave.

ROBERT F. BROWN: You can't read alchemists' writings as a prescription for how to do something.

CYRIL STANLEY SMITH: Not at all.

ROBERT F. BROWN: But that wasn't their intention, you're saying?

CYRIL STANLEY SMITH: No. And of course, poetry isn't that. But poetry is describing humans' emotional reactions to things. And that isn't what things are.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And humans' emotional reactions to things, it's both aesthetics and horror. [00:36:00] I mean, both sides of it, of course, are extremely important in individual history, and the aggregation of humans into [inaudible] civilization. All was level. All of a sudden what fits in one area doesn't fit in others. Because mathematicians have done wonderful things with the mathematics of tiles. I've done a bit myself. But tiles don't fit—what is between the tile that you ignore when you talk about the tile? You see a wonderful brick wall, and the brick, well, there's mortar between the brick [laughs]. The edge of some bricks is a little bit broken.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Of course, the brick isn't cued [ph] into shape, and you put it in different orientations, and get the wonderful patterns of the different Flemish barns, and all these things. Shape, orientation, density of orientation.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And the human being feels this. I mean really, we're just talking about human beings. But I'm about art or science or technology or warfare, or anything else. We're talking about this marvelous entity, which somehow has come out from the playfulness of atoms. [They laugh.] And the playfulness of cells based on atoms, and cells which are not completely impermeable.

ROBERT F. BROWN: Mm-hmm [affirmative]. [00:38:00]

CYRIL STANLEY SMITH: You have to look at boundaries, and you'll see there's—

[Audio Break.]

CYRIL STANLEY SMITH: —effectively impermeable. And that holds whether it's the binding of a book, the boundary of a page, the outline of a letter, the outline of a piece of carbon in the letter.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: We shouldn't be rambling all over the place.

ROBERT F. BROWN: Yeah, no—

[END OF TRACK AAA_smith92_6995_r.]

ROBERT F. BROWN: April 1st, 1992, with a little feedback.

[Audio Break.]

ROBERT F. BROWN: Number two.

[Audio Break.]

ROBERT F. BROWN: I'd like to perhaps begin asking you, I think you have, underlying your interest in relations between art and science seem to be a certain personal aesthetic. At one point you talked about forms of art in which the artists' hand prepares the printing surfaces, for example, in printmaking are often preferable to unique works executed in the traditional media of the painter. And I don't mean to target that, but is this in general the case, would you say? In your preference, hierarchy?

CYRIL STANLEY SMITH: I don't remember saying that.

ROBERT F. BROWN: That was in your essay *Art, Technology and Science*, 1970.

CYRIL STANLEY SMITH: Would you read it to me again?

ROBERT F. BROWN: Yes. "Woodcuts, etchings, lithographs, especially if the artist's hand prepares the printing surface"—

CYRIL STANLEY SMITH: Oh yes.

ROBERT F. BROWN: —are often preferable to unique works executed in the traditional media of the painter.

CYRIL STANLEY SMITH: Yeah. I see what I was driving at.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I'm thinking particularly about the Japanese woodcuts, their treatment both of line and of color.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And of course, any medium will have people who will misuse it. And all media should go through a period of experiment before you know what you really want to do.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. And you've also—

CYRIL STANLEY SMITH: That's really a very silly statement. [00:02:02] It's just saying that little things are different. [Laughs.]

ROBERT F. BROWN: Yeah. That wasn't necessarily your own preference. And you also, in that same essay of 1970 said that, "Much of the refinement of an artist's vision as he works towards realization comes from his interaction with his materials.

CYRIL STANLEY SMITH: That I believe very profoundly.

ROBERT F. BROWN: Yeah. And that's analogist parallels you've seen between, say, chemical phase changes and changes in artistic styles.

CYRIL STANLEY SMITH: Yes. Yes.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And not only chemical phase changes, but the whole curious properties of materials, properties of matter, becoming probably as a material. And the artist's sensitive to the way they give the material—well, conformed to some methods of treatment, so much better than others, and most will select the particular material, probably, to match the idea he has in his mind. And of course he learns, as we all do, quite as much with our fingers and our muscles as we do with our eyes and our minds.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I think the whole body reaction to things to [inaudible] is very important.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. That's related to your saying elsewhere that because parts adjust faster than wholes, change moves structurally upward. It begins at the most elementary level—

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: —and perhaps, what, intuitively, or unconsciously, or by accident?

CYRIL STANLEY SMITH: Well, it begins with an accidental change in the environment to the smallest thing. It may respond to it or it may not. But it has an opportunity of responding. In other words, it's always as well a chance bringing things together, which may or may not interact. [00:04:01] And this is true as human beings and their ideas, as it is a molecule as in their direction.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I also go back to this analogy between the nature of human society and the nature of society of atoms. Or at some point which a single choice produces something experimentally, or incidentally, which may or not interact with something else and become a nucleus of a new way of being.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. And there's a fairly exact analogy in art as well, is that correct?

CYRIL STANLEY SMITH: Of course, yeah.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: I think art, of all things, is closest to the—well, to nature. To the experimental aspect of the growth of biology, the growth of the universe, all of these things begin with an experiment, which may or may not open up into a glimpse of a new world.

ROBERT F. BROWN: Mm-hmm. Mm-hmm. Mm-hmm [affirmative]. You've pointed out, though, a danger sometimes, for example, with 20th century artists in their effort to seem to be technological, sometimes are following rather than leading things. They're—you said their efforts sometimes seem to be more directed to our catching up with and exploiting the technologist's world, than toward leading it. You were referring, I think, to the use of mechanics and contrivances, and so forth—

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: —by certain 20th-century artists.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: So do you find that sometimes the artist very self-consciously tries to lead, ends up by—

CYRIL STANLEY SMITH: He is exploring what is, to him, a new world, a funny thing, which is fine. [00:06:00]

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: But I do think that as with most of histories, it's mainly the artist who has led technology, or in the 20th century a considerable inversion of those things.

ROBERT F. BROWN: Yes.

CYRIL STANLEY SMITH: Of course a popular idea that technology is applied science is one thing which I completely disagree with. I think if anything, sciences always come out of the technology, just as technology usually come out of someone trying to make something pretty. Or enjoying himself.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: That's why in fact, you would matter [ph].

ROBERT F. BROWN: Is this something that you began realizing a very long time ago? When did you begin expressing this, and—

CYRIL STANLEY SMITH: I suppose it began during the year of my first Guggenheim fellowship. I spent some time in London.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Specifically, I'm always working on the history of metallurgy, but just inescapably took me into the history of art.

ROBERT F. BROWN: Mm-hmm [affirmative]. And you linked up, then, I think, with people at the Victoria & Albert Museum, for example?

CYRIL STANLEY SMITH: Yeah. Yeah, yeah.

ROBERT F. BROWN: You've mentioned, I think, before, the curator, or the keeper taking you in to look at certain objects.

CYRIL STANLEY SMITH: Of course I'd seen these things, but I hadn't looked at them. [They laugh.]

ROBERT F. BROWN: There's a big difference.

CYRIL STANLEY SMITH: Or maybe it's the other way around, right? I looked at them, but hadn't seen them. Of course, the discovery of the Japanese sword took me into a part of the museum that I hadn't normally looked at before in my casual interest. [00:08:06] Gradually, this greater sensitivity to the nature of materials, that seems to categorize Oriental art. It seeps into my mind as being something extremely basic.

ROBERT F. BROWN: Hmm. Compared with the West, at least sometimes it seemed to Westerners that Oriental art has remained rather static; it achieved certain levels of perfection and refinement very early on. But would you disagree with that in general? Take the Japanese sword, for example. Is it possible to detect further and further refinements in your studies of its history?

CYRIL STANLEY SMITH: That's a really intriguing question. I think it does, of course, become more and more a question of just plain skill, somehow, and a little less of discovery. But do I agree with that? I don't know. I never agree with anything I think of.

ROBERT F. BROWN: That's Western art. On the other hand, you talked in your essay on the structural hierarchy. You mentioned, I think you had partly in mind Western styles and stylistic change.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: And these began, as you said, in the small parts, the breakthrough, the accident. And as you looked at the history of art, is this a pattern you saw repeating itself time and time again? [00:10:00] Would art historians—did you talk a great deal with art historians following this Guggenheim visit—

CYRIL STANLEY SMITH: Yeah?

ROBERT F. BROWN: —did you find they were perceiving along similar lines, or—

CYRIL STANLEY SMITH: Some of them. But not most. Most, the common run of art historian, I think, tends to see so much with external, rather than the actual physical operation of the physical interaction of the artist with his material.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I do believe that you can't thoroughly enjoy a work of art, until you have some sense of the actual making of it, the operation of making it. The movement, the hand moving materials, and of course the hand guided by an idea in the mind, but always being—the idea of always being modified by what happens as the hand interacts with the material.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: It's really a wonderful hierarchy of interaction of the—when you add it up to the universe, with a human being an extremely interesting [inaudible] of the very high complexity, but not infinite complexity.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: The human being, too, is also at the level where the properties of the atom are still visible. As they get much bigger, the properties of the atom just completely merge into something we'll call a planet, or—the human being is in touch with atoms and molecules via our cells.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Of course, as you can see, I'm always going back to hierarchical levels in the interaction of levels both above and below. [00:12:02]

ROBERT F. BROWN: Well, you've mentioned in one essay that you lamented, I think, the segregation of various scholarly disciplines. I assumed when you began looking into art, you saw this immediately. You've already alluded to the most art historians, for example, looking at surface effects, rather than trying to look at relations between the way something is made and the materials used.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Does this segregation of disciplines, is this something that has always—has been with us throughout your lifetime? Or do you begin—are there changes?

CYRIL STANLEY SMITH: Of course, I began—I think it's not a bad pattern to become very deeply involved, very narrow-mindedly involved in one thing. I know it very, very well. And on this space, then you can begin to understand things beyond it. Of course, if you stayed within the boundaries of those things you learned as your discipline, you may be useful to society, but [laughs] it's not a very exciting life, and it certainly doesn't provide the basis for change. But if you see the interaction between something you know fairly well and something that doesn't fit, then you begin to wonder about fitting on another level.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: That's why I found mosaics so interesting, because they're playing around with the same sort of thing that science is playing with when they try to model crystals. But where [inaudible] reactions are quite definitely [inaudible.]. But then you get to a point where there's a boundary on things, near a boundary, have to have a different orientation, or a different internal constitution in order to exist. [00:14:01] Because boundaries can be one-dimensional, two-dimensional or three dimensional, or N-dimensional. This comes into a very interesting question, what we mean by "dimension." I sometimes think the mathematicians have gotten hold of it in the wrong way.

ROBERT F. BROWN: In saying what, of the matter of—

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Hmm. Well, it's at those boundaries, then, that change occurs by and large, is it?

CYRIL STANLEY SMITH: But of course it can also happen in the middle of something.

ROBERT F. BROWN: In the middle.

CYRIL STANLEY SMITH: But a change in the middle of something is a change of a boundary of the units of what you're calling something, which is a larger pattern, or indirect.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Here again, I think the analogy with a chemical base change is extraordinarily close [ph].

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Of course, the most remarkable question at all, is why there should be any difference [laughs].

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: Because what we're seeing is differences which are resolved to a different degree of either spatial or temporal resolution of differences.

ROBERT F. BROWN: Mm-hmm [affirmative]. Can you conceive of a time when there are no differences [laughs], so to speak?

CYRIL STANLEY SMITH: Yes. I will see no difference in another 50 years.

ROBERT F. BROWN: I see.

CYRIL STANLEY SMITH: Just as I didn't see any difference 90 years ago [laughs]. But I've had a lot of fun looking at differences in between. [They laugh.]

ROBERT F. BROWN: Well, in your essay on structural hierarchy of 1978, you touch on not merely the natural or the scientific or the aesthetic, but also the social structures. [00:16:03] And you see clear analogies, as I think we've discussed a little earlier, between them. And yet you end that essay saying that change is always

unpleasant at the level most involved, at the fundamental level, and yet that's what is needed. So there's an excruciating paradox.

CYRIL STANLEY SMITH: I don't think I said that very well, but I think it's a very important idea. It means that you have to break your habits. Of course most of the time, if you didn't have any habits, you'd [laughs] have a very hard time living at all. And you lock into a certain way of looking at things, to point out how useful this is. But then there's always a point when you really have to abandon something that you've believed for a long time. The difficulty of seeing things in a slightly different framework, and the delight of seeing—once you've made the jump of using your new viewport in whatever you see. And the way in which, with an idea in your mind, when you feel—you're trying to puzzle out the meaning or the structure of something. As you walk around the world, there'll be all kinds of trivial little things, which will certainly make you see what you've been aiming at, without knowing quite what you were aiming at, you see. That's precisely what's beyond the boundaries to all.

ROBERT F. BROWN: There's something in your career during World War II and then following the war when in Chicago, you were able to pull together, you began doing this then, as sort of an interdisciplinary center you created at the university.

CYRIL STANLEY SMITH: Yeah. [00:18:00]

CYRIL STANLEY SMITH: It's the interest in the problem, rather than the textbook theory.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: It comes out of the fact that there is really a great conflict, I think, between teaching and research, which is not polite to mention in the academic world. To be a good teacher, you have to pretend you know something. To be a good researcher, you know you don't know something. [They laugh.]

ROBERT F. BROWN: You supposed that's why you were pleased never to teach, but rather to be a researcher?

CYRIL STANLEY SMITH: Yeah. At one point, Enrico Fermi and I thought we should give a joint course on solid state physics, and he would talk of it from a theoretical standpoint, and I would talk in terms of the properties of materials, as a metallurgist sees it. I think there could be a marvelous course like that. But I found after about four lectures, I realized how incredibly ignorant I was just plain unable to talk to the class. It's the only time in my life, I think, I've ever been near a psychological tremor.

ROBERT F. BROWN: You mean you were getting into areas that you didn't know that much about yourself? Or you had—

CYRIL STANLEY SMITH: In order to teach, I had to re-examine these things that I had taken for granted. There just wasn't time in preparing a lecture every week to do that. But it takes a long time to do—to explore something.

ROBERT F. BROWN: Mm-hmm. Mm-hmm, mm-hmm [affirmative]. And to have given them received knowledge, or what was assumed from the textbooks, they could read about it themselves, is that right?

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: There's no point in lecturing.

CYRIL STANLEY SMITH: I think, of course, that education, at least after the grammar school level practically, is you learn. [00:20:04] You are not taught.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And all a good teacher can do is to get kids into a state where they can learn, and somehow learn—they want to learn, which is the most important thing. In other words, not be satisfied with what you know.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: And of course, a world in which everybody was not being satisfied with what he knew, it would not be a viable society. I think that most people have to do what's expected of them [laughs] in order to be anything other than the most primitive of societies.

ROBERT F. BROWN: Mm-hmm [affirmative]?

CYRIL STANLEY SMITH: Of course it's over and over again, one sees the same thing in the social world that you

also see in science. And the atoms themselves also—you become fond of a certain structure. You develop a nice theory of capitalism, communism, and all the other isms. And to a certain extent, they're right. But they're never wholly right. So if you ever believe any one view, it's wrong. It's never enough. Again, the boundary question.

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: And within the boundary—when there's a curious way in which a boundary, the boundary itself is fairly fixed within the boundary, you can have virtually complete freedom.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: In other words, the right side of the room, and you can move anywhere. It doesn't matter.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Yet, if you remove the boundary, well, what are the limits to movement? There are no limits to movement, so you're in the state of the gas. [00:21:57] I think the recognition, which ultimately becomes the recognition of how long it takes to do something; in other words, time is the very essence of structure.

ROBERT F. BROWN: And in a society, for example, there hasn't been that tolerance of time, is that right?

CYRIL STANLEY SMITH: Well, there've been so many cases where society has become—where the leaders of society somehow get large numbers of people thinking the same way. And then thinking that that way is the only way, so you get the dictates of the various isms, which is being rigidly enforced because that's what a theory says.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Of course, the same thing in science. There wouldn't be any science without theory, and theory is wonderfully useful, provided you know what you're talking about. But you tend to use [laughs] the theory beyond the boundaries, which were established in order to develop a theory in the first place. And the artist—Ernst Gombrich, has had an enormous influence on me.

ROBERT F. BROWN: Did he?

CYRIL STANLEY SMITH: Particularly his sense of order. He boiled it down, really, to the aesthetic experience being a question of the production and the appreciation of the levels of framing. So you're not talking about everything. Filling, so you're getting some individual quality to what's inside the frame. And linking. Framing, filling, linking.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: That goes with societies with their boundaries and atoms, and molecules, and everything else. [00:24:06]

ROBERT F. BROWN: I'm going to say it's there.

CYRIL STANLEY SMITH: And particularly, of course the most intriguing thing about biology is the way in which the cell means so many different things. And the individual cell in relation to others may be like itself, but all of them are producing something, another larger sort of cell, which is—has its own identity, but the identity coming from the intercellular—the reactions on a smaller, intercellular level.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. This Gombrich, did you get to know Gombrich at all?

CYRIL STANLEY SMITH: Yes. I met him during—let's see, it wasn't my first year in London [ph]. Yeah—it's quite a long time ago.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Rupert Hall, the historian of science in Oxford, was—not in Oxford, the Imperial College in London, although he was living in Oxford—he arranged to take Gombrich and me to lunch once and [inaudible] that was where it started. And we hit it off quite well. We haven't corresponded very much, but let's say some of these cases where—it's what our concerns recently, complete meeting of the minds. He really—a meeting of the minds in such a way that it disturbed my mind in a productive way, you see? Disturbing, in a most delightful and distressing at the same time. All of the discovery is what it's all [00:26:00] about.

ROBERT F. BROWN: Yeah. Yeah. You were distressed because there was someone else also thinking along the lines you were?

CYRIL STANLEY SMITH: Oh, no. No, no.

ROBERT F. BROWN: No?

CYRIL STANLEY SMITH: I realized what I had been thinking, you see, but not quite right. I tried to find out—I tried to understand why.

ROBERT F. BROWN: What refined—

CYRIL STANLEY SMITH: I don't mind in the least to find somebody else thinking the same thing. Because if I do find more than three people thinking the same way, I try to leave the field and go into something else. [They laugh.] That's certainly been true in my scientific work. I've never stayed within any one approach for very long. And for several people working in a field, well, that's good, let them go ahead with it.

ROBERT F. BROWN: It ceases to be so interesting to you, then.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: And you—

CYRIL STANLEY SMITH: Yeah. Remember, the main things that I've done on structure, which I had a lot of fun developing, becomes fairly widely accepted in there are enormous numbers of papers on the things, at the time I was, essentially, by myself, just exploring.

ROBERT F. BROWN: What refinements did your meeting with Gombrich cause in your thinking?

CYRIL STANLEY SMITH: Well, it was essentially reinforcing this—well, making a much more of a hierarchy than the details of other internal structures. In other words, the purpose of art.

ROBERT F. BROWN: Mm-hmm. [00:27:54] You, in various essays, repeatedly point out that the study of—for aesthetic purposes, the discoveries of things for aesthetic reasons, have prefigured what has been picked up by technology and theorized over by scientists. And I recall one of the more—some of the more vivid were in studies of 18th century. Metallurgy, and also I think the great attempts to try to imitate Chinese porcelain.

CYRIL STANLEY SMITH: Yes, which is a very interesting—

ROBERT F. BROWN: Very graphic example, isn't it?

CYRIL STANLEY SMITH: —stage [ph] of European both science and industry.

ROBERT F. BROWN: Yeah. This was a very vivid one, wasn't it? How did you become acquainted with European porcelains, and understood some of their intention to try to imitate the Chinese? Is that about the time you began looking at Japanese swords as well?

CYRIL STANLEY SMITH: It was kind of—

ROBERT F. BROWN: Something like that?

CYRIL STANLEY SMITH: —looked at the same time, pretty much.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Going back very much earlier, and of course talking to you has my memory trying to see how—

ROBERT F. BROWN: [Inaudible].

CYRIL STANLEY SMITH: —I realize that when I was about—let's see, when I was about 10, I started in my little home laboratory, and that was a lot of fun, seeing how materials interact. And when I was about 15 and I began to get a little bit interested in as a hobby in fretwork, and I realized that cutting out these patterns, two pieces of wood and joining them together was, I suppose, the beginning of what can very crudely be called an aesthetic experience.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Upstairs, actually, I have a box about so big that I made it at that time. [00:30:03] It was just routine common print work. But it's not a bad-looking thing. Of course, except for this, I don't think I ever made anything which was fit to look at. [Laughs.] Although I played a great deal with all the techniques of metal work, and quite a bit with ceramic glaziers. I've never made anything that I'd conceivably want to put on exhibition anywhere. Which, by the way, brings up another point that's crossed my mind—I did once have appeared in an art—those two are my photographs.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Within that very early collection of photographs, that were shown in New York—I think it was [inaudible] who organized it—and these two, which were coming to the microstructure of carbon silicon alloys which I was worked on a lot. Really rather intriguing. They somehow caught his eye, and they were exposed in an exhibition. The other—of course, as far as the exhibition *From Art to Science*, have you seen that catalog by [inaudible]?

ROBERT F. BROWN: I may have.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Now yes, and you mentioned in one essay, and looking at Mondrian's work, for example—

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: —which I gather—perhaps he arrived at intuitively, or by—he came up with is diagrammatic way of painting exactly parallel certain natural arrangements, or arrangements found in nature.

CYRIL STANLEY SMITH: Yeah. And, I mean, you can't do anything, except produce patterns [00:32:00] which are acceptable to nature [laughs].

ROBERT F. BROWN: Mm-hmm [affirmative]. That is because? That is because otherwise, well—

CYRIL STANLEY SMITH: Well, otherwise what?

ROBERT F. BROWN: Yeah, nothing. [They laugh.]

CYRIL STANLEY SMITH: Of course, the wonderful way in which you form patterns in your mind, with thinking of things that might be based on your past experience of what has been, and then how you can modify what it is to achieve a new pattern, which is far as your concerned is new and interesting. Of course so often, anything you do—thinking is new, has some way of being done before in terms of the smaller elements of it.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Of course, the smallest elements are always reproduced. The larger they get, the less probable they are.

ROBERT F. BROWN: Mm-hmm [affirmative]. But when you did it as a 10-year-old, or so, when you did that fretwork docks [ph] did you proceed mainly out of curiosity and use of the tool and the material you were—

CYRIL STANLEY SMITH: I enjoyed the technique and the materials very much. As far as the designs were concerned, I don't think that it was the tiniest bit original, I simply bought these transfers of designs, stuck those on the wood, and then laboriously went around them. But it is pleasant, simply to follow a line. And of course another thing, which I probably mentioned last time—I spent hours and hours with a Meccano set building things. I think the present trend to just buy a pre-shaped toy, rather than to build it, is very dangerous. [00:33:59] Look, just the other day the *New York Times* reported the ending of the Heathkit company, and I think it's just awful. I mean, the days when kids play and learn something in building them—you're learning something. Now you buy a set. What do you learn, by just pressing keys, rather than building? I think this is what's wrong with the education. I think the education has got to be experienced. Not simply taking things over the existing and just shoving them around. I think a toy shop today is just this disgusting collection of crude, plastic things to shove around, you don't have any sense of the nature of the things that you're doing.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I can't think of anything that points out, really, the trouble that I put into education as the decline of, first something like the Meccano set, and then the Heathkit. But of course, there are always artists who are continuing to do their own experiment. And that's so important. Even if they aren't producing anything to look at; simply interacting with matter is important. Interacting with your whole body, not just your eye.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You can analyze it later, but you've got to have the experience of what you analyze first.

ROBERT F. BROWN: But because so much of society doesn't have that experience anymore, what do you suppose will happen to society? Is it going to become just much more routinized or dulled, or subject to—

CYRIL STANLEY SMITH: I just don't see how this present trend for more mechanization, and more and more, can do anything other than what's happened with everything in the past has got too large. [00:36:02] The whole thing's broken down. I think it's inevitable. The thing that I'm puzzled about is, it seems that almost never in human society are people satisfied with a reasonable size of things, and changing it internally to improve it, or simply to experiment. But not wanting to make it bigger and bigger and bigger. I very much feel that things can be too large, even if they're good. In other words, too much good is bad. On the other hand, too little good is what—[laughs] how to reach the balance?

ROBERT F. BROWN: Yeah.

CYRIL STANLEY SMITH: That's where some dynamics comes in nicely, as they're all meant to be. How big a group things are interacting in a given time. Time. Time.

ROBERT F. BROWN: Mm-hmm [affirmative]. What about our increasing reliance, or seemingly increasing reliance, on new computational devices? The whole computer phenomenon?

CYRIL STANLEY SMITH: I think for doing something you know what you want to do, that's just marvelous. And mechanization can take a great deal of the toil of muscles away from them. But I think if you get to the point where you don't feel what you're doing, it's bad. I think the present somewhat teaching of science is pressing a few buttons and getting a pattern on the screen—you don't have any idea what it's like to put things together and feel them pushing and pulling, and melting and flowing, and doing it easily or not unless you've been in the lab and felt things. [00:38:11]

ROBERT F. BROWN: Mm-hmm [affirmative]. It's simulation now, in many ways.

CYRIL STANLEY SMITH: Yeah. I mean, the computer is just marvelous at doing something we have to be repetitive. Of course, it can also produce all kinds of patterns following an algorithm, like these wonderful things that [inaudible] is doing whether that is for effect or program. But you don't do it when you press the keys on a computer.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: You don't do it. A machine does it. You don't feel it.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I think it's quite dangerous. Everything has its place. I'm not saying I don't enormously admire the computer and what opportunities it's giving us. But I do think that it's one more stage of losing touch with nature.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: There's so many things that we use without totally understanding it. A telephone, for instance. I don't think—a few people may know a little bit about electromagnetism and so on, but the detailed structure, and particularly what goes on the other end of the wire, is something that you can take for granted.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: That's fine if you want to talk to someone on the other end of the world. But the increased communication that's has come mostly from electronics, and also from using physical information. [00:40:08] You're giving us a different world. I still think as far as the individual human being and his enjoyment of being, that's—well, it's changed the environment so much that he's got to develop means of isolating himself. He's got to choose—he's got to choose what to ignore, that's really what it is.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: If you can't choose to ignore, then you're in for trouble. That's the trouble of any political system or theoretical thing. It does the choosing of what to ignore for you.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. The same is true, I suppose, in science, too, if one gets

too fixed on a theory—

CYRIL STANLEY SMITH: Oh, yeah. Yeah.

ROBERT F. BROWN: —or in art, if you're fixed on one style.

CYRIL STANLEY SMITH: Yeah. Of course the first movement away from a theory, or away from a start, is very exciting. It may not express the new possibilities in the most wonderful form. But it's far more exciting, those things, while it's being refined later on.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I had a lot of fun applying my knowledge of materials to archaeological artifacts. Very few people have looked at them, and have looked at the whole object, and they've tried to understand the written mechanism, putting it together to understand history. I was looking at the record that was in the structure of the object, and there were very few people—I wasn't the first by any means to do this—but I think it involved quite deeply—[00:42:06] there were, I suppose, only one or two papers a year on this general field. Now, there's just a plethora of things, all of which are very useful. I no longer read this stuff, it's always more of the same. There's never new—no new vista coming out of it somehow. For doing this, you have to have been in the marketplace, I think, but you also have to have plenty of time completely isolated from it. I'm inclined to the idea of some institutions, probably associated with a university, which is essentially a series of cells for individuals. Enough departments. A department to the [inaudible] you're reading too much. For the outside world, it's essential. For the individual, it is not.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: The individual should exploit the framework, but it shouldn't be limited by it. And curiously, you only have freedoms when you are within four walls, preferably without windows. [They laugh.] Then you're free.

ROBERT F. BROWN: But that gets back to what you said earlier that the incompatibility, perhaps, of research and teaching.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Would your suggestion be to segregate the two, as you just described?

CYRIL STANLEY SMITH: I think everything has to be segregated for a long period, but never forever. It's an oscillation—

ROBERT F. BROWN: There should be a way to come back, yeah.

CYRIL STANLEY SMITH: —between condensation, between contact and non-contact. [00:44:00]

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: It must oscillate, and if things just stay stuck together, well, what the hell? Of course—there's something in nature that's just screaming of the importance of aggregation for a time, and not permanence.

ROBERT F. BROWN: What is that something in nature?

CYRIL STANLEY SMITH: In the beginning, the world, was without form and void, and God—

ROBERT F. BROWN: It was fairly—fairly good image of—

CYRIL STANLEY SMITH: Then eventually, man came, and then woman. [Laughs.] At least somehow they were together. Then theory developed. You've got a wonderful idea of the way things are, so they built a monument to God, Tower of Babel. And God didn't like it [laughs]. But then I think those first few versus in Genesis are just marvelous.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: It's both structure and it's theory, and not too much of any one kind of structure, and not too much of any one kind of theory.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: How do you know when you're within a boundary, or when you're not? You can be, most of the time in society, when you're within national boundaries, you're vaguely aware of it. But you're not limited by it. When you cross—go through the customs barrier, you're aware of something.

ROBERT F. BROWN: [Inaudible.]

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ROBERT F. BROWN: Asking once again about—you were talking about education earlier, and that kids need to learn, not be taught.

CYRIL STANLEY SMITH: Yeah.

ROBERT F. BROWN: Have you ever thought through, or thought about, or discussed with others what kind of structure, therefore, would be the best, or lack of structure, to achieve this? I suppose after the very earliest years, the child learns, is in a learning situation rather than being taught.

CYRIL STANLEY SMITH: Yeah. At some point, again, it's the same bit of discovery in my own case, the discovery, or the meaning of a large, good library, instead of the little library at school, or the purposeful disciplinary libraries in the department. And then a really good library. The Sterling Library at Yale had an enormous effect on me. I went in specifically to learn some special thing, and then found myself just in contact with a little bit about everything. It was a marvelous experience.

ROBERT F. BROWN: Your use of it, your consumption there was not wholly random, was it? Or was it? Was it essential in some cases?

CYRIL STANLEY SMITH: It was. You know you're kind of looking for something.

ROBERT F. BROWN: Yeah?

CYRIL STANLEY SMITH: But if you only see those things that pertain to what you already know you want to know, you won't get that much. These accidental side contacts. I think I mentioned, I began by thinking about the history of my bit of science, what was to be learned by reading the books and papers that have been published. [00:01:59] I soon found after quite thorough immersion in practically everything in the Yale library that pertained to it, I found it all begun long before there was any available record. So this started me on the objects. And the objects—not only was I interested in the theory evident to how they were made, but I also began to feel something about what the shape of them [laughs] meant, and the shape of the ideas of the person who made them. All beautifully interacting. Of course I suppose electrons, they're the only ones who are completely free. [Laughs.]

ROBERT F. BROWN: Mm-hmm [affirmative]. But even in your own earlier specialty, metallurgy, you soon discovered that there was a pre-verbal record, a pre-verbal evidence that—

CYRIL STANLEY SMITH: An enormous one, yes. And that the great skill of people, even before there was significant writing, is just amazing.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Another aspect of this that I found quite intriguing was that by about 2000 BC, the people had already found out the principal kinds of metals and alloys, in the principal kinds of working these things, so that they could shape pretty much what they wanted, and were developing just different shapes to be made with these techniques. Then for some reason I still don't understand, for about almost 3,000 years, there was no fundamental change in the body of techniques or types of materials. In other words, further exploration seemed to have died out. [00:04:01] The engineer and the artist used what materials were already available. And the new period of researching to and discovery of, of new kinds of materials—was a 20th century phenomenon. From 2000 BC to 2000 AD, there was an enormous development in ease of manufacture and the shapes of things made, and the way that is, and the way they permitted all kinds of different social structures. But not much in the understanding of the structure of materials, although there were quite a bit of theoretical thought on the structure of matter; in other words, the extremes, and the atom and astronomy, the cosmos, were of great interest to intellectuals in this period. But the properties of matter, the material, practically disappeared from respectable science. As I probably said during our last interview, I think that the ability of calculating things via the new mathematics in the 17th, 18th century, prevented people from thinking about the nature of things. I think these beautiful curves in Newton in the equations developed are marvelous concepts of the human mind. But they do not relate to the way nature sees it, which is the aggregate of little granular things and their connections. The framing, filling and linking—

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: —on the subatomic level, the atomic level. The 17th century corpuscular philosophers were much nearer to understanding this kind of thing. [00:06:01] And that disappeared from respectable science, all thanks to the marvelous insights of Newton, and the whole development of that time. It just went out on this glorious side road. It was even behind the wheel, going around the real nature of matter, and hence the real nature of cellular matter, and hence all of biology, and all of real structure, and organic materials. Now we're rediscovering the same cellular structure, not only among universes, but among cosmology generally. These same patterns are coming out of things, billions of lightyears away. They're still somehow found [ph] eventually, these cellular patterns, the boundaries of things which somehow seem to hold together in a curious way, so there can be freedom in both inside and outside. So a very thick boundary, getting fuzzier and fuzzier, until you have complete freedom.

ROBERT F. BROWN: Why do you suppose Western thought went down this mathematical path? It was elegant.

CYRIL STANLEY SMITH: Because it was so beautiful in an intellectual sense. There can be intellectual beauty, as well as—I suppose intellectual and aesthetic are the two ways.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Of course, everything practical is somewhere in between. [00:08:00]

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Somewhere in between—some—it's a little bit of both. It isn't it—it is always the connections inside and outside.

ROBERT F. BROWN: Mm-hmm [affirmative]. But I know in the history of art, the predominant emphasis, or at least a sort of a hierarchy of regard, was the fine arts as opposed to what have been called recently the applied arts.

CYRIL STANLEY SMITH: Yeah. Of course, I've been very much intrigued with decorative art essentially, seeing what they were doing. It would depend more intimately on the material and the shapes also, tend to follow the same kind of interlock that you find on the atomic level. The fine artist uses the same thing on another level. It's gorgeous.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Now the feeling that you have in some parts of the world, I think a very rich experience for me was going in the Hagia Sophia in Istanbul—it's an incredible building. It's just in that—what is it—completely beyond analysis because you feel space because you're enclosed. Again, there's this question of freedom within boundaries. But from the other side of it, another somewhat similar experience is Delphi in Greece. Where there's a magic about this whole landscape. That's quite independent of what human beings have done. Also in Japan, Koyasan. [00:10:00] And it does something to you. And you don't know why. And you're perpetually puzzled by it [laughs]. You want to go back and back. The Koyasan experience was very meaningful for me.

ROBERT F. BROWN: Could you describe that a bit?

CYRIL STANLEY SMITH: No.

ROBERT F. BROWN: No. It's ineffable. It's just that—

CYRIL STANLEY SMITH: Perhaps it's magic [laughs]. And of course, there's been so much use by both serious religious teachers and by charlatans, and shame on us all, and how this curious property of magic which can be—the tricks of it can be learned by individuals to manipulate other individuals. And when is that legitimate, creative art, and when is it exploitation? And the advertisers, the awful things that they're doing to us. And they're using the most marvelous properties of matter and mind, using it purely to [inaudible.] I think it's just ghastly. You can't even have a decent program on TV without advertising, because the advertisers want most people to see it, so mostly TV isn't worth seeing. But what can you do about it? You have to let people learn there are some things that are worth avoiding [laughs]. And if you enjoy—if you accept something without too much work, it's not worth accepting. [00:12:00]

ROBERT F. BROWN: Have you ever thought of, or urged others to try to begin transforming some of the lamentable conditions, such as you've just mentioned?

CYRIL STANLEY SMITH: No. Here again, I think people do come in this whole spectrum of attitude to the world.

And some people are more interested in thinking what ought to be done, than in doing it. I'm not an activist.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I was interested, just the other day, I was looking at George Kistiakowsky's diary of his time that he was the science advisor. And he recorded the conversation with me. I just got fed up with all the weapon stuff, the science and bias seemed to be related to. I decided to resign from the community. And in my discussion with Kisti, as he reports, which I vaguely remember, and I said, "We ought to be doing something about the problems of disarmament and how we adjust to it," which, of course, is a very acute problem today. I put it up to him, and he agreed with me. And he said, "Well, do something about it." Did I do anything about it? No. No. Shameful. But I feel incidentally that that discussion perhaps began Kisti's change of heart, because he was essentially—he was all for armament for a time. [00:13:59] Of course, he liked practically all of the early science about it; he just turned strongly against the whole mention of armament policy. I think that my wife's study of the way those scientists who had been working mostly on the bomb during the war began to be activists for reasonable social policy. It's extremely interesting. Of course, that was something, again, where people really tried hard to educate the public, and then did to a considerable extent. But nothing seemed to happen, and most of them sort of dropped out. There's no point in being an activist if you don't produce any action.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: But then eventually it comes back in these waves of virtually anything.

ROBERT F. BROWN: Mm-hmm [affirmative]. You're quite confident of that, that there is this oscillation of every—

CYRIL STANLEY SMITH: There are differences with too little and too much of any perceivable concept of action. And it's the imperceivables which—against which you're doing the conceivable which finally determines what happens. In other words, you can never grasp everything at one time.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: [Inaudible], an atom which wants to do something can do it violently on a local scale. But it can't control what's going to happen even a millisecond later, let alone a hundred years [laughs]. [00:15:58] At what level is there—really, at what level does something which is odd in both the mathematical and social sense find its opposite? Two odd numbers—I mean, odd numbers must always exist in pairs. The other member in the pair may be a million miles away, but nevertheless, if you've got a three here, there's got to be either a one nearby, or a three, or a five, or something.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I mean, the oddness and evenness in mathematics is beautifully echoed in the oddness—the oddness and evenness, the conventional and the unconventional of individuals in society. There's something there. There's nothing there. Which is more important? The artist is playing with this, and he feels it. Scientists are beginning to develop a way of looking at something which—in other words, it's really a question of paying attention to nothing, as well as something, which, of course, is practically Buddhism.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. Is that something you've leapt somewhat into, Buddhism?

CYRIL STANLEY SMITH: Not very deeply. But I've been very profoundly moved by Zen art. I think when it gets into words, it becomes silly.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I think, again, words are wonderfully useful, like the computer. But they really limit thought. It's fine for transmitting something which you know. [00:18:02] But it's a very poor way of transmitting the things which really matter. Again, here's the poet, you see, who uses something with a certain degree of precision, but he uses it imprecisely. Imprecisely, no, it's in a larger scale, it's much more precise. Again, the balancing of arts and arts.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I think the philosopher ought to be dealing with these things. Somehow, present day philosophy, it's become sort of mathematical logic, in a way, which isn't really adding much to understanding, I think. On the other hand, I'm really quite ignorant, and I've read very little philosophy lately.

ROBERT F. BROWN: Do you see in the field of artistic creativity, do you see—well, at one point you mentioned that the science generally mistrusted it, thought it was rather—that it was too dependent on the senses. Do you

see that this is no longer the case? That the—

CYRIL STANLEY SMITH: I think that the great scientists are almost indistinguishable in their [inaudible] of the world, as the great artists. The people who are trained in science mostly are not, again, this is the question of whether you're training or performing [inaudible], which is very useful to society, or whether you're concerned with those things which will change the environment in which to [inaudible]. [00:20:09] And you can't change too rapidly, that's another thing. If you have change which is too rapid, then you're in the state of a gas, and all coherence lost.

ROBERT F. BROWN: As you mentioned, in talking about stylistic change, slight departures are welcome as improvements. But really, original deviants are extinguished or ignored, which is sort of a human social response, analogous to the gaseous state, I guess.

CYRIL STANLEY SMITH: Yeah. Yeah.

ROBERT F. BROWN: Persecution, or ignoring.

CYRIL STANLEY SMITH: Yeah. Of course, the same thing in my beloved metal structures. I think the symbolism of that—

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: —which is the—that's in a low magnification, that is a high magnification. You see these boundaries, which are the boundaries of misfits between these regions which are pretty much the same throughout. But internally, exact order, everybody doing just what they should, all good communists. Here's another good communist of a slightly different orientation—so you get these few things that don't fit either, and then when it gets a little bit greater, it breaks down to this comfortable adjustment between two things which are quite different. [00:22:00] Here, you're getting a dispersed—here's an individual misfit, who doesn't matter.

ROBERT F. BROWN: Mm-hmm [affirmative].

CYRIL STANLEY SMITH: Here, slightly interacting directional misfits, and then here it's changed to a different dimension of misfit.

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative]. And a pattern within itself that is—

CYRIL STANLEY SMITH: It has a pattern within it itself, exactly.

ROBERT F. BROWN: Yeah. Yeah.

CYRIL STANLEY SMITH: But look at it low magnification, and you somehow have these nice lines. Just like a sub-bubble [ph].

ROBERT F. BROWN: Mm-hmm. Mm-hmm [affirmative].

CYRIL STANLEY SMITH: I've spent hours playing with the sub-bubbles [ph]. Weeks spent playing with them. There're most fascinating, the way they change. All those four bubbles meeting at a point. But then you look at it closely, you realize that the point isn't the point.

[END OF AAA_smith92_6997_r]

[END OF INTERVIEW.]