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William V. Cruess

A HALF CENTURY IN FOOD AND WINE TECHNOLOGY

With an Introduction by

Emil M. Mrak

An Interview Conducted by
Ruth Teiser

Berkeley
1967

Portrait of William V. Cruess

Painted by Mrs. Marie Cruess
Unveiled June, 1955
Now in Cruess Hall, University
of California at Davis

FOREWORD

When the Regional Oral History Office asked Dr. Cruess if he would consent to giving an interview, he explained that as a result of having had two strokes, his memory and articulation were imperfect, but that he would try. This he did with determination and courage. In spite of difficulty at times in finding words to express his thoughts, he gave the interview in seven sessions, between October 19 and December 15, 1966. They were held in his office in Hilgard Hall. The interviewer had been acquainted with Dr. Cruess and his work for some years. Dr. Cruess made careful preparations for each session, usually bringing notes. His discussions covered all major aspects of his work and his life, but it was determined in advance that material in his written memoir titled Biographical Data need not be duplicated.

Editing of the transcript by the interviewer was confined mainly to deleting occasional repetitions and taking several sections out of the order of speaking to place them with related subject matter. Dr. Cruess himself then read it carefully, making some corrections and a few additions.

Dr. Cruess has deposited in the Bancroft Library a copy of his autobiographical memoir, Biographical Data. It is the only copy known to exist at this time. He has also deposited a bibliography of his

extensive writings, and he has presented to the University Archives copies of most of his papers.

Ruth Teiser
Interviewer

15 November 1967
Regional Oral History Office
486 The Bancroft Library
University of California at Berkeley

INTRODUCTION

by Emil M. Mrak, Chancellor
University of California
Davis, California

Professor William V. Cruess unquestionably deserves to be called one of the fathers of modern food science and technology. During his early career as a chemist, he applied his talents primarily to the improvement of California wines. When passage of the eighteenth ammendment required him to turn his attention to other areas, Professor Cruess embarked upon a program of intensive research and development that has yielded enormous practical and theoretical results in the field of food preservation and distribution.

Realizing that development of scientific methods to preserve and utilize food products was not keeping pace with advances in food production--with the result that increasingly large surpluses of many commodities were being produced in California--Professor Cruess initiated the establishment of a Department of Fruit Products on the University's Berkeley campus. Originally a subdivision of the Department of Viticulture, though it eventually attained full departmental status, in which there was several major accomplishments in the technology of food preservation.

It was, for example, through the efforts of Professor Cruess and one of his talented co-workers, Arthur W. Christie, that sun-drying of fruits yielded in California, to mechanical dehydration. Naturally, industry came into the picture and developed dehydrators for sale, but Professors Cruess and Christie first set forth the basic principals and specifications that made such developments possible.

Professor Cruess's work in developing new products to utilize surplus commodities also contributed greatly not only to the state's economy, but also to the consumer's delight. Three of his notable accomplishments in this area--all now popular items on grocers' shelves--were fruit cocktail, fruit nectars, and bottled prune juice. Although others (including the present writer) participated in this work, it was Professor Cruess, with his enormous talent, energy, and desire to improve methods of utilizing food products, who almost single-handed, brought about the development of these products.

If these were the sum of Professor Cruess's achievements, one would have ample reason to praise his service to both the food industry and mankind as a whole. But they are not. For when prohibition was repealed, Professor Cruess mobilized his staff and immediately set about helping the California wine industry reestablish itself on a sound basis. As one who was present at the time, I can assure this work was not at all easy. It required the rediscovery of efficient methods of growing and processing grapes and the reeducation of those who managed the industry. Among the problems that demanded solutions were those of what grapes to use and when to harvest them, what chemicals to add to the must, how to prevent bacterial spoilage, and what metals to use or avoid in processing the wine. Professor Cruess's labors in these areas were Herculean, and his achievements contributed greatly to the speedy development of one of the finest wine industries in this world.

I should like to say a word also about the importance of Professor Cruess's contributions to the very foundations of modern food science and technology. When the Food Products Department was first established, the curriculum was essentially practical, lacking both breadth and a firm theoretical foundation. In strengthening the department, Professor Cruess built a staff of young men well-trained in the basic sciences, some of whom also had the practical outlook of the food plant operator. Under his guidance, the curriculum gradually acquired greater breadth and depth; with greater emphasis being placed on the basic disciplines--chemistry, biochemistry, mathematics, engineering--the groundwork was laid for what I term today the full-spectrum program in food science and technology. In brief, Professor Cruess shares with Dean Prescott of MIT the honor of having placed the entire field of food technology, as we know it today, on a firm basis--truly, a great achievement.

Aside from his notable professional accomplishments, Professor Cruess was distinguished by a great dedication to his students. He was a demanding teacher who expected much of his students; but he in turn gave generously to them of his time and interest. He guided them, both professionally and personally, and in some cases even provided financial assistance to enable them to complete their studies. He and his charming wife often entertained his students in their home, inviting as many as fifty or one hundred for barbeques, even dances. And a few of his students were married in his home. The sincere mutual respect and affection between Professor Cruess and his students offers, perhaps, both a lesson and a hope to those who are now concerned about faculty-student relations in the high-speed, impersonal environment of the "multiversity."

Because Professor Cruess's modesty has undoubtedly prevented his mentioning the many honors conferred on him in recognition of his achievements, it seems appropriate that I list a few of them. As I recall, one of the first he received was the Medal of the Legion of Honor, awarded by the French government for his research contributions. In this country, he was one of the first recipients of the Nicholas Appert Award of the Institute of Food Technologists. He was cited by the American Society of Enologists for his work with wines, and by the Olive Technical Conference for his tremendous contribution to the olive industry. The Forty-Niner Award, given annually at the convention of the National Canners Association of America, was conferred on him for outstanding service to the canning industry.

The University of California has not failed to recognize the achievements of one of its most renowned faculty members. Professor Cruess received an honorary Doctor of Law degree at the Davis campus, and the University's first substantial building, devoted entirely to food technology--also at Davis--was named in his honor.

It is difficult to express adequately, in a few words, the extent of Professor Cruess's service to the University to the food industry, to those who have been privileged to know him personally, and to the larger community of mankind. His career has been marked by distinction in all its phases; and his modesty, selflessness, and dedication, as well as his professional brilliance, have won the highest esteem of his students, colleagues, and friends. He is, indeed, a great man.

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TECHNOLOGY, CHEMISTRY AND MICROBIOLOGY OF FRUIT AND VEGETABLE PRODUCTS. b. San Miguel, Calif., Aug. 8, 1886. s. William V. and Lucy (May) C. Edn.: B.S. Univ. of Calif., 1911; Ph.D., Stanford Univ., 1931. Hon. Deg.: LL.D., Univ. of Calif., 1960. m. Marie Gleason, June 4, 1917. Exp.: Asst. in Zymology, Univ. of Calif., 1911-14; Asst. Prof., ibid., 1914-18; Assoc. Prof. of Fruit Products, ibid., 1918-34; Prof., Food Technology, ibid., 1934-55; Prof. of Food Technol., Emeritus, 1955—. Hon. Pos.: Past Chmn., Dept. of Food Technol., Univ. of Calif.; Past Pres., Inst. of Food Technol. Mem.: Am. Chem. Soc.; Soc. Am. Bact.; Inst. of Food Technol.; Inst. Microbiol.; A.A.A.S.; Sigma Xi; Phi Lambda Upsilon; Alpha Zeta; Sigma Phi; Alpha Chi Sigma; Faculty Club. Author: Commercial Fruit and Vegetable Products, 1948, 1957; Principles and Practices of Wine Making, 1948, 1960; Lab. Manual of Fruit and Vegetable Products, 1923; Technol. of Wine Making, 1961. Contbr. to: Food Technol.; Food Rsch.; Industrial and Eng. Chem.; British Food Mfgs.; Food Engrng; Fruit Prod. Jour.; Canning Tr.; Canner-Packer. Awards: Chevalier du Merite Agricole, France; Officer du Merite Agricole; Am. Acad. of Microbiol.; Nicolas Appert Award of Inst. Food Technol.; Babcock-Hart Award, Inst. Food Technol.; Awards of Merit from Dried Fruit Assn. of Calif., Fig Growers Assn., Farm Bur. of Calif., Calif. Olive Assn., and Calif. Raisin Growers. Gen. Int.: Rsch. that has resulted in marked improvements in olive processing, Frozen Foods, and Dehydration and Wine making. Areas of Rsch.: Processing and Preservation of Fruit and Vegetable Products, such as Canning, Freezing, Drying, Juicing, etc.

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STUDENT YEARS
(Interview 1, October 19, 1966)

Teiser: In your autobiographical memoir,* your discussion of your early farm years was so extensive that we will not have to retrace those steps. But I wondered if you were interested in food in a little bit of an abstract way as a child. Were you?

Cruess: I don't think I was any more interested than the average person at that time.

Teiser: I was interested in the diet you described. You mentioned that there was little fruit and there were few vegetables too.

Cruess: We had mostly red beans and bacon or salt pork; we didn't have very much fruit at all. Our place was a dry farm, and our main diet was salt pork and beans, and homemade bread. And once in a while we had doves or quail. We had quite a large place with quite a number of quail and doves.

Teiser: Were you a good student as a youngster?

Cruess: Yes, I think I was a fairly good student. I had good grades.

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* W. V. Cruess, Biographical Data, 1964. A copy of this 48-page typescript has been deposited by Dr. Cruess in The Bancroft Library.

Cruess: The teachers had the spelling bee complex at that time, so two or three times a month we would get together and spell each other down, and I could usually last until the last man or next to the last man. I could spell very well, but I was rather weak on mathematics.

Teiser: You must have had to do some boning up in chemistry then.

Cruess: Yes, I did.

Teiser: Would anyone have been able to tell that you were headed for an academic career?

Cruess: No, I don't know that they would. My father and Eddie O'Neill [Professor Edmond O'Neill], were students together when they were young, and O'Neill kept in touch with him. He said I should take an academic curriculum instead of engineering. I had come with the idea of going into mechanical engineering, but he persuaded me to join the College of Chemistry.

Teiser: Who was Professor O'Neill?

Cruess: Professor O'Neill was dean of the College of Chemistry. He and my dad went to school together until they were about ten years old; then he moved down south. I met Eddie, Professor O'Neill, for the first time after I came to Berkeley, but my father gave me a letter to Professor O'Neill telling him to please look out for us a little bit, which he did. At that time, the College of Chemistry had

Cruess: only six majors in chemistry, whereas now they have seventy-five or more.

Teiser: How many people were on the staff then?

Cruess: Oh, five or six, I guess. There was O'Neill and Morgan and Biddle and Blasdale. I think there were about six or seven besides Professor O'Neill.

Teiser: Can you recall your first impression of the campus?

Cruess: Yes. I had lived in Oakland for about six months before I came to Berkeley. About the only contact I had with the University was to go over and watch the football games. At that time we had five or six buildings that were used by the University, but I saw mostly the football and track and so forth and didn't give much attention to the academic side at that time. But the number of University buildings was fairly small, and practically all of the buildings that they had at that time have been replaced by newer buildings. And instead of having a couple of hundred students in the University --as you know now they don't have room to park for them all--we only had one or two cars on campus as that time, and automobiles were a curiosity. We got around with bicycles mostly, or on foot. Automobiles came later.

Teiser: Did anyone ride horses on the campus?

Cruess: Yes. The President of the University, Benjamin Ide Wheeler. Every morning he would ride to various points around the

Cruess: University and stop and talk to the students and others.

Teiser: But students didn't have horses, did they?

Cruess: No. Students had very much less money, and nearly all of them worked for part of their expenses.

Teiser: I think it's fascinating that you actually lived in the Chemistry Department as a student.

Cruess: In the junior and senior years, we lived in one of the old chemistry buildings.

Teiser: Where was the building located?

Cruess: It has disappeared now, but it was on the northeast side of the campus, very close to where the athletic field is now. The principal building there now is the Faculty Club.

Teiser: You don't mention this in your autobiographical memoir, but you must have been a very good student at the University. Were you?

Cruess: Yes. I was pretty good. I didn't get any honors, but I usually had A's or B's, and I never had any low grades.

Teiser: Did learning come easily, or did you have to study much?

Cruess: It came fairly easily, but I had to study quite a bit to retain it. I apparently didn't have any too good a memory, but I usually got by all right.

Teiser: You started as an assistant before you graduated, did you not?

Cruess: Yes. During the junior year, I had a job with the College

Cruess: of Chemistry setting up material for the lectures and handling the students' papers and so forth. I didn't have anything to do with giving courses or correcting blue books or examination papers. It was mostly setting up for the lectures and taking the roll in a couple of courses. I was known as what they called a lecture assistant. My job was to assist the lecturers set up equipment for the lecture demonstrations, which they gave to us in person.

Teiser: Were you paid for that?

Cruess: Yes. Our pay at that time was not very high. It was twenty-five cents an hour.

Teiser: You must have known how to live on very little.

Cruess: Well, money in those days seemed to go further. A meal downtown, in the evening or at lunchtime, was only twenty-five or thirty cents, whereas now it's one-fifty or a couple of dollars.

Teiser: Where did you eat downtown in those days?

Cruess: In the College of Agriculture we had a room that had enough equipment for breakfast, so we made our own breakfasts, and at lunchtime I went to the club. I belonged to a University house club, La Junta Club. I didn't have enough money to actually live in the club, but I took one meal a day there. Most of my lunches were taken at the La Junta Club. And I went to the dances and other social events that the club

Cruess: had, but I spent the rest of my time at the College of Chemistry.

Teiser: You didn't get your dinner at the club?

Cruess: No. We ate our dinners downtown at a restaurant. At the beginning of each month we bought an eating card, I guess you might call it, and they punched a hole in that for the amount that we ate.

Teiser: Were there some restaurants in Berkeley that catered just to students on that basis?

Cruess: No. I think there were some down near the campus that catered to the University mostly, but most of the eating places were for the general public.

Teiser: I remember when I was in college the inexpensive restaurants were usually Chinese restaurants. Was this one?

Cruess: No, the one I went to was American, run by a white person. But we often took a trip to San Francisco to get a Chinese dinner. We could get almost twice as much Chinese food for the same amount of money.

Teiser: Do you remember the name of the restaurant?

Cruess: No. I know we went upstairs about two or three flights, and we were the only white people there. The man I ate with quite often when we went to San Francisco had a friend or two in Chinese restaurants. He knew them by their first name and so on, and we would chat with them when we had

Cruess: dinner.

Teiser: Was Chinatown then still rebuilding after the earthquake?

Cruess: It was rebuilding at that time, and a lot of it was under construction.

Teiser: Back to the University--you said that your first serious studies in what was to become your field were with Professor [Myer E.] Jaffa?

Cruess: Yes, that's right.

Teiser: What college was he in?

Cruess: He was in the College of Agriculture. His subject was more or less nutrition and pure foods and so forth. He was head of the pure food and drug regulation of that Board of Health.

Teiser: What was that position? Did it carry duties beyond the University?

Cruess: Yes. He gave courses [at the University]. He also had an extension course where he went to various places. His work was mostly with the food value of various products and about digestion and so forth, as well as with food and drug regulation.

Teiser: Did the state have pure foods regulations at that time, as it does now?

Cruess: Yes. They were very much sketchier than they are now; they didn't have so many regulations. Much of Professor Jaffa's time was given to animal feed, such as the nutrition of milk

Cruess: cows. He gave his time more to farm animals than he did to human nutrition.

Teiser: What was he like personally?

Cruess: Well, let's see-- He was a man of medium height. Not much hair on his head. He wore a moustache. And was a good lecturer.

Teiser: Was he a quiet sort of person?

Cruess: He spoke quite easily and was a pleasant, good lecturer, very clear. He had a fine sense of humor. I think during my senior year I took care of his house for him, lived in his home while he and his children went to vacation in Yosemite, I remember, for a month. I watched the house. But luckily we were not molested.

Teiser: Was he the first, or one of the first, to concentrate on nutrition studies?

Cruess: Yes, I think he was. Agnes Fay Morgan, who retired a few years ago, was just starting in his department. He retired several years after I went to work for the University. Agnes Fay Morgan took over the work there and greatly expanded it, and made it a nutrition department.

Teiser: You mention in your memoir Professor George Colby. He is still quite well remembered, is he not?

Cruess: Yes, he is.

Teiser: What sort of man was he?

Cruess: He was rather plump. He had quite a lot of weight. And he liked his wine and beer. One of his jobs was to look after the fermented products, the wine especially, and--oh--once in a while he would drink them. He was a chemist, and he didn't teach any courses, but he had two or three graduate students who worked under him. They didn't have any Ph.D. candidates, but they had quite a few Master's candidates. He was quite an offhand individual and enjoyed rather racy jokes and so forth. He was a good chemist, was a specialist mostly in the field of animal feeding. He was also a specialist in wine and wine chemistry and the making of wine, and worked quite often with Professor [Frederick T.] Bioletti, who was the head of the Department of Viticulture.

Teiser: Professor Bioletti was very important in the development of wine studies, was he not?

Cruess: Yes. He worked with Professor [Eugene W.] Hilgard, who was at that time head of the Department of Agriculture. Both he and Professor Bioletti were interested in wine making and wine chemistry. Bioletti was younger than Hilgard. Hilgard retired about 1910, I think, and Jaffa retired twenty or twenty-five years later.

Teiser: What was Professor Bioletti like as a person?

Cruess: He was a small man; he was a very short person, about five foot four or five. His parents were English. He had quite

Cruess: a bit of an English accent, and he wore a handlebar moustache which was neatly trimmed. He also had quite a lot of interest in foods, that is, the preservation of foods by canning and so forth. That's where I got my first interest in that subject, with him. But his primary interest was in wine making and viticulture.

Teiser: At the time, then, there was more interest in the University in wine and food for human consumption?

Cruess: Yes. There was a lot of interest in enology as it's called--the technology and chemistry of wine making.

Teiser: The study of zymology fed into the study of enology, did it not?

Cruess: Yes. Professor Bioletti had all the courses in wine making, and zymology was one of them. The professor of zymology at that time was Professor Hans Holm. Professor Bioletti took over his course when Professor Holm took a leave of absence for a couple of years. Professor Bioletti had given the course for two or three weeks and then turned it over to me, because I had had the course in zymology and at that time I had just graduated from the University. He gave me the job of giving the lectures in the course in zymology. But we didn't have many students. I think we had three students at that time, and I talked until they got sleepy. It was my first teaching position. It was a

Cruess: course of lectures twice a week and a laboratory course also twice a week. So that was good experience.

Teiser: Was that for one semester?

Cruess: Yes.

Teiser: Did all three of your students pass?

Cruess: Yes, I think they did.

Teiser: So that gave you a good beginning in your teaching career then?

Cruess: Yes.

Teiser: Had you intended before that to make teaching your profession?

Cruess: I had gone to the University with the thought of graduating in mining engineering, but as it turned out I got this part time job with Professor Jaffa in which we set up the courses with laboratory experiments.

TEACHING AND RESEARCH IN THE WINE INDUSTRY

Teiser: From that time on were you going to teach, or was there a possibility that you would work in the wine industry?

Cruess: From the start with Professor Bioletti, it was about half and half. For example, I would try to give a lecture and laboratory course at the University except on Friday, Saturday, Sunday, and Monday. Then I would go back and lecture in the laboratory course for two afternoons. I would take the train to Martinez and under Professor Bioletti's guidance conducted experiments on wine making in a winery. At Martinez another graduate student, R. W. Bettoli, looked after the experiments in wine making at Martinez and came back and worked for three days a week in the laboratory at Berkeley. We conducted the wine making experiments for Professor Bioletti. And Professor Bioletti quite often came up and worked with us and watched what we were doing.

Teiser: At what winery was this?

Cruess: The first experiments were in the Colton Winery. That was in 1911. Professor Bioletti wanted us to carry on some experiments at the Colton Winery on fermentation--on the use of pure yeast and sulphur dioxide. At that time,

Cruess: Professor Hilgard was in the last or the next to the last year of his academic career. The Colton Winery was owned by the former mayor of Martinez. And I think he was a good advocate of using wine. But also he was a very nice sort of fellow.

Then, in 1912, we went to the Swett ranch. At that time I didn't have any courses during the fall semester, so I spent all my time at the Swett ranch during the fermentation season. John Swett had retired. He was the founder of education in California. Frank Swett, his son, and I carried out experiments on fermentation at the Swett Winery.

Teiser: Was this the kind of experimentation that you would have done in the University? was it for research, or was it intended to make better wine for these wineries?

Cruess: It was half and half. Mostly, the experiments that we conducted were applied to wine making. Not very highbrow or scientific. But they resulted in a printed publication about our work. We spent two summers at the Swett place, spending a couple of months each time. Then we went back. John Swett, of course, has long since passed away.

Teiser: What sort of person was he?

Cruess: He was a typical University scientist; he was quite a highbrow investigator. He was a very good teacher.

Cruess: He had a chin beard and was a little bit ferocious looking. He and--let's see, who was the man who did so much work on Yosemite?

Teiser: John Muir?

Cruess: John Muir and John Swett were pals more or less, and quite often I got in on their conversations and listened to their discussions of geology and so on--geological terms especially. They didn't agree on things, so the conversation would be quite spirited.

Teiser: John Muir was not much of a highbrow, was he?

Cruess: No, but he had done a great deal of reading.

Teiser: So he was an equal arguer?

Cruess: Yes. He and Mr. Swett did have some good arguments.

Teiser: Was the Swett Winery a small commercial winery?

Cruess: Yes, it was a commercial winery, not very large. But the Swett Winery had a very good reputation; it was well known for high quality.

Teiser: Were they mainly table wines?

Cruess: Yes, they were table wines entirely. There are two kinds of wines usually. The wines that are fortified with brandy were the sweet wines, port and sherry and so on. They didn't make that kind; they made dry wines.

Teiser: Did they sell under their own label?

Cruess: Yes. They sold them both ways. He made some wine for the

Cruess: larger companies to sell under their label, but most of the wine was labelled with the Swett company's label.

Teiser: Did that winery disappear in the time of Prohibition?

Cruess: Yes. It never was taken up again after that. John Swett had meanwhile died, and Frank Swett, the son, was interested in growing vines for the commercial planters. He was a nurseryman. He gave up the wine making business. When Prohibition came along, he abolished the winery. He had quite a large nursery near Stockton, and he was quite a prominent nurseryman.

Teiser: Mainly grapevines?

Cruess: Yes. Mostly grapevines and walnuts. He had quite a large orchard in which he grew walnuts and pears. Shortly after Prohibition, he became head of the Pear Growers Association.

Teiser: That was a long period for men who were interested in wine making to survive. It was lucky that there were people like you whose memories of wine technology went back to pre-Prohibition days and could bring it up to the thirties.

(Interview 2, October 26, 1966)

Teiser: Could you tell us a little about the other wineries in which you worked as a young man?

Cruess: I spent considerable time in the Dehay Winery. Mr. Dehay was the old barber of Cloverdale. When he retired, he did quite a little work on the growing of grapevines for wine making. His son was a graduate of the farm school at Davis,

Cruess: and he was a pretty good friend of mine. So one of the first things I did after taking the job with the College of Agriculture was to go to his place, the Dehay ranch in Cloverdale, and live there in the house with them for a couple of months. Young Dehay and I carried on various experiments on wine making.

Teiser: Were they making table wines?

Cruess: Yes, they were.

Teiser: What was the nature of your experiments?

Cruess: The experiments there at Cloverdale were on the control of fermentation. Ordinarily, various kinds of yeasts will grow, and some of them are good, and some of them may spoil the wine. We experimented on the control of fermentation, the comparison of various yeasts, and the use of sulphur dioxide to control fermentation.

Near the Dehay place were two other small wineries, and I spent quite a lot of time in them. Actually they were fairly good sized wineries, but they would be called small now. That was in 1912 or 1913. One of them was the Smith winery; it was closed a long time ago.

Teiser: Was the Dehay family an interesting one?

Cruess: Yes. They were from France. Mr. Dehay came from the northern part of France. He made very good wine, and he had a kind of an interesting way of introducing the kids to the

Cruess: use of wine. Instead of giving them a full glass of wine, he gave them a glass mostly of water plus a small amount of wine.

Teiser: Is that the traditional French way?

Cruess: I think it must be. They start them off with a small amount of wine and gradually increase the strength.

Teiser: Had he been a wine maker in France?

Cruess: I don't know whether he was or not. He was primarily a barber, and wine was a side issue with him.

Teiser: I wonder how much French tradition there was in wine making in those years in California.

Cruess: It was talked about very much, but they had not taught wine making very much. In the University's College of Agriculture at Berkeley, Professor Bioletti had two courses--a lecture course on wine making and a laboratory course that went along with the lecture course. But the class was quite small, usually one or two students at the most, because wines were cheap and because of the competition with France and Spain. There wasn't very much future for graduates of the University in wine making. For example, at that time twelve cents or thirteen cents a gallon was the going price, so they couldn't make enough to make it worthwhile.

Teiser: What quality were the ordinary wines here then?

Cruess: The quality varied quite a bit. There was some high-class wine but much that was poor or not very good.

Teiser: Could it be aged at that going price? Could they afford to hold it?

Cruess: They tried to sell the wine quite young. They didn't age it very much in those days.

Teiser: Did any of the wholesale distributors then ever age it themselves?

Cruess: Yes. The big factor in the wine business was the California Wine Association--C. W. A. They had a large wine aging cellar near the bay, and they had several hundred thousand gallons of wine that they would age. The chief chemist and the man who knew the most about wine was Charlie Ash. He was very well versed in wine making. Their plant was near Richmond.

Teiser: Where did a proficient wine chemist get his training in those days?

Cruess: There were several graduates of enology colleges in France who had good training. So in a way it was the French science.

Teiser: Did the California Wine Association at that time buy young wines?

Cruess: Yes. They made wines on a large scale. The California Wine Association had several million gallons of wine each year.

Teiser: Did they have their own vineyards, or did they buy from independent growers?

Cruess: Mostly independent growers. They were not so much in the grape growing business as in the wine making business.

Teiser: Did they age the wines sufficiently to bring them to a higher quality? Was their quality considerably higher than the general level of the market?

Cruess: The market price of wine was quite low at that time, so we couldn't afford to spend much money. But the California Wine Association made what is called a sound wine, a wine that kept well and didn't get sour, because they knew how to handle it.

Teiser: Someone mentioned that in Europe even today you often get a ropy wine but that you never get a California wine that is ropy.

Cruess: I've only seen one or two samples of that kind of wine in California, and I think it is not very common in France.

Teiser: Was it more common before Prohibition? Is it something that has been improved upon, or was it never common here?

Cruess: It never was very common here. The principal wine spoilage organism was the Lactobacillus. The wines when they spoiled, they became lactic sour, but they found a good many years ago that this type of spoilage could be easily prevented by adding a small amount of sulphur

Cruess: dioxide in the process of wine making, and that is a very common practice now.

Teiser: In Europe as well as here?

Cruess: Yes.

Teiser: Was that process first found here?

Cruess: No. It developed first in France.

Teiser: Where had Professor Bioletti gained his experience and knowledge of wine making?

Cruess: His training came from France through Professor Hilgard and others. That is, Professor Bioletti graduated from the University of California. He came over to California from England quite young. He graduated from the University and got a job with Professor Hilgard on the chemistry and manufacture of wine, and he became quite well known as a specialist here. So the training that he got was from Professor Hilgard and from the French enologists. He learned a great deal with Professor Hilgard. I think soon after graduation from the University he took a job with Professor Hilgard. And Hilgard had studied in Germany and France and came to America quite young. So in a way Professor Bioletti was trained in the French methods by second hand so to speak.

There were famous wine men, of course, in California who had training in France. One of them was ...Pacottet... It's a peculiarity of this stroke business that what you used

Cruess: to know on the tip of your tongue escapes you. You are not able to remember it.

Teiser: I wanted to ask you a little more about Bettoli.

Cruess: Bettoli, who worked with me on the experiments at the Swett Winery and the Martinez winery [the Colton Winery] was a graduate classmate of mine. He graduated from Ag Chem [Agricultural Chemistry] at the same time I did, and he went to work for a winery which later became the Italian Swiss Colony. But he started out after graduation with a smaller winery in the Napa Valley. He became a very good wine maker; he had a good reputation. He died about twenty-five years ago. His name was R. W. Bettoli.

THE CALIFORNIA WINE INDUSTRY DURING PROHIBITION

Teiser: What did he do during Prohibition?

Cruess: For a few years, he and the Italian Swiss Colony attempted to make and sell concentrated grape juice for making wine in the home. Although it was successful from the scientific standpoint, the demand for grape juice for wine making was not very large. Bettoli died soon after Prohibition went into effect. He married and had a son, whom I used to see quite often but whom I haven't seen for the past twenty-five years or so. The son is a graduate of the University of California in mechanical engineering.

The Italian Swiss Colony tried to make a concentrated grape juice known as "concentrate" that would keep, but demand was limited. It turned solid and was very difficult to get back into solution. If they did not concentrate to that point, the concentrate would be apt to get infected with yeast and spoil. It was quite a problem just to concentrate the juice to the optimum point. So making this concentrate for wine making for household use and for commercial use kept the Italian Swiss Colony going. They made enough to keep in business but not enough to make much money. That never became a very popular method of using the grapes. But it

Cruess: saved the vineyards; they kept in business and had the grapes when Prohibition was killed.

Teiser: They continued growing and concentrate production throughout Prohibition, then?

Cruess: Yes, they did.

Teiser: Were there many wineries that were able to keep up any continuous operation like that?

Cruess: Yes, there were quite a few. There was quite a big demand for grapes to make homemade wine and for concentrate of the grape juice for the same purpose. But the biggest demand was for the grapes. I think a person would get a license to make two hundred gallons without tax. He had to declare it and have the Prohibition department accept him to make sure that he wasn't a bootlegger. Of course many of them probably were. So the Italian Swiss Colony kept in business in that way. Other large producers were the California Wine Association of San Francisco, the Italian Vineyard Company, Guasti, California, and the Italian Swiss Colony of Asti, California.

Teiser: Besides a little business, it must have taken a little

Teiser: faith and a fair amount of capital to continue.

Cruess: Yes, it did. One of the main points of success I think was in having contact with the right people in government, that is, [to persuade them] not to clamp down too tightly on home wine making.

Teiser: Were most of the home wine makers Italian?

Cruess: Yes, they were.

Teiser: Knowing Italian buyers must have been important.

Cruess: Yes, that's right. Quite a large number of Italians went into the business. You had to get a man who was selling grapes, and he would make your two hundred gallons of wine for you at a reasonable price, and that was quite a flourishing business. Italians were principally involved in it, because Americans wouldn't wait to age wine and so forth, and go to the trouble of crushing and pressing the grapes. They would get hold of hooch of some kind, most of it bootleg wine, bootleg whiskey, and alleged whiskey. The main trouble was taking precautions to see that the whiskey was not made with wood alcohol. A fair amount of wood alcohol was used. The food and drug people tried to prevent that, of course. There wasn't so very much of the wood alcohol used, because it is apt to kill or blind the user. It was not extremely common. But much of the liquor made at that time was very young, of course, and very powerful, and not

Cruess: very good.

Teiser: Did some of the wineries make wine for church use?

Cruess: Yes. A famous winery at Livermore made quite a lot of wine for the church. It was the Concannon winery, and it still is in business.

Teiser: Aren't most sacramental wines sweet and fortified?

Cruess: It depends. There is more sweet wine than table wine, but there are both. There is one man who is very famous for his sacramental wines. I knew him very well, and he died just about two years ago. His sons were graduates of Notre Dame. He was American. He fought in the Spanish American War, and his name was Joseph Concannon.

Teiser: Were the large wineries able to make the two hundred gallon quotas for people, or did that have to be individual enterprise?

Cruess: They'd usually sell the concentrate or the grape syrup, which they would deliver to you in the barrel. The man who made the wine was near the man he was making it for.

Teiser: Was there an attempt to market more table grapes?

Cruess: They were mostly wine grapes, not suitable for the table. The Italians wanted a red wine usually, and the red wine grapes are not suitable for table use.

Teiser: Are they suitable for raisins?

Cruess: They are not very suitable for raisins. One of our

Cruess: experiments after Prohibition was to study the concentration of grape juice to be used supposedly in making grape juice. The real purpose for all of this was to make wine. A large amount of wine was spoiled from inexperience because often it was made by someone who had not made wine before.

Teiser: Was Cresta Blanca an old winery?

Cruess: That was started by a graduate of the University, 'way back. His brother was a famous wine specialist, enologist, a graduate of the University. There were two brothers, Charles and Clarence Wetmore; both were graduates of the University. Three of these [Livermore Valley] wineries were quite famous at that time and sold quite a few grapes and grape juice for wine making.

Teiser: Did Cresta Blanca operate that way through Prohibition?

Cruess: Yes. They made pasteurized grape juice.

Teiser: Is that just for table grape juice use?

Cruess: Yes. Most of their grapes were sold fresh in twenty-five pound and fifty pound boxes for making homemade wine.

Teiser: Did you make wine at home during Prohibition?

Cruess: No, I didn't. I made only small amounts for experimenting. However, I was well supplied by a friend who made two hundred gallons for family use.

Teiser: Was the Wente Brothers winery started before Prohibition too?

Cruess: Yes.

Teiser: Did it survive in a similar fashion?

Cruess: Yes. They went through the Prohibition period selling fresh grapes principally. Soon after Prohibition went into effect, there was a very lively demand for fresh grapes for making wine. Wente shipped quite a few that went into wine making.

Teiser: Then you must have had to shift your career when Prohibition came along.

THE FIELD OF FOOD TECHNOLOGY BEGINS

Cruess: Yes.

As Prohibition was coming on, I went into other work. I started a course in the preservation of fruits for making various nonfermented products. I studied also the production of canned fruit. That's how the food technology work was started.

Teiser: That perhaps was the one good result of Prohibition.

Cruess: Yes. So far as we're concerned. Out of that has come the large building at Davis for the study of unfermented food products--fruit and vegetable products--like preservation by freezing and canning.

Teiser: Were there at that time other food technology courses given in the United States?

Cruess: Well, there was some work at the University of Oregon. That is, at the College of Agriculture in Corvallis. When Prohibition went into effect, they built up their research on various products like loganberry juice canning and so forth. Their work and ours were more or less simultaneous. One professor of horticulture worked on experiments with loganberry juice. He and I started at about the same time. His name was Professor C. I. Lewis and was succeeded by Professor

Cruess: E. H. Wiegand.

Teiser: Were your teaching efforts and your research efforts similar at that time? Both in the same field?

Cruess: Yes. The first work that I did at the University was mostly in wine making. After Prohibition it was entirely on unfermented products.

Teiser: What were some of those researches?

Cruess: I think the earliest work was on unfermented grape juice. I worked more with the liquid products.

Teiser: Did you do some work in that period on dehydration?

Cruess: Yes, we did. One thing that happened--there were people who bore the expense for the investigation of various uses of fruit or grapes--unfermented products. And shortly after Prohibition, the University was given funds for research on the dehydration of fruit at Davis and carry on experiments there on the making and utilization of dried wine grapes. That is why the study of dehydration and sun-drying of grapes got started. That is how we started on the concentration of juices and dehydration and the making of other products from wine grapes. So for two or three years we spent most of our time at Davis during the grape season. I remember I had a course in co-operation with Professor Christie. A. W. Christie and I oscillated between Berkeley and Davis. I would spend two or three days down here on research on the

Cruess: production of grape concentrate and dried grapes. Then I would go back, and Christie would carry on for two or three days. Professor A. W. Christie later went with the Walnut Association for a number of years. In fact he worked for them long enough to reach retirement. He did more than any other man on the drying of walnuts. Completely revolutionized the method of drying.

Teiser: In those years, how long did it take you to get back and forth between Berkeley and Davis?

Cruess: We went by train. I think it was a little over an hour.

Teiser: How did you get from the station to the campus at Davis?

Cruess: We'd usually walk out. Or if somebody were going through with a car, we would get a ride. Sometimes it was not a car but a horse and buggy. In those days the use of autos was more or less just beginning.

Teiser: I suppose no faculty member was wealthy enough to own one.

Cruess: Oh, by 1918 to 1920 quite a few of the faculty owned automobiles.

EXPERIMENTS ON FLOR SHERRY
(Interview 3, November 2, 1966)

Cruess: We might discuss the experiments on flor sherry.

Teiser: Did the flor sherry experiments come out of some visits you made to Spain?

Cruess: They were started before I made the trip to Spain. To tell the truth we meant to visit Spain at that time, but the war was still going on. The Civil War was still operating when we made our last visits, so we didn't get to observe the Spanish method of making sherry in actual visits. But we got the information from several of the Spanish investigators who came to Paris. There was one man in France who did want to work by the Spanish method; another was in South Africa. So the flor yeast, the yeast that is necessary for developing the Spanish type of sherry, we had not perfected the method of growing under California conditions. There are flor yeasts naturally occurring on Spanish vines, but in California, until twenty or twenty-five years ago, there was no flor sherry present except some that may have been brought in. In other words, the Spanish type flor sherry yeast did not occur in California. It did occur in South Africa and Spain, of course. So the major problem with flor sherry was to get it

Cruess: to grow under California conditions and to develop the flavor that we desired.

Teiser: What was the method that California sherry makers had been using then?

Cruess: There was no attempt at that time to make a flor sherry that was the Spanish type sherry. We merely fortified, that is, we added alcohol sufficient to keep the product. They made a sweet wine without growing the flor yeast, so the flavor of the American sherry was more or less neutral. It didn't have the flavor of Spanish sherry.

Teiser: Was there any other place in the world where they made sherry without flor, or was this an American development?

Cruess: Without the flor they made a type of fortified sherry in France, and in California we just fortified it.

Teiser: Was flor desirable because it gave the sherry a better flavor?

Cruess: Yes, I think that's the reason for it. It's quite a complicated process to develop the flavor. It takes at least two years. But in Spain the flor sherry may be in the operation of being made over a period of twenty-five years. Each flor sherry is made up of one to maybe fifty different wines. A wine that is to be made into flor sherry may be kept for ten to twenty years or longer. So they put in one gallon of new wine, and blend it in with fifty gallons of partially

Cruess: aged wine and flor yeast, and age it under flor. In the process they get one hundred gallons of flor wine.

Teiser: So it is always being added to?

Cruess: Yes, it is always being added to but not in large amounts. The sherry is made in one hundred fifty gallon barrels, and each solera may have fifty or more barrels.

Teiser: It's a complicated system, isn't it?

Cruess: Yes.

Teiser: Is this what they call the solera system?

Cruess: A solera may contain a thousand or more barrels.

Teiser: There is a good explanation of the process in the bulletin that you wrote on the flor sherry process, Bulletin 710, dated 1948.* Had you by then developed a whole system that had been put into use here?

Cruess: Yes. There were fifteen different wineries that were using this process experimentally, more or less under our direction. Some of them continued for quite a while to make flor-type sherry, and some just used the process for two or three years to find out how it worked. And they discontinued the experiments after a short time. Some of them were wineries

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*See Cruess, W. V., Investigations of the Flor Sherry Process, Bulletin 710, October, 1948, College of Agriculture, University of California, Berkeley; 40 pp.

Cruess: that made only unfortified wines, whereas all sherry has to be either fortified by adding brandy or it has to develop naturally by the flor process. It's all under the government supervision; it has to be done just so. The wines that we made experimentally were held for just one or two years to see how they worked.

Teiser: Some of the wineries continued making them though?

Cruess: Yes. Almaden has a flor sherry, also the [Louis M.] Martini wine company. We had one at Italian Swiss [Colony]. The enology laboratory at Davis developed a shorter process in the course of their research. By the shorter process, they could make wine similar to the Spanish flor wine, but it is not as flavorful. Apparently the flor process has to be employed to get the maximum flavor. The shorter California process, two years or so, gives the wine somewhat of a flor character, but not equal. Whenever you shorten the process greatly, as you do with the short bulk method of making sherry, you have less flavor.

Teiser: It is a bulk method?

Cruess: Yes. Instead of using the small barrels, fifty to sixty gallons, we can make sherry in bulk, in a tank of two thousand to ten thousand gallons. Although you can produce the film in this process, the flavor is not equal to the Spanish flor process.

Teiser: Do they get a film over the top of the whole tank?

Cruess: Yes. Cresta Blanca was one of the places where they were using the bulk process for Spanish flor. The bulk process didn't use film , and the flor flavor did not develop fully.

Teiser: This is basically a problem of economics, isn't it?

Cruess: Yes. I think that only Louis Martini and Almaden are using the flor process now commercially. They are using the old flor process. In Almaden they have a large number of barrels under the flor process. In fact they have old, used barrels that some of the others had been using experimentally. That is, some of the large companies could sell ordinary sherry at a profit, but when they tried to make the Spanish flor type of sherry, it was too costly, and they couldn't be bothered.

Teiser: How long did it take you to work out the system in your experimentation?

Cruess: All we did was adapt the Spanish process to California conditions. We didn't develop anything very new. A new method of making Spanish type sherry was developed by the Department of Viticulture and Enology at Davis. The way in which it was done was to pump air through the tank of wine, and keep it closed, and the oxygen, instead of being taken by a film and then from the film to the wine--the wine was aged with air under pressure. Instead of getting the oxygen

Cruess: from the film growing on the surface, it was obtained by aging the wine in a closed system. It was a bulk process, and it gave the wine more or less a Spanish type flor [flavor] within thirty days instead of taking three years or longer. But although it gave somewhat of a flor wine taste, it was not perfect. It was good enough to be used in big wineries.

Teiser: Is Cresta Blanca using the bulk flor process now?

Cruess: Yes, I believe they are.

Teiser: I remember that the California Wine Association was making some, very small quantities, and was blending it with their other sherries. Is that correct?

Cruess: Yes. It had some flor sherry.

Teiser: I think you're being very modest. I want to put on the record that the credit for bringing the flor process to California is yours. Is that a correct statement?

Cruess: Yes. I think that is correct, although it was coming at the time, and it would have come without me. Our work hastened it, however. *

* See also p. 54.

OLIVE RESEARCHES

Teiser: There have been a number of instances in which you have studied European processes for food technology and preservation too and adapted them to California uses, have you not?

Cruess: Yes, I think we have.

Teiser: I mean you personally. Didn't you bring a good deal of information to our olive industry by drawing on European technology?

Cruess: I did a lot of work on the Spanish process of making Spanish type pickled olives--green olives. We did quite a lot of work on making green olives, shortened the process, and got it under control. But it's so much less expensive to grow olives in Spain and to make pickled olives from such fruit that California cannot grow and make that type of pickled olives on a large scale and make it pay. So for the Spanish-type green olives we use the small fruit and fruit that is not quite good enough to be pickled for canning. It's largely a matter of size. Lindsay Ripe Olive Company is the largest maker of Spanish-type green olives [in California], although one of the companies south of Lindsay, Early California Foods, is using the process. The Glick Olive Company and the Smith

Cruess: Olive Company are using the process quite successfully.

Teiser: Does this give them a use for their undersized olives that they didn't have before?

Cruess: Yes. It gives an outlet for the smaller olives that are not quite large enough for canning.

Teiser: So that much of the process has survived?

Cruess: Yes, it has. Lindsay, Glick, Smith, and Early California Foods all use the process.

Teiser: You have done a great deal of work with the olive industry early to late, have you not?

Cruess: Yes. I first became interested back in 1914 or 1915 and have been working on it ever since. So my two main lines of investigation and experimentation are olives and wine, although a large amount of my time had been given to other things, like the canning of fruits and dehydration.

Teiser: What other lines of investigation did you carry on with olives?

Cruess: One thing that happened to the olives was botulinus. Many years ago, the industry was almost wiped out, because in three different occasions the olives spoiled, and the people who used them didn't realize that the spoiling might develop a poison.

Teiser: That must have been hard to live down.

Cruess: Yes. So for a while the ripe olive industry was at a

Cruess: standstill practically.

Teiser: Botulinus affected only black olives?

Cruess: Yes. It is caused by the growth of an organism that can't grow if there is very much acid, so anything that is sour never develops botulinus. And the California ripe olives, of course, had been treated with lye during the pickling process, and that destroyed any acid. So there was no acid to hold the organism in check. They used the temperature of boiling water for sterilizing canned olives, and it takes a very much higher temperature of 240° F., which was necessary to sterilize ripe olives. Some softening occurs, and very important changes in flavor. Olives that are pickled by the California process and heated to a high enough temperature to prevent the growth of botulinus change in flavor and soften. So we had to modify the process so that the olives that were canned would be free of surplus lye action and could be sterilized without softening too much or changing in flavor. Our part in the process was merely to modify the canning process so that the olives would not change too much in flavor under the higher temperature used.

Teiser: You published a bulletin on that, did you not?

Cruess: Yes.*

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* Bacterial decomposition of olives during pickling. With E.H. Guthier. Berkeley: University of California, 1923. Bulletin No. 337.

Teiser: What was the period in which you worked on the olives in this particular experiment?

Cruess: I think it was around 1920.

Teiser: You continued working with olives after you solved that one, did you not?

Cruess: Yes. I've given more attention to olives than to any other fruit, and I'm still working on them although last year and this year I did not and will not do very much work on the olive. Back in 1933 and 1934 we worked with the California Olive Association, and they established a big meeting that is held once a year. They have been meeting for the last forty-five years. Everything that has been done on research into the canning of olives was reported to the olive industry at those annual meetings.

Teiser: They have had a closer organization than most growers.

Cruess: Yes, they have.

Teiser: What other types of research did you do on olives?

Cruess: Oh, I'd have to have the old publications to discuss that; but at least one per year for the last forty-five years.

Teiser: All of your work is published, is it not?

Cruess: Yes.

Teiser: Ten or fifteen years ago you gave us some little cans of experimental olive products. You were working on ways of using excess or undergrade olives by mixing them with other

Teiser: things, I believe. Is that correct?

Cruess: That was a ground up mixture of olives and greens, called olive relish.

Teiser: It was good.

Cruess: Several companies are making that type of product--chopped, canned olives. They use olives that are not quite good enough to be canned whole but can be canned chopped up or ground or minced. Probably twenty per cent of the olives do not have the natural flavor and may be soft in texture but are good for making chopped or ground up olives, known as chopped olives.

Teiser: Who had the idea of marketing chopped olives?

Cruess: Oh, I think the Bell Olive Company started it first.

Teiser: Then the idea for that product didn't come from the University?

Cruess: No, I don't think so.

Teiser: Did you work on ways of handling the product here?

Cruess: Yes, we have, but it was largely a commercial development.

Teiser: Were the sliced olives commercially inspired?

Cruess: No, I think we were the first to suggest that kind of product. One of our graduates was in the olive business. He has since died--four or five years ago. His name was Richard Ball. He worked for the Pacific Olive Company, and he did quite a bit of development work on canning sliced olives. They have

Cruess: never taken on and become popular. The Pacific Olive Company, I think, still cans them, but the demand is not very great. The price has to be fairly high to cover the cost of pickling and canning, and apparently the people won't pay enough for such a product to make it worthwhile. The chopped olives can be used in much the same way as the sliced and can be made and canned much more cheaply.

Teiser: I don't know how much nutritional value there is in chopped olives, but there is a lot of flavor for a small amount of money.

Cruess: Yes, that's it.

Teiser: Is there much nutritional value in ripe olives?

Cruess: No, not very much. The oil content is the main nutritional value, because everything else is leached out in the pickling process. The flavor is largely due to the adding of salt, and of course salt is a very low priced product.

Teiser: Is much oil retained in the canned product?

Cruess: Yes, the oil is all retained. Green olives have, oh, ten per cent, whereas the olives that are used for the ripe process--the Mission olives--have twenty per cent oil. The chopped olives are made from two varieties that are quite rich in oil--the Mission olive and the Manzanillo olive.

Teiser: Is the Manzanillo the one that is also used here for green olives?

Cruess: Yes, it is used for green olives. It's smaller in size than the Sevillano. Sevillano has about fourteen per cent oil, and it's in demand for whole green olives or pitted green olives.

Teiser: Pitting is one of the great revolutions in the industry here, isn't it?

Cruess: Yes. The pitting was developed very largely by the Lindsay Ripe Olive Company. They were the ones, I think, who were the first to produce it commercially.

Teiser: Did you do some work on different flavors for olives?

Cruess: Yes. We tried various additions of ingredients, to the chopped olives especially, and also to the green olives, but it is not used very extensively because of the cost and returns.

PUBLICATIONS AND FOOD INDUSTRY ASSOCIATIONS

(Interview 4, November 9, 1966)

Cruess: I thought I would just call attention to some of my old publications. This book is the first of this series that I wrote.

Teiser: These are all different editions of Commercial Fruit and Vegetable Products?

Cruess: Yes, the fourth edition is the latest edition.

Teiser: The first was published in 1924?

Cruess: Yes.

Teiser: I always wondered what sort of work went into such a great compilation of material.

Cruess: I think it grew to considerable size due to the fact that we used it in teaching, that is, in the course I gave in the University. It was a lecture course on fruit and vegetable products, that is, the canning and drying and so forth. Each chapter was more or less a lecture, or two or three lectures in some cases. The information in this book was in my lectures, so the first edition didn't contain many illustrations and was quite short. In the fourth edition we put in even more illustrations.

Teiser: Did you rewrite it each of these times?

Cruess: Yes.

Teiser: The fourth edition was published in 1958.

Cruess: In the fourth edition, we rewrote it. The company wanted the size cut down because it was too long, so I think we abolished four chapters in making up the fourth edition.

Teiser: Are you using the editorial <u>we</u> now? This is <u>your</u> book, is it not?

Cruess: Yes. And here is the entire Olive Association history [a stack of publications]. It began in 1922.

Teiser: It says <u>Proceedings of the Olive Processors Conference</u>.

Cruess: The proceedings are published every year.

Teiser: From 1922 on?

Cruess: Yes.

Teiser: The 1922 copy is small compared to the others, isn't it?

Cruess: Yes. It contains a list of papers.

Teiser: I suppose you have given papers at almost every one of the conferences.

Cruess: Yes, I did.

Teiser: Every one?

Cruess: Yes, every one. Except that during the war the meetings were discontinued, although we did get together our papers and compile them in the <u>Proceedings</u> despite the fact that we didn't hold the meetings.

Teiser: Were olives shipped overseas to the troops? Were they a Quartermaster General interest?

Cruess: I think they didn't make olives a special item, but they were included in overseas shipments to the troops.

Teiser: Have the papers you have done on olives been in direct response to industry demand and need, or have you done some pure research too?

Cruess: Most of the research has been in response to demands for solving of problems, but some of them were done just for the fun of it.

Teiser: The "fun of it," is that what you call pure research?

Cruess: Yes. Each one of these [Olive Association] papers is by various people. In most cases they are members of the Olive Association and are commercial men, but in some cases they are from the U. S. Department of Agriculture, the University, or the National Canners Association, that is, non-industry people.

Teiser: It's a remarkable organization of growers and processors, isn't it?

Cruess: Yes, it is fairly unique. I don't know of any other single industry that has been so faithful as we have been in getting up proceedings and so forth.

Teiser: And meeting on technical problems?

Cruess: Yes. The National Canners Association is, of course, nation-wide, and they cover a wider ground than we do. They have been going for many years now.

Teiser: You have given papers many times at meetings of the National Canners Association, have you not?

Cruess: Not so many times, but I have several times. It costs quite a bit of money, and in those early days we didn't have money to travel, and it was too heavy an expense for me at first.

Teiser: Weren't you given an award by the national Institute of Food Technologists? You have been given so many awards that I can't keep them all straight.

Cruess: Yes. They gave me one several years ago. I have not attended their meetings very often because it was too expensive.

Teiser: You have been quite close to the California Canners League, have you not?

Cruess: Yes. I have gone to most of their meetings since about 1913, but the last two or three years I have not attended. The University doesn't participate in all their meetings. Once a year they have a meeting of the Canners League of California, but usually most of the papers are either by members of the National Canners Association research staff or by industry people. We attend mostly for the information that we get.

Teiser: Mostly to listen?

Cruess: Yes, and to keep acquainted with men in the industry and to pick up some "three star" and so forth.

Teiser: [Laughter] They have good cocktails there. When you first knew the Canners' Association, was it a small organization?

Cruess: Yes, it was small in those days. They had a national office in Washington and not a very large research staff. Way back in 1910 to 1915, they developed a technical staff. In the last twenty-five years they have built up quite a research staff in Washington D. C., Seattle, and in California.

Teiser: This is the National Canners Association?

Cruess: Yes, the N. C. A.

Teiser: The California state association has had a fairly continuous history too, has it not?

Cruess: In that case, the organization has been broken up according to the composition of the people in the industry. It is not a single organization like the National Canners.

Teiser: Who sponsors the yearly cuttings?

Cruess: That is done by the National Canners and also largely by the local associations. There is another association in addition to the National Canners: the Institute of Food Technologists, which is independent of the commercial canners. It is related to all of the industries which come under food legislation. It is independent of the National Canners and independent of the Olive Association and so on, but they have quite a wide ground to cover.

Teiser: You have been active in the I. F. T. for many years, have

Teiser: you not?

Cruess: I have been quite active in it.

Teiser: Weren't you the recipient of their highest award, the Nicholas Appert award?

Cruess: Yes, I had three or four awards from them.

Teiser: I'm looking at the item from <u>Leaders in American Science</u>, the fifth edition, the biographical entry on you. It says that you also recieved an award of merit form the Dried Fruit Association of California. Was that for a particular effort?

Cruess: For many years we carried on research on the dehydration and sun drying of fruits, and we have participated for about the last forty years in their annual meetings. Sometimes we gave papers and sometimes we just attended.

Teiser: Did you do extensive work with raisins?

Cruess: Yes. During the period of Prohibition, the drying of fruits was our major field of research. We built a dehydrator at Davis, and Professor Arthur Christie and I gave much of our time to building and equipping it and using the dehydrator at Davis experimentally. Christie joined us--in the department--and was in charge of the dehydrator. This led to an appointment for him with the Walnut Association. He left to join the Walnut Growers more than twenty-five years ago and became a key man with them. He retired about two years ago. He and I worked together within the University on dehydration. That preceded our work on wine.

One of first judgings at California State Fair
at Sacramento about 1936
Standing, left to right: Louis Wetmore, in charge of orchards in San Joaquin Valley for Libby, McNeill, and Libby; Maynard A. Joslyn, Assistant Professor at Berkeley; William V. Cruess, Professor at Berkeley; Maynard A. Amerine, Instructor at Davis. Seated, left to right: George L. Marsh, Associate at Berkeley; Albert J. Winkler, Professor at Davis.

WORK WITH WINE FOLLOWING REPEAL

Cruess: The wine making wasn't anything that I had planned to take up again. I started with wine research way back in 1911 and through 1918 spent most of my research time on wine making. Then when the fermentation industries were revived after the repeal of Prohibition, there was a tremendous amount of work that had to be done to teach and show the wine people how to make wine without losing it. The first year or two they made a lot of vinegar instead of wine. [Laughter] With the development of the fermentation work at Davis, I gradually moved out of wine research and haven't done much of it in the last ten years or so.

Teiser: It was my impression that your work with the wine industry just after Repeal was a very important factor in re-establishing it on a quality basis.

Cruess: Yes, I think it was. There were several graduate students at that time, and we used them to carry on wine research. We didn't have very much money, and they had to spend about half their time on graduate research for higher degrees. Two of them got Doctor's degrees--Dr. Mrak and Dr. Joslyn. They started as graduate students, and we didn't have enough money to get them appointed to better positions, but it was hard

Cruess: times, and they were willing to work without very much pay.

Teiser: Part of the work was research and part of it was carrying results of the research and earlier knowledge to the wine growers, was it not?

Cruess: Yes. As for as wine making was concerned, all of us spent a great deal of our time visiting the various wineries and holding wine meetings and so on to educate the wine makers.

Teiser: Did you go to them, or did they come to you?

Cruess: It was a little of both, but mostly we went to them and held meetings. We would present several papers in a one-day meeting. We had meetings in both Napa and Sonoma several times. And we went down to Southern California on several occasions, since there were big wineries around San Bernardino and mainly around Cucamonga. They were usually the big wineries that knew pretty well how to make wine, because they had been making and experimenting with grapes and wine as much as they could during Prohibition. Quite a lot of wine went to the Catholic missions and churches.

Teiser: I guess we owe a great debt to the church, don't we?

Cruess: Yes, I guess we do, which is a hard thing for a Presbyterian to say. [Laughter]

Teiser: Concerning the Southern California wine makers--I've always been curious to know whether it is the conditions in Southern California or their techniques that make their wine presumably

Teiser: less fine than the best of northern California wines.

Cruess: I think it is the high temperature of the hot summers which make for quantity but not quality. Most of their wine is low in acid. They have too high a temperature to grow wines of high table wine quality.

Teiser: Were there a few men who stood out as leaders in the revival of the industry after Repeal?

Cruess: Yes. There were a few, like Louis M. Martini, Frank Swett, Arthur Lachman, Charles Wetmore, and Colonel A. Haraszthy. E. M. Sheehan was in charge of promoting the wine industry. He was head of the State Viticulture Commissioners N. V. C.

Teiser: Were there some young men who suddenly got excited about the wine industry in that period?

Cruess: Yes, I think there were quite a few.

Teiser: Were they the young men who came to Davis to take courses?

Cruess: Several of them were. Several of them also were entirely new to the wine industry. During that period they were not very prosperous, and there were not very many jobs in the wine industry.

Teiser: Did some of the wine makers actually come to the University to take courses just after Repeal?

Cruess: Yes. During the first two or three years we had extension courses on wine making both here and at some of the wine making centers.

Teiser: Did you give some of those courses yourself?

Cruess: Yes. If they were not exactly courses, they were meetings at which several of the University profs and several of the industry men gave papers and held discussions. We did a large amount of Extension work. We worked quite closely with the Extension people of the University. They would arrange for meetings. I won't call them courses because they were not exactly courses but rather Extension Service meetings.

Teiser: Were there several others in the department who were active with you in the post-Repeal period?

Cruess: Yes. These young fellows who had never done any research on wines--about all they knew about wine was how to use it properly--and among them were [Emil] Mrak, who is now chancellor at Davis, and [Maynard A.] Joslyn, who is now in nutrition. There was a young man who did a lot of work on the chemistry of wine making--[L. G.] Saywell. He left the University about thirty years ago, I guess. I think there were four of us who worked together for about four or five years. Saywell shortly went to work for a large company, and reputedly he has made considerable money. He left the University two or three years after he graduated.

Teiser: You were the one who had the knowledge that was carried over from the earlier period, were you not?

Cruess: Yes. I gave them all I knew, and they read a lot.

Cruess: I followed the research very closely.

Teiser: A friend of mine at Stanford University said that you had developed cultures for specific California wines, like Louis Martini's Moscato Amabile.

Cruess: I had worked with that experimentally, but what I developed was not that, but the yeast for the Spanish flor sherry. I didn't discover it, of course. It was discovered and developed in Spain a long time ago, but that particular wine was not made in California and never occurred here naturally. We have thousands and thousands of wines that occur naturally, but none of them were of the Spanish sherry type. I got cultures of the Spanish sherry from various sources in Europe and made pure cultures. I studied them and developed a method. These Spanish sherries are now present all through the California wine industry. They have caused some trouble; that is, they are fine for making Spanish sherry, but they also cause a little clouding in other wines if they are not held in check. So the wine makers know that now and do not allow the flor yeast to contaminate other wines. The flor yeasts are good and desirable for the flor sherry, but they are a pain in the neck if they grow in other wines.

Teiser: Have you worked with Louis Martini on yeast cultures for the Moscato Amabile?

Cruess: Louis Martini, Jr. was one of my students, and I knew him

Cruess: well. The wine that he used was a well-known wine made from California grapes and not a wine that I developed. He made a culture of flor yeast and increased its development and use.

Teiser: You did some work on very low alcoholic content wines and also on very high alcoholic content wines?

Cruess: Yes, I did. In 1919, when the country was dry and it was against the law to make wine, we worked on a process of making high alcohol content wines--eighteen or nineteen per cent alcohol. We published some of our findings. One of my students and I worked on it, I think, in 1919; he has since passed away. That was on the high alcohol content wines. There wasn't much demand at that time for wines with an eighteen or nineteen per cent alcohol content, because it was against the law everywhere in the United States to make wine. But I had a student that had to have a problem to work on, so he worked on the making of high alcohol content wines by fermentation. Ordinarily, the high alcohol content that is necessary for sherry and port and so forth--the dessert wines--is acquired by adding brandy or alcohol. We were able to produce them by fermentation. That is just of academic interest, because under the alcohol regulations, to make a wine with that alcohol content you have to add brandy and pay for the alcohol that you use.

Teiser: Should the law be changed?

Cruess: No, I don't think so. It is rather difficult to use it, and if it is not used properly, you wind up making vinegar and more or less non-usable products. So the process is not used commercially, and the brandy regulations more or less prevent its use anyway.

Perhaps I should mention another word or two about Louis Martini, Sr. He if the father of my student, who is also Louis. He [the father] is a graduate of an enological school in Italy and founder of the L. M. Martini winery of California and still very active.

FURTHER ON OLIVE RESEARCHES

Cruess: I thought I might give a summary of some of the olive research work. One of the pieces of early olive research was on the nature of the bitter principle. I took that as a problem to study for my Doctor's degree at Stanford. The bitter principle is quite interesting. A glucocide chemical can be hydrolized with sodium hydroxide, and from that you get a series of chemical compounds that are used for studying the chemistry of the olive. That was one of the reasons that I have always been interested in experiments on olive research.

Teiser: Stanford was an unusual place to work on such a practical project, was it not?

Cruess: Yes, it was. Most of my work was done with Dr. Alsberg in the chemistry department at Stanford. He later transferred to California. About twenty years ago he overdid and suffered a case of pneumonia and died.

The chemistry of the bitter principle is known as oleuropein. It was really my excuse for doing some graduate work at Stanford. But I became interested in it and remained interested ever since. It led to experiments in various other fields, such as on quick methods of pickling. At that

Cruess: time it took about three weeks to pickle olives by the ripe process; it was very slow. In our experiments we were able to cut down the time to two or three days. In speeding up so much, cutting the process down to three days, the quality of the pickled product is not so high. As a matter of course in commercial practice now, they use a six or seven day method. Some of the olive men themselves were able to shorten the process very much. If you use just a moderately warm temperature, the olives are apt to spoil. But by using a temperature high enough to destroy micro-organisms and cut down enzyme action, just long enough to bring about these changes, you can cut the process very materially.

A very important feature of the process of pickling ripe olives is to darken the skin and to destroy the bitter principle. Then they are placed in water for a couple of days or longer. During that period, they may be aerated. The usual process for blackening the color, to get the black color that is demanded in ripe olives, is by exposure of the olives to air. The second method, the one which is now used more commonly, is to aerate the water in which the olives are held. A number of our experiments and research were on methods of controlling the darkening process by using a high enough temperature to inactivate the enzymes. We found that by pasteurizing or heating the olives to about 180° F., the enzymes

Cruess: would be inactivated and the pickling process would continue. I might say that twenty-five years ago, a large percentage of the olives were spoiled by bacterial action during pickling and had to be thrown away. There was one company in the south that went out of business because such a large percentage of their crop was spoiled. We found that the spoilage was bacterial. The secret of avoiding spoilage was to use a high enough temperature to kill the bacteria that were responsible for the spoilage. So twenty-five years ago an owner called me up and said that he would have to go out of business unless he could prevent spoilage of his olives during washing. I went down the next day to his place in southern California and found, as I knew beforehand, that we could control the spoilage by using a high enough temperature to destroy the bacteria that were causing the spoilage. We tried that in a small way at the factory, and it seemed to work. So the next morning the foreman had machinery put in to apply our methods of prevention of bacteria spoilage. So within a period of a week or so he was able to completely eradicate the spoilage, and the process was soon applied in the other plants. It was sort of an underground method of transmitting information from one place to another and from one plant to another. The method of preventing spoilage was soon known and used very extensively, so that that kind of

Cruess: spoilage was prevented completely and has never caused any further trouble.

Teiser: What olive company was that?

Cruess: It was a Long Beach company which has since gone out of business, but not for spoilage reasons. The owner, I think, was sidetracked by his interest in "another gal." He died about twenty years ago. He had a factory in southern California, but when he went bust, they closed up the plant.

One of the most important changes that we made in the pickling process was the use of cans that were coated inside. They were called enamel lined cans. They of course were not new; they had been used for some fruits for twenty years or so before. But so far as ripe olives were concerned, they were canned at that time in plain tin cans. The olives during pickling would turn black, which was the desirable color. But on standing after sterilization in the plain tin can, they gradually deteriorated in color. They gradually bleached out until after three or four or five or six months, they bleached so much in color that they were not so much in demand. We found that if they were sterilized in cans that were enamel lined, the olives would hold their color indefinitely. I've seen olives still with good color ten years after canning.

Teiser: Did you do some work in this area?

Cruess: Yes. I didn't do any work with making or coating the cans, but I used the enamel lined coated cans for experiments. The color was preserved by this method of canning.

Teiser: Whose suggestion was it that enamel lined cans be tried?

Cruess: I think I was the one who suggested it originally, but some of the commercial can makers had the same idea. We were just a little ahead of them.

Another problem when we first took up sterilization of cans after the famous botulinus poisoning incident. That was just a few years after they started canning olives. They were using the temperature of the boiling point of water to sterilize the olives, which wasn't enough, and botulinus bacteria survived that temperature. That was not settled until about 1921. But the olives previous to that time had been pasteurized at a temperature not high enough to kill the bacteria botulinus but high enough to keep the product. But when it came to use the very high temperatures necessary to kill botulinus, many of the olives softened, and it was found due to the residual lye left during the pickling. That is, the olives contained a trace of the lye used in pickling. Or the pickling process had affected the texture of the olives so that the heat--the flesh that has been under the pickling process is sensitive to a high temperature and will soften. But if the pickling process can be carried on without leaving

Cruess: any lye in the tissues, the olives do not soften, and they then stand up very well. Our early work after the change from the low temperature of 150° to 160° F. to a temperature of 250° F. caused the softening of the olives. By changing the pickling method just slightly so that there was no excess, no trace of lye, the olives did not change in texture.

Teiser: Was this your guess that this might work?

Cruess: Yes. Dr. Meyer and other bacteriologists were working on the poisoning, and sterilization. We didn't want to work on the bacteria spoilage, because that involved the health feature of the preservation of food, and that was, of course, under the State Board of Health. Our job was to find ways of having canned olives of the proper texture and flavor, so that people would buy and use them. We didn't work at all with the poisons.

Teiser: Who suspected that the residual lye was causing the softening?

Cruess: I think that was ourselves.

Teiser: Is that you individually?

Cruess: Yes. I and some of the men from the University who were working on olives. So you might say that was control of the pH value of olives during sterilization. When olives are sterilized at a high temperature, it is called retorting--using heat and pressure.

Teiser: This was an instance in which the University through you

Teiser: definitely saved an industry, wasn't it?

Cruess: It improved the final product, but it probably would have been done anyway.

Teiser: It would have been done by someone else if you hadn't done it, but you did. I think it is interesting how the division and department of Food Technology has served this very definite dual purpose of teaching and working with the growers and processors. I don't know if there are other departments in the University which have had such a strong dual function.

Cruess: There is the mining industry, of course.

We did considerable work on the Spanish green process of pickling olives. And in order to know something about it, I took some of my sabbatical leave in 1922-1923 to spend time in Spain. The wife and I actually lived for two months in Spain. I got a lot of information on the green olive pickling process, and it was sufficient to advise the processors and packers of canned olives on how to do it successfully. At that time, there was only one company that was pickling olives by the Spanish process, and they had some difficulty with it. We made available to them the results of our research on pickling green olives, and they carried them on after that for several years, actual pickling and packing green olives in commercial quantities, in Visalia

Cruess: in the south, and Oroville in the north. Now, the pickling of green olives is carried on at most commercial olive canneries as a means of utilizing the small fruit. For us, it was an extension of the pickling and packing of green olives in Spain, adapting their methods to California conditions.

Dr. Vaughn is carrying on that phase of the work, and he has two or three men involved in Ph.D. research in this area. Olives can spoil in so many different ways, and it is quite an expensive spoilage. Olives are a high-priced commodity, and if you lose a cask of green olives by spoilage, it amounts to quite a bit of money. So there is still quite a demand for research on green olive pickling. Although I started pickling green olives twenty or twenty-five years ago, Dr. Vaughn has kept it up and has published several papers on it. There is quite a demand for research by the olive association, and he published articles in the Proceedings. So the Spanish green olives have become quite important commercially. Much of the experimental work has been done by Dr. Vaughn and others, and his students.

One of the most important experiments came right after our visit to the Spanish green pickling plants. That was on incubation. That is, Spain has a warmer climate that we have, and they ship their olives soon after pickling.

Cruess: The voyage is slow, and the olives continue curing and pickling right in the casks. By the time they reach the market they are cured. So without doing very much research on it, it was obvious that the green olives reached the market in good condition. But when the process was applied to California, by the time green olives are pickled, it has turned cold--too cold for them to go on pickling. For that reason, the pickling was slow and the olives were not ready to be sold until the following summer. So the problem was to shorten the process. The obvious answer was to incubate the olives, to keep them warm so they would continue to undergo curing. That was the principal change that we made in the green olive process. It was something that they didn't have to bother with in Spain because it was warm and the olives went on curing. But in California the temperature was lower, and they found that they should incubate them.

The second problem was the lack of sugar in the Spanish olives. Most of the sugar was washed out during the pickling process that was used at that time, so that they didn't develop enough acid by natural pickling but only by adding sugar. Sugar is necessary to form acid by the lactic acid bacteria, and lactic acid is necessary to lower the pH level, that is, to increase the acidity sufficiently for the product to have a flavor of pickled green olives. So one of

Cruess: the main changes we made in the pickling process of green olives was to add a little sugar several times during the fermentation. Another thing we did was raise the temperature, that is, incubate them, but incubation will soon use up all the sugar. So, in addition to incubation, we added small amounts of sugar. If you add too much sugar, it will spoil the olives, so it is a matter of adding just the right amount.

The first work that I did on olive pickling was done 'way back in 1915, I think. The main purpose of our experiments then was to shorten the process. It usually took about three months for the fermentation to be complete.

Professor Bioletti arranged for me to carry on experiments on pickling of ripe olives with a cannery in Hayward, the Hunt Brothers Cannery. We found that it was possible to shorten the process from three weeks down to three days by raising the temperature and by pumping air through the olives. Using a higher temperature, and pumping air through the olives at the same time, that combination made it possible to shorten the process from three weeks down to three days. That combination was more or less new. If it is not properly made, the quality may be below that it should be, so the short process is not used very often, but we demonstrated that it is possible to shorten

Cruess: the process greatly. One of our graduates who is now working with the olive industry has cut the time down to one day, but his process is not used industrially. Bringing it down to five or six days is practical.

FROZEN FOODS
(Interview 5, November 16, 1966)

Teiser: What subject would you like to discuss today?

Cruess: I have suggested the subject of frozen foods. The topic I have here [on card outline] is the history of the frozen foods in California. Back around 1925 there was almost no frozen food in retail packages. There were commercial plants for frozen meats and frozen fish. You could not buy them at retail except to take home and use [immediately] at the time. There were no frozen food cabinets in grocery stores. That took place about forty-five years ago and was one of our major lines of investigation. I think we started about 1925, not systematically. Dr. E. L. Overholser of the pomology department had a freezing plant for experimental purposes. He later went to one of the other experiment stations, the one in Washington State. He started in California with the Pomology Department. He supervised the building and equipping of a plant for experimental cold storage work. I joined him, in another department, because he had the information and equipment. Later he went to the Experiment Station for Agriculture near Pullman, [Washington], not the one in Seattle. He went there after he left California. I worked with him from 1925 to 1930 or so, and we

Cruess: published a bulletin* on the freezing of fruits. It was not so very new except that we advocated or suggested freezing fruits in cans or closed containers, whereas before then fruits and vegetables and meats were stored in large containers or just in ordinary packages wrapped in paper. Our work was experimental in the use of small containers like glass jars and cans that could be used in the home or distributed through ordinary retail outlets.

Since then, of course, frozen foods have been made available in packages in all retail stores. We carried on quite a few experiments between, oh, 1930 to 1940, but many others were working on the same problem, so we do not claim to be the first or the major ones in the development of frozen packages. We have meetings once a year with all the canning companies and freezing plants and so on, and with them for about five years we had displays of various frozen fruits and vegetables, in the displays of regular canned fruits and vegetables. These products that were preserved by heat or by sterilization were displayed beside our experimental packs, and we showed how much better the

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*W. V. Cruess, E. L. Overholser and S. A. Bjarnason, "Storage of Perishable Fruits at Freezing Temperatures." California Fruit News 64, (1724), July, 1921. (Not listed in W. V. Cruess Bibliography.)

Cruess: frozen foods were than the canned insofar as fresh flavor and appearance were concerned. But the canners of California, of course, were not very much interested in the frozen pack. Their business was canning and the sale of canned products. So our work, although it showed them what could be done, they didn't do it. Later on, some of the commercial cold storage plants not only in California but throughout the world became interested. We don't claim very much originality on the use of frozen fruits, but we carried on quite a few experiments, as I say, from 1925 to the present day, when we carry on investigations at Davis on frozen foods. But shortly after, it was demonstrated that frozen foods were vastly superior to the brined and canned in freshness of flavor and appearance. We don't say they were better, of course, but the frozen foods were different, and it was a means of giving the consumer or the housewife products that were of frozen quality and flavor. So now almost every food store in the country has frozen food cabinets for displaying and selling all kinds of things all the way from frozen fish and meats up to frozen vegetables and fruit juices.

Teiser: Did you do some work on frozen orange juice?

Cruess: Yes. Professor Joslyn did most of our work on frozen fruits, and for many years he carried on investigations of frozen orange juice. For example, he found that orange juice should

Cruess: be heated sufficiently before it is packed and frozen to inactivate certain enzymes, the ones that cause clouding and changes in flavor and so on. But the major breakthrough was accomplished by the experimental station in Florida--the Florida Citrus Exchange. They found something that no one else had discovered, namely, when orange juice is frozen and thawed, ordinarily it doesn't have much flavor. But they found that if some of the juice were concentrated to about fifty-five per cent dissolved solids and that mixed with a moderate amount of fresh juice, it resulted in a good product. The mixed juice is frozen at about forty-five per cent soluble solids, and it is packed at about forty-five per cent. What we buy in ordinary retail stores contains forty-five per cent soluble solids. That has a fresh flavor from the addition of fresh juice, whereas the juice that is concentrated forty-five per cent has no fresh flavor. The flavor goes out in the concentrating process. Before it is frozen some fresh juice is added to impart a fresh taste. Before use, it is blended with fresh juice and concentrate containing fresh juice.

Teiser: Did you do some work on this yourself?

Cruess: I worked on the whole problem 'way back before they developed the present frozen orange methods.

Teiser: They could hardly have arrived at the final technique

Teiser: without the basic, could they?

Cruess: No.

Teiser: I am trying to give you more credit than you are giving yourself.

Cruess: I did some work on one thing that our department did, but most of it was done by Joslyn and [George L.] Marsh. We also found that if we froze ordinary navel orange juice, it would turn bitter, whereas the Valencia orange juice would retain its flavor and not change. So the principal thing that our department found was that the ordinary Valencia orange juice retained its flavor during freezing and thawing. The navel juice, upon freezing and thawing, turns bitter. For that reason, they haven't used the navel juice for frozen packing. No one has solved the problem of concentrating navel juice so that it won't become bitter. In that major piece of work that we did, I think Joslyn and others in our department, and I too, to a limited extent, discovered that it became quite bitter. It wasn't very much to discover, because almost everybody found that to take place. They packed a lot of the navel juice.

California, naturally, had navel oranges, whereas the growers down in Florida didn't have the navel variety. They mostly grow some ten or eleven other varieties, none of which has the disagreeable flavor of the navel orange

Cruess: when frozen. But they all have trouble with the curdling of frozen food when it is thawed, unless the enzyme pectinase or pectic enzyme is inactivated by heat. We did the first work on that, and we found that heating to a sufficient temperature would inactivate those enzymes, and the juice would not curdle. The frozen pack orange juice now on the market doesn't have very much of the curdling trouble because of that discovery. I think that was one of the major findings.

The orange juice that I mentioned previously was developed by Florida industry and largely by the men in the industry, U. S. D. A., the U. S. Department of Agriculture. They and the Florida Citrus Exchange research people found that the flavor could be retained by packing a mixture concentrated with enough of the fresh juice to give flavor to the mixture, as I said before. That was a very big finding, and it resulted in a tremendous increase in frozen citrus juices. Before that, a moderate amount of orange juice was frozen in cans, but it didn't have very much flavor. The Florida Exchange method of concentrating part of the juice and then adding fresh juice--the mixture was excellent in flavor and more or less like the fresh juice.

Quite a bit of our work on frozen pack was done by Joslyn and Marsh on a grant from manufacturers, one of them for

Cruess: freezing equipment. They did a lot of work on rate of freezing, how long it took to thaw, and the changes that took place in freezing and thawing. Their findings were published by the University and the frozen food companies. But I personally didn't do very much on those experiments except to apply them and obtain funds for Joslyn and Marsh.

Teiser: Were you head of the department at that time?

Cruess: Yes. We have done a great deal on the practical problems of freezing, thawing, and packing of frozen fruits and vegetables. One thing that I and several others discovered was that if vegetables are frozen and then thawed, they acquire a disagreeable flavor, that is, if they are not blanched, if they are not thoroughly precooked before freezing. They will, after several weeks or months of freezing storage and then thawing, have a flavor so disagreeable that people won't eat them. We discovered that if they were blanched or parboiled sufficiently, they could be frozen and kept for several years or as long as you wished without a change in flavor. That discovery was basic to the production of frozen vegetables. Frozen fruits retain their flavor without this method, but vegetables are quite different and will have a disagreeable flavor upon thawing if they have not been blanched sufficiently to inactivate the enzymes. However, that was also

Cruess: discovered by a man in the eastern United States at about the same time we discovered it. We claimed credit for it, but we are not sure he didn't beat us to it, although I think we did beat him to it.

Teiser: Was that Clarence Birdseye?

Cruess: Yes, it was Dr. D. K. Tressler, a man who has worked with Birdseye quite a bit.

Teiser: The Birdseye Company publicity gave Birdseye a lot of the credit.

Cruess: Yes, it did. He did more than anybody else to popularize and increase the use of frozen pack vegetables. I knew him quite well; he always used to stop by when he came through this area.

Teiser: Was he a nice fellow?

Cruess: Yes. He died about five or so years ago. He was a good sort. He was strong on patenting everything, and he did so. So the Birdseye process is very thoroughly patented. Everything that they did was patented, so it's well protected.

Teiser: Were there basic things that were patentable in the freezing process?

Cruess: Quite a bit of our research was on the changes that take place during freezing and thawing rather than on devising new methods or equipment. Part of our work was on what happens, and to some extent on new methods. For example, the frozen

Cruess: pack of dry sugar instead of syrup with berries was worked on in our department, although it was developed more by industry than by us.

Although it's not very important commercially, Joslyn and I developed a method of preparing and freezing avocados. They should be sieved, or made into small pieces. And persimmons should be dead ripe and then sieved. Those two products can be made commercially, but they are not, because they are so much in demand for fresh use.

People in the Hawaiian Islands have done a lot of work on frozen tropical fruits such as the avocado. And the guava, which is peeled, cut in peices, and packed in juice or in syrup. Another fruit, the papaya, has been packed commercially in the Islands. The lower grades, not perfect fruit, are cut, sliced, and packed with syrup or mixed with other fruits, and frozen or preserved by pasteurization and so forth. The mango can be frozen as a purée and is a very nice product, but the demand for fresh fruit is so great that there is no reason for packing it. The second quality of papayas doesn't appear attractive enough to sell as fresh fruit but can be used to produce by-products. The volume is not very great, and I do not think that any of the papaya products are on the market. But papaya juice and papaya syrup and papaya concentrate and mixed papaya

Cruess: and other fruits can be packed in syrup.

We did quite a bit of work on the retention of the color and flavor of fresh sliced fruits. We observed and found that a small amount of sulphur dioxide, SO_2, packed with the syrup or with the sliced fruit, tended to hold the color and flavor of sliced peaches and sliced pears and other sliced fruits. A small amount of sulphur dioxide, not enough to make the flavor disagreeable, but enough to hold the color, was very useful. It is used commercially for frozen, sliced fruit, for baking and so forth, but it is not used so much for retail packages because they don't require much of it. So I think all that need be said about the use of sulphur dioxide is that it is used for sliced fruit, particularly peaches, apricots, and pears, to hold their color and flavor. Commercially it isn't used very much [for retail packages] because it takes a lot of extra work to add it. The commercial plants that freeze these products, sliced peaches especially, and apricots, do it in such a large volume that it can be done economically, whereas in the small retail packages it is not so practical to add the sulphur dioxide.

Ripe olives can be frozen, but there isn't much demand for that because they are just about as good canned and sterilized by heat as they are frozen. But our experiments

Cruess: showed that ripe olives could be packed with a dilute brine and frozen and would be pleasing in texture and flavor upon thawing. So if there were much demand for frozen olives, they could be packed.

Teiser: Would that be more economical than canning?

Cruess: No, it wouldn't be as economical as canning, but the flavor might be superior, because the product is not canned by heat. It is just pickled and put in a dilute brine and preserved by freezing, so the flavor is that of the freshly pickled olive. But the unfortunate thing is that although the olives retain their flavor and texture through freezing and thawing, they soften quite a bit. The soft olive is not so attractive and is not very much in demand, so the frozen pack olives have not become commercially successful, although our experiments showed that it can be done.

These are the reports of our experiments during the period dating from 1914 or 1915 up to the present time. They are the original typescripts for our various articles. They are articles that were copied by various publications. Many of these were just published and not put in a book. Most of them are in the bibliography of my published work.

Teiser: You were the senior writer or the sole writer of most of them, were you not?

Cruess: Yes.

Teiser: Are they copies that may be deposited in the Library?

Cruess: Yes. They are copies of most of our publications up to the time I retired. It doesn't include the very few that came out after I retired. *

* The collected papers of William V. Cruess are on deposit in the University Archives.

DEHYDRATION OF FRUITS AND NUTS
(Interview 6, December 7, 1966)

Cruess: I thought we might talk about the work that we did during 1920 when we had an early rain, and practically all of the prunes that were dried in San Jose and the neighboring vicinity got moldy, and many of them spoiled. So many million dollars worth of prunes got vinegar sour and spoiled by the growth of yeast during the drying period. At that time most prunes were dried in the sun, and dehydration was not very much in use. Toward the end of September of 1920 there was an early rain of about five or six inches. It rained on and off for a couple of weeks, so that the prunes grew whiskers and fermented and spoiled.

We were called down there to run experiments to see if we could save some of the prunes and prevent this catastrophe again. So I spent about two weeks in San Jose in the drying yards. We found that the prunes, although they might be wet and developing a small amount of mold, some could be saved by treatment with sulphur dioxide fumes. So we saved a few of the prunes that way. They also had a few dehydrators, four or five when they should have had one hundred fifty or so. So they couldn't dehydrate many prunes, but they dehydrated a few of them, all they could,

Cruess: by the makeshift dryers. A few tons of prunes were saved in that way; some more were saved by the sulpher dioxide, sulphur fumes.

As a result of the early rains of 1920, when so many prunes were lost, they designed dehydrators for that area. By the end of 1925 or so they had enough dehydrators so that if it rained early again, as it often did, they could save the prunes. Those experiments stimulated the building of dehydrators, so that within five or six years of the terrific spoilage by early rains, they built enough dehydrators to dry the entire crop. That catastrophe stimulated the prune growers to build enough dehydrators so that never again would they have to dry them in the sun. They dry a few in the sun but most of them in dehydrators, because they found that with dehydration the dried product was better in flavor and the yield was a little bit larger. So dehydration has replaced completely the drying of prunes in the sun except for a moderate amount of small dryers.

There are a few small dryers left who couldn't afford or wouldn't build a dehydrator. For example, before I sold it [ranch] we used to have four or five prune trees, and the nearest dehydrator was ten miles away. So we dried that small amount in the sun. There are a few dryers scattered through the prune districts where sun-drying is

Cruess: still used on small orchards. But as a general rule, prunes are now dehydrated, whereas they were sun-dried before. As I said, our work on the rain damage stimulated the building of dehydrators for prunes. Professor A. W. Christie conducted a great deal of research on dehydration. He and I worked together on it.*

Later they had the same problem with walnuts. Before then practically all of the walnuts were dried in the sun, but then they had rain damage losses. Walnuts usually are dried at a later date than prunes, but the late rains cause quite a lot of spoilage. Because of the experiments that Christie, who was one of my students, made, he was asked to join the Walnut Growers Association and carry on further experiments. He was hired by the Association after that. That was in 1928 or so, and he left the University and went to work for them. I didn't have very much to do with that. We had one student, Cliff Bedford, who was doing some work on the dehydration of walnuts, but most of the work was done by Christie, and the work was published in a bulletin. Several bulletins have been published since on the drying of walnuts.

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*See Bulletins 321, 322, 330, Circular 213, Proceedings of the First Dehydration Conference, and several other publications. --W. V. C.

Cruess: He [Christie] went to work for the Association and got old enough to retire about two years ago. We have no one, I think, working on walnut dehydration at present except incidentally or occasionally. Practically one hundred per cent of the walnuts now are dried in dehydrators. Ordinarily prunes and other cut fruits are dehydrated at 140° F. to 175° F., but walnuts will not stand that high temperature. They must be dried at not above 110° F., which Christie discovered. He got the growers to put in dehydrators and learn to operate them properly. So the dehydration experiments resulted in two very large advances in the building of dehydrators, namely the dehydration of prunes, grapes, apricots, pears, and peaches.

Teiser: Do you remember what ranches you went to in the Santa Clara Valley when you first studied the problem in the 1920's.

Cruess: I worked with two associations; one was just east of San Jose and was known as the East Side Dryer. John Leonard and Anderson Barngrover Company were others.

The work that we did on the sun-drying of prunes and the spoilage of prunes by early rains resulted in experiments on dehydration. And it also resulted in the building of an experimental dehydrator in Davis, California. Two years after the rain damage we had a dryer designed and built by Christie, Bioletti, myself, and others, and it

Cruess: was erected at Davis. Christie went to work for us between 1915 and 1920, when we did so much work on dehydration and worked out the methods that should be used. For those years, about three years, during the drying of prunes and grapes and so forth, Christie or I, one or the other, spent all the time during the two or three months of drying of fruit, at Davis. We had a dryer that held about five tons of fruit, and we dried all kinds of fruits in various experimental ways. But prunes, peaches, grapes, and pears were used in many of our experiments.

We carried on quite a few experiments to work out the best method of preparing and drying the various fruits, expecially prunes, peaches, and grapes. For example, our dehydrator was so arranged that the temperature and the air flow could be varied. It was built in such a way that it would be run experimentally with a blast of air or air suction. As a result of the experiments that we made, dehydrators were improved, and the results were published. For example, one experiment was the drying of prunes on screen trays and also on wooden trays. On wooden trays, you have more sticking; the prunes dehydrate down and stick to the trays and are hard to get off. But most of the experiments on prunes were on other problems.

Christie and I worked together with the carpenter

Cruess: and others at Davis on building the plant. Professor Bioletti, Christie, and I designed the dehydrator. It didn't have anything very unusual about it, but we tried to include equipment for varying the method of drying so that all possible conditions could be set up and experimented with. At that time the one who was not teaching for a day or two days lived at Davis and carried out dehydration experiments and directions for drying.

Teiser: Did you maintain communal living quarters at Davis?

Cruess: For dehydration, we had to be at the plant during the night, so one of us would go to bed about 8:30 p.m. and set the alarm to ring in an hour or so, when data could be taken on the amount of drying during that period and so forth. Once every hour and a half we had to wake up and go down to make a reading. There were the three of us. Professor Christie and I did most of the experimental work, but during the early afternoon, when neither one of us were available, Professor Flossfeder took care of the dehydration. He was interested in experimental drying of various fruits, especially grapes. He was a professor of viticulture. In that way, the three of us kept the thing going for a period of about three months.

One of the experiments we did was on recirculation of the air for drying. If you dry fruit with a blast of air

Cruess: and throw the air away, two things happen. You waste a lot of heat and increase the cost to dry. But if you recirculate the air, pass the heated air around and around, you can cut down the loss by the carrying away of the hot air. It is simplest to say that the recirculation of the air used in drying was proven to be economical; that is, there was less loss of heat by recirculation and better control of the temperature of the drying. One of the things that Christie and I found was that by dehydration the yield was slightly increased, because the losses that would occur in sun-drying would be avoided so that a greater tonnage of fruit would be obtained by dehydration, controlled drying, than by sun-drying. Because in the sun, the fruit could go on metabolising. Sun-drying takes a couple of weeks, and during those weeks the fruit goes on metabolising or working so that some sugar is lost, and dehydration avoided that loss. So the cause of the lower yield by sun-drying was the loss of sugar, while the metabolism of the fruit was prevented by dehydration. The temperature was high enough so that the fruit didn't go on carrying on its metabolism.

I mentioned that our experiments led to the dehydration of walnuts. That occurred right after the experiments at Davis, and the experiments were continued by Professor Christie after he went to work for the Walnut Association.

Cruess: We had quite a large number of men working on dehydration and on sun-drying. They were usually advanced students that we got to help us with some of the experiments. Nichols became the dehydration specialist. Nichols at that time was conducting dehydration research for the U. S. Department of Agriculture. He had done graduate research at Boston Tech and got an advanced degree there. Later he became a dehydration specialist for the U. S. D. A. in California. About the time that Christie was leaving for the Walnut Association we secured a position for Nichols in our department. He took over the research and teaching in dehydration in our department. He was a brilliant investigator and very fine person. He carried on in Christie's place. He was my right-hand man. A few years later he became ill with appendicitis, suffered complications, and suddenly died. That was a great blow to the department and a tragic loss to me personally. He was a "great guy."

Reed was another one. In all, there were about fifteen in the laboratory, some of them students, some of them members of the staff, who helped us with the dehydration work. Christie was appointed by the Walnut Growers and was replaced by Nichols.

One thing that we experimented on was what they call the parallel current method of dehydration. In that

Cruess: method, the freshly trayed fruit is put in at a very high temperature. That is, instead of 160° F. , at which temperature there is not much effect on the fruit, they used 200° F., a very high temperature. The rate of drying is thereby greatly increased. We didn't discover that, of course; it was done by C. C. Eidt, a Canadian specialist. The Canadian dehydrators did a lot of work on the parallel current method of drying. For the first few hours of drying you used a temperature near the boiling point, and the moisture was driven out very rapidly. But it couldn't be applied too long, because the fruit would get scorched and not be of a high enough quality for packing. So the initial part of dehydration is done at a very high temperature, 180-200° F., and then finishing at a lower temperature so that there will not be scorch damage. We experimented with the Canadian process, which, by the way, is now quite often used for the dehydration of grapes and vegetables expecially. It's not very much used for other products.

One measurement that we took was the effect of various temperatures of dehydration on the damage to the sugar in prunes and other fruits. Others had carried on investigations into the effect of high temperatures on the sugar content of fruit during drying. It was conducted by the Canadian workers and ourselves and others. It is now

Cruess: quite well established that a high temperature can be used when the fruit first goes into the dryer and until the fruit is about half dried. From there on, you have to get the temperature down low enough so the sugar is not destroyed and the product scorched.

During the Second World War a lot of work was done on the dehydration of vegetables. Large quantities of dried vegetables were packed and delivered to the dehydrators of Great Britain. They did a lot of work during the period before America entered the war, and we have benefited by their experiments. As you might expect, since the dehydrators were built on short notice in many cases, many of them were not very efficient. It was found, for example, that if we tried to put the air through without guiding its flow, some of it would be lost. When the air went through properly, the fruit came out right. It was not realized at first that it was necessary to control the air flow so that the trays on the top of the stack of dryers did not get all the air and the trays at the bottom might not get any or got too little. In other words, there was very irregular air distribution. The problem was very easily solved by baffle plates and by so constructing the dehydrator that no air was lost at the bottom or at the top. Some might go above the trays and be lost, and some might be lost below the trays,

Cruess: so distribution of the air was very important.

As I said before, we saved quite a few of the prunes that were rain damaged by sulphuring them. Of the many thosands of prunes, the growers only had facilities for a very small proportion of the crop. If sulphur was burned and the air containing a small amount of the burning sulphur fumes was passed around the damaged prunes, they could be saved. If the prunes that had suffered by too much water from the early rains--those that were still edible could be saved if they were kept in the fumes of burning sulphur for two to three hours and then allowed to dry on the trays in the sun in the usual way. They would be edible although they would taste a little bit of sulphur dioxide.

Most of the spoilage of rain-damaged fruit was caused by blue mold and by grey mold after the fruit was partly dried. I imagine that about ninety per cent or more of the prunes that were put on the trays at that time in September, 1920 to 1930, were so damaged that they were only good enough to be used for hog feed. That was quite an impetus for dehydration.

The dehydrators for experimental dehydration at Davis were designed by, I think I mentioned before, Christie, Nichols, and others, but was done very much more thoroughly by engineers of the University in the department that was

Cruess: engaged in the construction and design of various equipment. They were useful to us in advising us how to design and build the dehydrator so that it would be efficient. So in addition to our own staff, members of the staff of Agricultural Engineering were very important in the design and construction and operation of the plant. They didn't work with us on the dehydration experiments, but they advised us a great deal on how to build an efficient dehydrator.

I think I mentioned that a very important aspect of dehydration efficiency was the recirculation of air. The air could be blown through the fruit, and some of it could be sent back and used again. In that way the total amount of heat for dehydration was conserved and cut down. As much as seventy-five per cent of the air could be recirculated without damaging the fruit and would save fuel.

In our experiments at Davis, most of the work was on prunes, but we also did a lot of work on the dehydration of grapes, peaches, apricots, and pears. The Thompson seedless grape is dried in the sun mostly, but a moderate quantity of the grapes are dehydrated. It is quite a tricky thing to dehydrate grapes without their sticking or being damaged by heat. They have to use a fairly low temperature of drying during the initial stage of dehydration, and various other factors have to be taken into account. Only a small amount

Cruess: of grapes are dehydrated; most of the raisins that you buy are dried in the sun. If you want to dry raisins that have a light color, they have to be dipped in dilute lye solution to check the skins and then dried on the trays with a modest amount of the fumes of burning sulphur--sulphur dioxide--passed through to hold the color. Nichols and I worked on the principles and methods of dehydration of grapes to make the light colored dehydrated raisins. But the amount used is moderate.

Teiser: Did you and Dr. Nichols initially develop that technique?

Cruess: No. Christie and I worked on the dehydration of grapes just to work out the best methods of accomplishing it. It was not discovered by ourselves; most of the work was done by commercial companies. One of the men who worked with us was Pucinelli. He was a young fellow, about twenty years old at that time, and he was quite interested in drying. He tried to build a little dehydrator in their prune orchard. We worked with him for a couple of years. Later he became so expert at it that he designed and built dehydrators as a means of making enough money to live. But as a result of experiments made in his orchard dehydrator, the best methods of handling prunes and grapes were worked out. Pucinelli helped us quite a bit at that time. Later he built dehydrators for other fruit growers in Sacramento Valley. Still later, and I think

Cruess: even now, he is building and operating dehydrators for grapes, prunes, and walnuts for the growers and the commercial plants. Incidentally, he has a dehydrating plant in Italy.

Teiser: Are most of the grapes for dehydration grown around Fresno?

Cruess: All of the prunes are grown at San Jose and around Sutter County in the Sacramento Valley. Sutter County grows a lot of prunes, and Sacramento Valley grows a lot. Also, many are grown and dried in the southern part of the Sacramento Valley. Above Sacramento, there are two or three valleys that grow prunes and grapes for dehydration, namely Napa and Sonoma Valleys.

We spent a lot of time for three years and during the last days of World War II on the dehydration of vegetables.

DEHYDRATION OF VEGETABLES
(Interview 7, December 15, 1966)

Cruess: I thought I might start out this morning with a brief description or discussion of dehydration in World War I. We carried on some experiments at Berkeley and also at a large plant near Eureka, at Fortuna. The plant was used for dairy products: for butter preparation and packaging, and the dehydration of milk, dry milk, that is. We were invited at the beginning of World War I to use their plant as a place for the preservation and drying of vegetables experimentally. That was in 1918 and 1919. At that time vegetables were not dehydrated commercially, but we carried on experiments at this dairy products factory on blanching. We had noted that the dried products were very tough and of poor flavor. It was thought that by carrying on experiments on the precooking of the product and then drying it, the product would be of better flavor and texture when it was cooked, and that proved to be the case. Experiments were made, of course, in Germany and England, but the perfection of blanching for dehydration did not occur early enough to use that method of preparing the products for drying during World War I. Consequently, although the product made by slicing, dicing, or cutting the raw material into julienne

Cruess: strips and then drying looked very fine in appearance, but upon cooking they were tough and of very poor flavor. They could be cooked for one to two hours in live steam or boiling water and still be tough. At about that time World War I closed, and we carried on no more experiments at that time.

But between World Wars I and II it was proven by the Germans and the English that the products should be precooked or blanched. That was done in Germany and England, and by the time we entered World War II it was a well established process. So our experiments on the preparation of vegetables for dehydration were quite simple as compared to World War I. In World War I, we blanched a lot in smaller quantities and worked out the processes of preparation and dehydration. But before that method was perfected and accepted, the need for dehydration in World War I was over. At the beginning of our participation in World War II--the war had been going on for a couple of years by that time--we didn't have the facilities for large-scale experimentation, and again we went to the various commercial plants and conducted experiments on blanching. That was in 1941.

During World War II they had the benefit of the perfection of preparation of vegetables for dehydration, especially in Germany. All of their products were blanched at that time, and the same thing was true in England. So

Cruess: the principal problem in America was the building of plants to get a sufficient amount of dehydrated vegetables to make it worthwhile. By dehydrating the precooked vegetables, you can carry from five to ten times the weight of dried as fresh vegetables. That was the reason for dehydration; to save time and space. For example, potatoes were washed very thoroughly in the spray washer. They were carried through a stream of water. They were then cut mechanically lengthwise into strips or across into sections. As you realize, potatoes have a large amount of soil and material that is not to be cooked, which clings to them, so they have to be washed very thoroughly. That is done by passing the potatoes through a spray of cold water, which usually removes or loosens all of the adhering soil.

The product can then be put in the proper form for blanching. We found, and others have found also, that it was desirable to have some way of determining when the blanching was thorough or sufficient. If the potato or other vegetable is insufficiently blanched, it will remain tough and have a disagreeable odor, because it has the flavor of the raw product and has taken on changes in flavor that are undesirable. So if we use potatoes as an example, the potatoes are sliced and then put through another cutting machine that cuts them into narrow strips, that are about

Cruess: 1/16 of an inch in diameter and square in cross section. That form of vegetable is known as julienne strips. The potatoes, carrots, or whatever the product might be, are cut into julienne strips or into cubes or into slices. The blanching then consists of placing the strips, cubes, or whatever in a conveyor where they are steamed for a certain length of time. Usually vegetables like potatoes are carried through the conveyor, which is made of screen or strips, and travel through the steaming or blanching procedure. Potatoes take about six to seven minutes in live steam to finish the blanching process.

Various methods are used to tell one when blanching is done. They blanch long enough so that the enzymes of the vegetables are destroyed. If the enzymes are not destroyed, the vegetable will then become tough and the flavor poor. The length of drying depends on the method of exposing the product to drying temperatures. Blanching was found to be necessary for all products except onions and garlic. If you stean onions and garlic to blanch them, you drive off the odor and taste. In the case of garlic, the flavored material is easily lost in dehydration, so they are not given a blanching process. They are cut into rather thin strips so that they dry quickly. They are dried at a temperature that is not high enough to drive off the flavor too much,

Cruess: usually 140° F. instead of the 160° F. or 165° F., which is used for other products.

A very good indication of the adequacy of blanching is the absence of certain vitamins. That is, if they are blanched sufficiently, the carrots or potatoes or whatever are more or less free from peroxidase or vitamin C. The presence of these vitamins can be determined by putting a drop of indicator such as the enzyme ascorbase. You let it stand on the vegetable for about five or six minutes, and it will develop a reddish brown color with the indicator guaiacol, and that turns pink or red if the énzyme is still active or living. It usually takes three to five minutes in live steam to destroy the enzyme. If the product is cooked sufficiently before dehydration, the enzymes are usually inactivated. Two things are accompliched: the enzymes are inactivated, and the product is cooked sufficiently to be dried. The yellow color of carrot, carotene, is a good indicator of the adequacy of blanching. If the strips or slices are blanched sufficiently, they will show a negative test for the indicator. Benzidine, another indicator, turns pink when you place a drop of it on the blanched vegetable. If the vegetable or potato or other product is blanched sufficiently, on cooking it is tender and has a desirable flavor. Of course the products are usually soaked

Cruess: in water until they regain their original shape before they are cooked in the home. The prepared dehydrated potatoes or carrots, for example, are soaked in water overnight or for half an hour or so before they are cooked for the table. If the vegetables are not blanched, as was the case in World War I, they are so tough that they cannot be eaten, they wouldn't be very palatable. For that reason, more of the dehydrated vegetables in World War I were thrown away after they were cooked and put on the table than were used.

In World War II the products had a good texture and a passable flavor, but all of the G.I.'s whom I have talked with and who went through World War II never want to see, let alone taste, a dehydrated vegetable. The flavor is not bad, but it is quite flat, and the vegetables are lacking in vitamins. Carrots and potatoes and other vegetables lose quite a bit of their flavor in standing after dehydration. They found that if cabbage, particularly, and carrots and and potatoes, to some extent, after they were blanched and dried, were packed in an atmosphere of carbon dioxide or nitrogen and then sealed, they would hold their flavor much longer. In that case, they can use those products. The carbon dioxide gas is cheaper and more stable. When potatoes and cabbage, for example, are packed in tin cans and sealed, they hold their flavor and color almost indefinitely, if,

Cruess: in the case of potatoes, the dehydrated potatoes contain eight hundred to one thousand parts per million of sulphur dioxide. If they are packed in inert gas, they hold their flavor and color much better than if packed in air. That is especially true of cabbage packed in an atmosphere of carbon dioxide to the extent that it contains one thousand to two thousand parts per million of sulphur dioxide.

Some products can be dried and packed without being held in carbon dioxide or nitrogen or other inert gas. You can store beets and lima beans which have been precooked without packing them in inert gas. That is the case with corn also. Onions should be packed in carbon dioxide or nitrogen, because they change in flavor so readily; otherwise, they oxidize and take on a disagreeable flavor. Peppers can be packed without inert gas, making them easy to pack. In some products the blanched product is immersed or sprayed with a dilute sulphite or dilute sulphur dioxide solution to retain vitamins and color. That is especially true of potatoes, cabbage, and carrots. They are sent through a solution of sulphur dioxide--that is, the solution may be two or two and a half per cent of sodium bisulphite--and then put on trays and dehydrated. So the product after dehydration will contain one thousand to two thousand parts per million of

Cruess: sulphur dioxide. As I mentioned before, onions cannot be treated either with a high dehydration or with sulphur dioxide, as they adversely affect the flavor. So the onions are merely cut into very narrow strips and dehydrated at such a temperature that the pungent odor is not lost. Although, if you drive through the vicinity of a plant that dries onions, you can smell the onions for five or six miles.

Teiser: Like the one at Vacaville?

Cruess: Yes.

Teiser: I love the smell.

Cruess: Yes, so do I. You would think they wouldn't have any flavor, but they do. They lose a lot of flavor but have some left when they finish drying, providing they use a rather moderate temperature of dehydration, not above 140° F. Whereas with potatoes you can use a drying temperature of 160° F. or 165° F. without injuring the flavor and color.

Some products have a much better flavor and color and keep better if they are dried quickly. Instead of using 170° F. or 175° F., as you can before the products are dried, you can use quite a high temperature because the evaporation is so rapid when the product is unblanched. If onions, for example, are fresh and freshly sliced or cut into strips and have not dried very much or yet lost half of their water, the rapid evaporation keeps the temperature down. So they'll

Cruess: stand a temperature of 170° F. or 175° F. for a short time if they are raw. Then the temperature is dropped to the drying temperature of 140° F., and the flavor does not change markedly.

In other words, the prepared wet vegetables, sliced or diced or cut into julienne strips, will stand quite a high temperature while they are high in moisture, because the evaporation then is so rapid that the product doesn't rise appreciably in temperature. Usually you can remove from one-half to two-thirds of the water before the product rises to a dangerous point. That method of dehydration with uncooked vegetables with high moisture content, dried at moderate temperatures, is known as parallel current dehydration. A parallel condition for dehydration means that you would use quite a high drying temperature without damaging the product, while it is high in moisture.

Teiser: Was the research on this done by you and Dr. Mrak and Dr. Mackinney?

Cruess: The original work was done, of course, in Germany. We simply applied the results of the German methods of preparing for dehydration.

Teiser: Did you work on this at Davis or here in Berkeley?

Cruess: All of our experimental work on dehydration of vegetables was made at Berkeley or in the commercial plants. Most of it was

Cruess: done in the commercial dehydrators. They called for assistance in preparing and drying the products, so most of our time was going from one plant of another, advising on preparation and dehydration methods. There were several plants in the south and quite a few in central California, that is, around Modesto, three or four; there were several in the Sacramento area. Most of the details of preparation had been worked out by the Germans. The plant at Davis was not built until after the war.

Teiser: Then was your work showing the dehydrator operators how to apply the methods to their operations?

Cruess: Yes, that's one thing we did. We also had to modify the various products and operations to meet our conditions. For example, very often potatoes were blanched in boiling water. But that doesn't give very much capacity, and the boiling water also dissolves some desirable water-soluble material. For that reason, we blanched practically all of our vegetables in live steam rather than in boiling water. So it was modifications of that sort which were made. We had from three to five graduate students who carried on the experiments for us. There was quite an increase in our staff at that time, and most of the increase was of either women or younger students who were not subject to the draft. Much of the experimental work was conducted by girls.

Teiser: Did they make a place for themselves permanently then in the food technology industries?

Cruess: No. Most of them left at the end of the war. One boy got married and now lives in the South. I think he was only sixteen years old or younger. He worked for the University for several years after the war was over, so he was about eighteen or nineteen when he got married. He took a gal who was from the South and had come up to participate in the war work, dehydration and so on.

Teiser: Did you work at all directly with the Quartermaster General?

Cruess: Yes. Dr. Mrak and I carried on dehydration experiments about two years before America got into the war. We advised operators of dehydrators and told them how to get the best results in the dehydration of potatoes and other vegetables.

As a result of the work on dehydration and the publication of it, one of the leading dehydration men in the War Department visited the University and [observed] the preparation of vegetables for drying. As a result of our contact with him, we became quite well acquainted with him, and he invited Mrak to carry on the dehydration work and other war work with the Quartermaster Corps. Throughout the last at least two years of the war, Mrak worked for the Army on leave of absence from the University.

Quite important to dehydration is the tray load.

Cruess: If you pack too large a quantity of blanched potatoes or carrots and spread them around on trays for dehydration too deeply, the vegetables are apt to dry very slowly and unevenly. So the tray load, which is a measure of the amount of material of the product placed for dehydration, should be between one pound per square foot to one and a half pounds per square foot. If you put seven or eight pounds of pre-cooked potatoes, for example, they will more or less clump together and dry very slowly and unevenly. So we had to work out the best amount of blanched material for dehydration. Another difficulty was in not being careful in your preparation of sliced or prepared potatoes and other products. The dehydration would be very uneven. That is, the air tends to go through the dehydrator unevenly, in which you have placed the cooked vegetables or blanched vegetables. If you are not careful, most of the air will go through the dehydrator below the product to be dehydrated or over the top. So to force the air to flow through the product, the tray or conveying device to carry the prepared vegetable for drying has to be arranged or so made that the air is forced through the product to be dried and not allowed to flow under it or over it. So an important feature of the dehydration of these products was to arrange baffles, that is, something behind or above the tray that forced the air to go through.

Cruess: The amount of blanching varies with the product somewhat. It may take as little as two to three minutes for a product to be blanched sufficiently to be spread on trays and dehydrated. Or with corn, which is blanched on the cob--the cob and the vegetable are blanched before they cut off the cob, because if you cut the vegetable before it has been blanched, a large amount of it will shake loose and be lost. For corn, instead of three minutes blanching, it may take fifteen. The blanching period for everything except corn is from two to seven minutes in live steam. Peas blanch very quickly because, you see, they are small; individual peas heat very quickly, and two to at the most five minutes is sufficient at the boiling point. Cabbage is not blanched at all.

An interesting method of blanching is drum blanching. That is, the drying is done on the surface of a drum which is heated inside, and the product is spread on the surface. In the case of potatoes, they are cooked completely, and the product then is spread on a drum about five or six feet in diameter and twenty-five to thirty feet long. That is heated on the inside to near the boiling point, and it dries the spread thin layer. Drum drying may take only two or three minutes. And then the product, after dehydration, dries out and sticks to the drum as it is rotated. On the drum are scrapers that scrape off the dried product. The product is

Cruess: cooked and dried very quickly. And that's used mostly for potatoes. It dries in a thin layer and is scraped off as the drum revolves and then can be packed. The usual packaging is in an inert atmosphere, in nitrogen or carbon dioxide. They have also used that method of handling for carrots, but it seems to work better with a white product such as potatoes. That has been used and is used at present, of course, for preparing dehydrated potatoes, but the amount of food that is prepared and dried in that form is less, much less, than what's dried on screens.

I might say that Mrak and I published our dehydration experiments which were made before the war. The results were desired by the Quartermaster Corps, and they were published in a University bulletin in 1941, but published also by the War Department, about two years before the bulletin was published. Mrak was asked to transfer to the War Department shortly after the war had started. All of the work on dehydration was put together by Mackinney and me and was published as a bulletin, #678. It was finished in September, 1943. Most of the war was over but we got it published in time, so it was used to some extent. Another interesting thing is that of the twenty-five or so dehydrators that were built and operated during the war, only two or three have gone on. One of those that has increased in capacity now dries large quantities of potatoes and frozen

Food packed experimentally for U.S. Army, World War II, about 1943.
W.V. Cruess Emil Mrak

Cruess: shredded potatoes for commercial use. Dehydration has greatly increased in size. The manager of production is one of our graduates.

Teiser: Who is he?

Cruess: Ray Kuneman. The name of the plant is Simplot. The dehydration plants have been greatly expanded in that area; there are several others, mostly for frozen precooked products.

Teiser: Did you work with Vacu-Dry?

Cruess: Yes. It's an operation, of course, for the drying of onions, onions and garlic. We spent quite a bit of time at the Vacu-Dry dehydrator studying some problems that developed.

Simplot built a dehydrator during the first part of World War II and dehydrated potatoes and onions. At first he didn't blanch, and of course they were more or less inedible. He spent quite a bit of time coming down to the University and working in our experimental plant. I spent a couple of weeks up there with the Simplot Company. At that time Kunemann was working for the government. But as soon as the war was over, he was asked to go to work for the Simplot Company, and he has been there ever since. Which reminds me that he sent me a sack of fresh potatoes, fifty pounds of fresh spuds, great big ones.

The Simplot Company has been expanded, and they

Cruess: built several plants. One very large plant now is in the preparation of chemicals for the food processing industry. In fact, they are one of the largest users of prepared chemicals for the agricultural industries. This single company has one of the largest chemical factories in the United States. Simplot, of course, has become a millionaire several times over. He is a very nice sort of a person. I went pheasant hunting with him. I remember we got up at three o'clock in the morning and drove about fifty miles to the place where the product is prepared for freezing. He has three of four large plants; they are not dehydrating plants. They include factories for producing fertilizer such as sulphate, phosphate, and potassium chloride. He makes a tremendous amount of processed frozen pack potatoes, corn, thousands of pounds of wool, dressed beef, lambs for killing and dressing, much lumber, many tons of chemical fertilizer and so forth.

ADDITIONAL DEHYDRATION DEVELOPMENTS

Cruess: The rate of drying, as you might guess, depends on the temperature and the rate of air flow. If air is carried through the prepared vegetable at the speed of 250 feet per minute, the product takes 5.2 hours to dry. If the rate of flow is increased from 250 to 500 feet per minute, dehydration is complete in four hours instead of 5.2. If it is increased to 700 feet per minute, the drying time drops to 3.5 hours. About the highest rate they use is about 1,000 feet per minute. In fact, 700 feet per minute velocity is the usual speed. But at 1,000 feet per minute, it takes only 3 hours. Increasing the air flow from 250 to 1,000 more than doubled the rate of drying. We found that slow drying was sometimes due to insufficient rate of air flow, which meant they had to build larger equipment for conducting air through the prepared vegetables.

An interesting thing we developed at the University I guess twenty-five years ago. If you go camping at a high altitude and try to cook dried vegetables--dried potatoes or dried carrots--first soak the product until it is plump. Then cook it over the campfire. But we found that ordinary red beans, precooked sufficiently to be eaten, and then dehydrated--cooks very fast--the product can be used in the

Cruess: camp. You can use the ordinary white beans, but the flavor is better if you use red beans. They are cooked until they are ready for the table. Then they are spread in a dehydrator and dried at quite a high temperature. The product stands a temperature of 175° F. or so instead of 120° F. Although the cooked beans pop open more or less during dehydration, they soak up water very quickly and cook in a short time. So you can save a lot of time by preparing precooked red beans that are preflavored with sliced onion and garlic if you want. My wife doesn't like garlic, so I leave it out. The product cooks rather quickly in water and flavoring material. So far this is not used commercially; it is used by people who like to go to the mountains, and whom we have known for quite a while.

One difficulty with all of these products, I think, whole beans and other products especially, that plump up during preparation for dehydration, during cooking they expand. Carrots are thoroughly washed in a revolving drum and with a special series of knives cut into thin sections. The sections go through a cutter that cuts them into julienne strips. Then they are spread on trays and dried. Although the flavor is much better retained if the carrots are blanched thoroughly before they are placed in the dehydrator. So if the product is to be cooked quickly, it is blanched sufficiently to cook the product all the way through, and

Cruess: that may take ten minutes. But most of the carrots are cut into julienne strips and blanched ten minutes or so in live steam, until the carrots are practically cooked. They are not cooked sufficiently to be put on the table, but they are blanched enough that when they are dried they don't taste off in flavor and are not tough. That means that carrots are blanched from seven to ten minutes in live steam. They are usually dehydrated by parallel current dehydration and finished at a lower temperature. The dehydration is begun at about 185° F., and the drying is so rapid that the product doesn't reach a temperature that damages the flavor. Then the drying is continued and completed at a somewhat lower temperature. The finishing temperature is usually around 150° F. The dehydration takes about ten hours.

The onion, on the other hand, of which there is quite a large quantity prepared, is prepared for drying by removing the roots and the skin, the paper outer skin. That can be done cutting the onion into slices. After slicing, the adhering shell of skin is removed very readily by passing the dried vegetables through a drum. That is, the dried onion is broken up into small peices, and the skin is very readily separated by revolving the drums. If the onions are finished and dried at a temperature of 120° F. to 150° F., they retain enough flavor to be desirable. If you

Cruess: use high temperatures to increase the rate of drying, you may lose so much of the flavor that the product, when cooked, doesn't taste like onions anymore.

Potatoes are another product that is dried and packed in large quantities. The mashed potatoes may be dried over a drum and then ground and sifted and packed for quick-cooking mashed potatoes. Quite a lot of potatoes in that form are used. The cubes or strips are precooked too. When potatoes are prepared for dehydration, they are of course lye-peeled in a ten to fifteen per cent sodium hydroxide solution, and thoroughly washed in a drum in water, and then they are carefully trimmed and the undesirable pieces are entirely removed. The peeled potatoes are carefully sorted to remove all the material that is not fit for drying, so the loss in peeling and trimming is very large. Maybe a quarter to a third of the potato is lost in peeling and sorting. It is cut into cubes, or it can be cooked and dried in a drum to make mashed potatoes, or it can be cut into shoestring strips and so on. Commercially, most of the prepared and blanched, diced or shoestring potatoes are put on screen trays about three feet wide and six feet long or three feet by three feet and then put into the drying compartment, where they are dried at a temperature of at most about 160° F. If the dehydrator is six feet to eighteen

Cruess: feet long, at this end it will heat the product to the drying temperature that is used for julienne strip potatoes, will be as low as 110° F. where it goes into the dehydrator and will gradually increase in temperature as it travels through. The finishing temperature, where the product is dried for the last two or three hours, may be 160° F. or 165° F.

For the Army, the dried potatoes are packed with an inert gas to prevent changes in flavor during storage or shipping. But for household use, they are packed in one or two pound cartons, because the housewife doesn't want to be bothered with a large quantity of material. She couldn't use one hundred pounds of dried potatoes. One of the problems with potatoes is the clumping together during drying, and for that reason the tray should not be overloaded. The load for blanched precooked potatoes is one to one and a quarter pounds to one and a half of thoroughly blanched spuds. They are blanched for six to seven minutes. They enter the dryer at about 120° F. and gradually progress to the finishing temperature of 160° F. It usually takes six to seven hours to dry the shoestring potatoes. For the Army, they treated the prepared shoestring or julienne strip potatoes with bisulphide solution. The prepared vegetables passed through a tank of bisulphide solution, but the treatment with sulphur dioxide is unnecessary for the product for household use and wouldn't be desirable, because much of the flavor may taste of

Cruess: sulphur dioxide when the product is treated with a solution of bisulphide. It was necessary for the product for Army use, because it might be a year or two year before the boys got around to cooking the product for use, or be stored and the warehouse might not be open for a year or so.

William V. Cruess--1965

DR. MRAK, DR. JOSLYN, AND DAVIS

Teiser: Was Dr. Mrak a student of yours? Was that how you first came to know him?

Cruess: Yes. As I've often said, we raised him from a pup. We got him when he was a student in food technology and had him in our courses from the time he was a freshman until he was a graduate student.

Teiser: Could you tell when he was a freshman that he was going to be an outstanding food technologist?

Cruess: Only by his grades. He had a very high grade point average. Another one who was even better was Dr. Joslyn. Joslyn and Mrak were both "A" students. Joslyn was in the College of Chemistry, and Mrak was in what is now called nutritional sciences, in the College of Agriculture and Experiment Station. At that time there was no department of nutritional sciences, and we were in the College of Agriculture. The title of our work was food technology. Way back about twenty years ago, soon after World War II, all of the work on food technology was transferred to Davis. Dr. Mrak became the director of food technology at Davis, and some of the other men also went to Davis. I retired at about that time, so I didn't go to Davis permanently. I was there during the

Cruess: three or four years of preparation for moving the department to Davis. Dr. Joslyn decided he didn't want to live in Davis, so he was transferred to the department of nutritional sciences, Mackinney also. Those two were not transferred to Davis. I think the dean should have been hard-boiled and have transferred all of us. I begged off because I was retiring at about that time, and instead of going to the expense of moving from Berkeley to Davis and building a new place to live, I stayed in Berkeley. However I bought a place at Davis and still have it. It has not brought a very large return; it is not a very fancy place, but it is good enough for the location. I planned to expand it quite a bit and put in better storage for dehydrated and canned products.

Teiser: Is this a farm?

Cruess: It's right in town but quite convenient to the University, so I could easily have walked back and forth.

PARTIAL INDEX

BERKELEY: DEPARTMENT OF NUTRITIONAL SCIENCES
313 Hilgard

April 10, 1967

Mrs. Willa Baum
The Bancroft Library
Regional Oral History Office
Room 486
University of California
Berkeley Campus

Dear Mrs. Baum:

I am enclosing herewith five copies of the written agreement covering use of the manuscript. I note that your letter of April 3, 1967, states that any quotation for publication requires the written permission of the Director of the Bancroft Library, and that he will notify me before so permitting. That will be perfectly satisfactory to me.

It will be satisfactory to me for you to make a copy available to the Department of Special Collections Library, Davis Campus. I do not know any other special depositors that should receive a copy, but if you know of any I would be glad for you to authorize any such request.

I am leaving Monday morning from San Francisco air port for Hawaii for two weeks "vacation" with Mrs. Cruess. As you know, I am not in the best of condition physically and if on that account anything should occur to delay or prevent completion of the manuscript, etc., etc., you, Miss Teiser, and our office have my permission to take care of any arrangements, etc., including authorization to transfer to the Bancroft Library reprints, books, etc. that I have planned to place with the Bancroft Library. Our secretary knows where they are located in my office. She, Dr. M. A. Joslyn, and Dr. G. Mackinney of our department know where all such are located and have my full permission to transfer or make any disposition of them that seems desirable in the circumstances. I do not, of course, expect any such "calamity" but I mention this "just in case".

Yours sincerely,

W. V. Cruess
cb

W. V. Cruess
Professor of Food Science
and Technology, Emeritus

WVC:cb

Enclosures

May 4, 1967

Mrs. Willa Baum
The Bancroft Library
Regional Oral History Office
Room 486
University of California
Berkeley Campus

Dear Mrs. Baum:

Since your letter of April 31, I have read the manuscript a second time and made a few additional notes and suggestions. I am transmitting a copy herewith.

I still have to prepare a short statement on the recent happenings in food technology at Davis. The two weeks of vacation in Hawaii was a good antidote for the preceding work on the manuscript.

Thanks again to you and Miss Teiser for carefully reading and correcting the manuscript. It was a colossal task.

Yours sincerely,

W. V. Cruess
Professor of Food Science
and Technology, Emeritus

WVC:cb

Enclosure

May 18, 1967

Mrs. Willa K. Baum
Bancroft Library
Room 486 L
Regional Oral History Office
Berkeley campus

Dear Mrs. Baum:

This will acknowledge your letter of May 7, 1967, stating that it will be at least six months before completion of typing of the bound copy of the W. V. Cruess writings.

I deeply appreciate all that you and Miss Teiser have done in transcribing my notes and the tremendous task of transcribing, correcting and typing of these notes. Because of my illness and very imperfect dictation and correcting, your work has been unduly difficult. You have been completing the task in a very satisfactory (and more than satisfactory) manner. Many, many thanks.

Sincerely,

Wm V Cruess

W. V. Cruess
Professor of Food Science
and Technology, Emeritus

WVC/cz

cc: Miss Ruth Teiser

BERKELEY: DEPARTMENT OF NUTRITIONAL SCIENCES

May 10, 1967

Mrs. Willa Baum
Regional Oral History Office
486 Library
University of California
Berkeley Campus

Dear Mrs. Baum:

The accompanying statement gives the information that you requested concerning the Food Technology building at Davis, California. I shall be glad to furnish any additional information that you may need on this subject.

We have sent to you several bound copies of various reprints and a set of unbound reprints that you may wish to include with the other material for the Bancroft Library file.

Yours sincerely,

W. V. Cruess
Professor of Food Science
and Technology, Emeritus

WVC:cb

Enclosure

The Department of Food Science and Technology at Davis*

For many years it was increasingly evident that research and instruction of food technology in the College of Agriculture should be centered on the Davis campus for the following reasons: The production departments, such as Pomology, Truck Crops, Viticulture and Enology, Agronomy, Animal Science, Dairy Science (now part of Food Science and Technology), and possibly others were located at Davis. Fruits, truck crops, animal products and dairy products are produced and available at Davis. Also fruit and vegetable growers and producers of live stock and dairy products are conveniently located near Davis.

For a considerable number of years Dean Hutchison favored moving the department to Davis and sought from the Legislature and the University administration funds for that purpose. In 1939 the Legislature appropriated $750,000 to construct a building for Food Science and Technology on the Davis campus. The war delayed construction. In 1948-49 an additional $500,000 was requested. The University administration issued authorization to undertake the drawing of plans for the new building. Goodpaster of Sacramento was authorized to draw up the plans.

The principal contract for construction of the building was signed in 1949, and actual construction was begun in 1950. Michael Heller (now

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* The writer is indebted to Dr. B. S. Luh for much of the information on the Food Science and Technology Department in the College of Agriculture at Davis, California.

the Continental Hellor Corp.) of Sacramento was the principal contractor. The plans were drawn by the University architects who also supervised construction. A committee of the Food Technology Department conferred frequently with the architects before and during construction. Construction was begun in 1950. As I recall it, the building was completed and accepted by the University in 1952; and occupied in 1953. It was named Food Science and Technology; later in 1960 it was officially named "Cruess Hall" during a luncheon meeting on the Davis campus on March 19, 1960.

Several years before transfer of the department to Davis, Dr. E. M. Mrak had become head of the department. In 1959 he became Chancellor of the College of Agriculture at Davis. Dr. George Stewart became head of the Food Science and Technology Department until 1963. Dr. R. H. Vaughn was in charge of the department until 1966. Dr. Vaughn recently, 1966, gave up chairmanship of the department and Dr. C. O. Chichester is now the department head.

The building has 65 rooms as follows:

	Number of Rooms
a. Laboratories	18
b. Offices	14
c. Constant Temperature Rooms	4
d. Freezing and Cold Storage Rooms	11
e. Pilot Plant	1
f. Experimental brewery	1
g. Service Rooms:	
Autoclave Room	1
Balance Room	1
Calculator Room	1
Gas Chromatography Room	1
Instrument Room	1
Kjeldahl Nitrogen Room	1
Machine Shop	1
Paper Chromatography Room	1
Photography Room	1
Sensory Evaluation (flavor) rooms	2
Storage Room	1

Supply Rooms		2
h. Special Conference Room		1
	Total	65

Number of staff members in Food Science and Technology, exclusive of those in Dairy Science Building, 21.

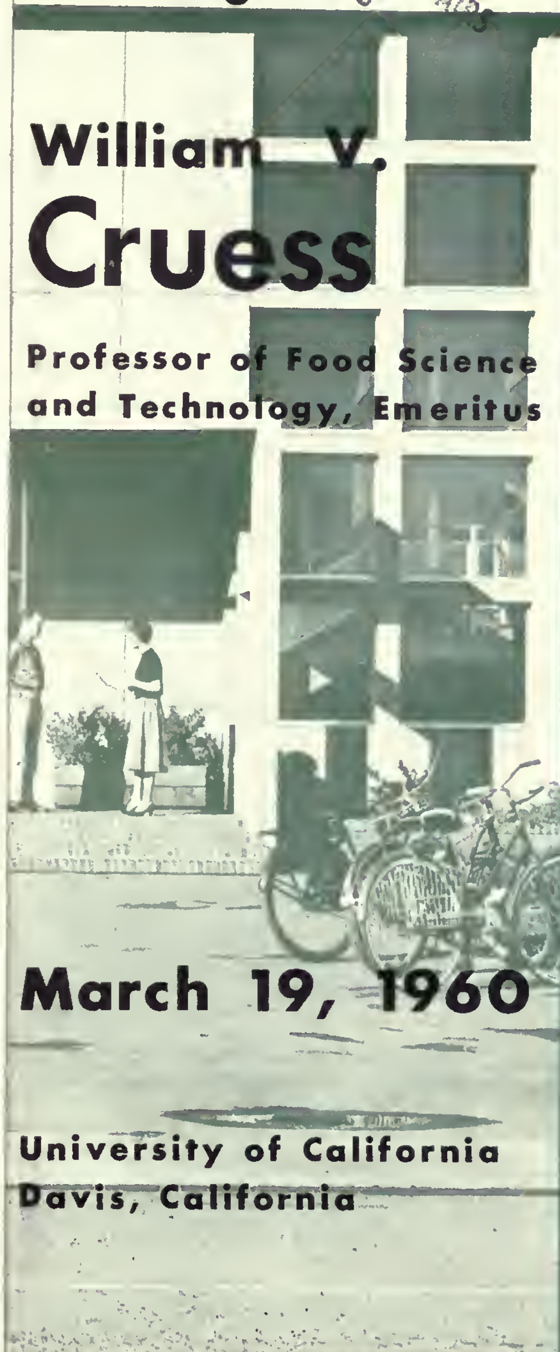
Total number of staff members including those in Dairy Science Building, 32. There is no longer a Dairy Science Department; it has been combined with Food Science and Technology, with Dr. C. O. Chichester as head of the combined department.

Cruess Hall before addition

Honoring

William V. Cruess

Professor of Food Science and Technology, Emeritus



March 19, 1960

University of California
Davis, California

CRUESS HALL

DR. Wm. V. CRUESS

Ruth Teiser

Born in Portland, Oregon; came to the Bay Area in 1932 and has lived here ever since.

Stanford, B. A., M. A. in English; further graduate work in Western history.

Newspaper and magazine writer in San Francisco since 1943, writing on local history and business and social life of the Bay Area.

Book reviewer for the San Francisco *Chronicle* since 1943.