abnormalities which may be confused with it. A preliminary report[7] on this phase of the work follows:

Malformations resembling certain types of crowngall and hairy root have been found at the union of apple root grafts which were made from cions and stocks treated with 1–500 mercuric cyanide, cut with knives dipped in 1–1,000 mercuric chloride, callused in clean sand and planted in steamed soil. Cultural and microscopic examinations failed to reveal the presence of the crowngall organism in these overgrowths. Other experiments have shown that fresh callus on apple grafts is not readily wet by water and have indicated strongly that it is not ordinarily an open infection court for the crowngall organism. These and other field experiments give added weight to the idea, which has been suggested from time to time, that gall-like formations, other than commonly known injuries by nematodes, woolly aphids, etc., may develop on apple nursery stock without the intervention of *Bact. tumefaciens*.

These and other considerations led us to initiate isolation and infection studies with the aim of determining the presence or absence of the crowngall organism in types of malformation found about the union on rejected nursery stock. Such studies are being made on apple trees which were discarded at the nursery because of malformations at the union (supposedly crowngall). So far, over 175 of these trees from seven nurseries in four states have been examined by making five attempts at isolations by the poured plate method, according to a standardized procedure, from the overgrowth on each plant studied. The technique used failed to reveal the presence of the crowngall organism in any of these plants. The efficiency of this technique was tested at frequent intervals upon crowngalls which had been produced by inoculation with *Bact. tumefaciens* upon apple nursery stock or by natural infection of peach or raspberry. Of 29 such plants thus studied, 27 yielded the crowngall organism, the identity of which was checked in each case by positive results from inoculation into tomato. The sharpness of differentiation in these results is surprising to the writers. From the nature of the situation, it would seem altogether unlikely that this degree of sharpness of difference will be maintained in further studies of rejected apple trees from various sources, since eventually a greater or less amount of typical crowngall will undoubtedly be encountered on such material. It is worthy of note that none of the malformations thus far encountered in the rejected apple nursery stock submitted to us for these studies were of the "soft gall" type.

[7] A more detailed account of this work is in process of preparation.

Of the several working hypotheses which might be advanced to conform with these results, the most promising one appears to be that the malformations dealt with on the rejected nursery trees were not induced by the crowngall organism. This suggests the further hypothesis that these overgrowths were merely incidental to the root grafting method employed in the propagation of this material. They appeared to have been associated in their development with imperfect unions and consequent disturbances in the translocation of water and food. Under these circumstances, from what is known of callus development, such malformations might be expected to occur.

In the event that these hypotheses prove to be correct, it appears that the chances of making more accurate diagnoses of crowngall will be much improved, and it may be possible to differentiate from the true crowngall problem an important confusing element. Furthermore, there appears to be promise that further investigation may lead to the satisfactory control of these overgrowths about the union. Such studies are in progress.

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NORTHERN CALIFORNIA CONFERENCE ON SCIENCE TEACHING

DR. EDNA W. BAILEY and Mr. Clyde M. Westcott, Pacific Coast members of the Committee on the Place of Science in Education of the American Association for the Advancement of Science, requested the school of education of the University of California to conduct two conferences on the problems confronting that committee. One was held in Berkeley, under the auspices of the summer session, on July 17 and 18; the other will be held at the Southern Branch in Los Angeles on August 3 and 4.

It was planned to make this a small working conference, composed of those who have certain responsibilities with regard to the teaching of science in this state. The plan outlined by Dr. Otis W. Caldwell, chairman of the committee, was used as a basis for the preparation of the program, which follows:

Friday, July 17

9:30 A. M.: General meeting and organization: *Chairman*, Professor George W. Hunter, Knox College, Galesburg, Illinois. Discussion: "Present situation in science teaching in California. What subjects are taught, where, when, in what year, in what sequence; the training of teachers and the load carried by teachers." Leader: Miss Elizabeth Bishop.

2:00 P. M.: Three section discussions—"The science laboratory; planning and equipping. Standard lists, Costs." Leader: Mr. Clyde M. Westcott, head of science department, Hollywood High School; "The synthetic view of science in relation to organization of courses in high school and college." Leader: Dr. Richard Holman, assistant professor of botany, University of California; "Science and health: What are the scientific fundamentals essential for health education?" Leaders: Dr. J. N. Force, professor of hygiene, University of California; Dr. Agnes Fay Morgan, professor of household science, University of California; Dr. Richard Bolt, assistant professor of hygiene, University of California.

Saturday, July 18

9:30 A. M.: Discussion: "Present-day problems"; "Relation of science teaching to religious education." Leader: Dr. Edna W. Bailey, supervisor of the teaching of science, University High School, Oakland. "How shall we treat the evolution theory in teaching elementary biology?" Leader: Miss Mabel B. Peirson, head of the department of biological sciences, Pasadena High School.

Luncheon, 12:30 P.M.: "Science for the millions." Speaker: Dr. William E. Ritter, president Science Service, Inc.; "Science in the secondary schools." Speaker: Dr. Leonard V. Koos, professor of secondary institutions, University of Minnesota.

Afternoon: Visits to laboratories at University High School.

The date of the conference happened to coincide with the climax of the Scopes trial, and in consequence it received much unexpected and undesired publicity. The conference was well attended and participation in the discussion was general. The following recommendations were unanimously adopted.

The science teachers of northern California assembled in this conference note with interest the following tendencies and needs in the field of science:

The four dominant sciences in the high schools of California are general science, biology, chemistry and physics. Botany, zoology and physiography have been disappearing and there has been a large increase in general science and biology.

There is considerable confusion throughout the state in regard to the desirable sequence of science courses. After considering the tendency in the state and throughout the country, the conference recommends that general science be offered by the junior high schools in the seventh grade and in at least one other year. In the four-year high schools, general science is recommended for the ninth grade. Biology should be given in the tenth grade. It is recommended by the conference that a life science be required of all students in the tenth grade. Chemistry and physics should be offered in the eleventh and twelfth grades. While there seems to be a greater tendency for students to take chemistry in the eleventh and physics in the twelfth, there is not sufficient reason to limit choice in the order of these two sciences.

There is great need for a definition by the College Entrance Board of the subject of physiology as an advanced science for the third or fourth year of high school.

It is recommended that the university offer two elementary courses in each science, one for those who have had high school work in that subject, the other for beginners.

Many teachers are required to teach science without adequate preparation and many teachers prepared in science are required to teach other subjects. From five to fifty per cent. of the teachers in the different schools of California teach some science, and forty-seven per cent. of the science trained teachers are teaching other subjects in the high school curriculum. The conference urges increased attention on the part of high school principals to the assignment of teachers to subjects in which they are properly prepared.

General science and biology constitute a large part of the science in the high schools of the state. Teachers of these subjects have not had proper training. There is distinct need of help from the university in the form of training in subject-matter used in the two courses mentioned. The conference requests the university to provide adequate preparation, such preparation to include courses from the following fields of science: Chemistry, physics, botany, zoology, biology, physiology, bacteriology, public health and nutrition. (There was a general feeling that earth science should also be included.)

In order that science teachers might be better able to realize the possibilities of science in training young people to meet problems of modern life, it is recommended that an extensive and thorough experimental study be made of the science training needed by the individual living in modern society, the selection and organization of subject-matter, and the choice of methods to be used in order to realize these desired ends.

It is recommended that the commissioner of secondary education of California provide a clearing house for laboratory plans, specifications for laboratory furniture, equipment and standard lists of supplies for each of the courses now commonly given in the secondary schools of the state. Also that copies of such material be prepared and made available to all teachers of science who desire them.

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