collection at Nebraska and other institutions is continuing, and it is too early to draw definite conclusions. However, feed-back from students is extremely positive. They do feel that leadership education has made major improvements in their self-perception and ability to lead groups. Many students have already found key leadership positions in Agricultural campus organizations.

College programs in agriculture are faced with a challenge to help develop capable leaders. "The journey of self-discovery into leadership education can be frightening and harrowing. Yet, the person who refuses to take this journey confines their life to a ritual of self-deception; they become a 'hollow person,' one of the many non-persons who, trance-like, notice life but never live it (Halpin, 1966)."

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Using Chronologies in the Training of Students

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Abstract

Excellent teachers are on the alert to methods that can be used advantageously in their teaching. The use of chronologies in the academic training of a student can be effective, especially in science courses. Fourteen ways in which the instructor can make chronological material "come alive" for students are suggested. A sample of a chronology for a course in plant breeding is also presented also.

The use of chronologies in the academic training of a student can be a valuable addition to a science course such as plant breeding, animal breeding, genetics, plant pathology. Justice Oliver Wendell Holmes said, "When I want to understand what is happening today or try to decide what will happen tomorrow, I look back. A page of history is worth a volume of logic."

The author has experienced that period on our campuses in which many students had little or no interest in learning about what had been accomplished before their day. It was not uncommon for a student with this lack of interest to rationalize by saying, "These things have no relevance to me. I am interested only in what is happening now." This viewpoint has been shared sometimes by instructors who make assignments for seminars or papers with the requirement that no literature citations over 10 years old will be acceptable.

There are indications today that the aforestated trend has been reversed. The trend now is toward students learning and appreciating important contributions of others to the science which they are studying. With the proper encouragement from the instructor, students can recognize the relevance of these contributors to their life today.

This paper will cite some things that the instructor can do to make chronological materials "come alive." Specific examples from the author's experience in his plant-breeding course will be presented.

Making the Material "Come Alive"

Wortman and Loftus (8) classify memory into three distinct types: sensory, short-term, and long-term. They state that sensory memory is momentary with a loss of information in about 1 second. It is a clearing house for incoming information. Short-term memory is that type in which information is stored for about 15 to 20 seconds and then lost. Long-term memory stores information that might be needed again. With this type, experiences are not lost when a person stops thinking about them.

Long-term memory is facilitated by impression (using one or more of five senses); by association; and

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by repetition. Learning chronologies can ordinarily be accomplished only through systematic reinforcement of subject matter. One-sentence statements are generally inadequate. An example is Cook's (2) published chronology of genetics in the 1937 Yearbook of Agriculture.

Like any subject matter, the instructor can have an influence, whether good or bad, on the attitude of the student by the way a chronology is introduced and presented. At the First Southern Regional Work Conference on Agricultural Instruction, Dean Chester S. Hutchison, College of Agriculture, Ohio State University, pointed out that two of the major conditions resulting in poor teaching are inability of the teacher to create interest and the lack of enthusiasm by the instructor (3). Some of the ways in which the instructor can make chronological material "come alive" for the student are the following:

1. Develop an appreciation of the historical events and their relevance to the student and to the course. Fulfillment of this prerequisite is imperative to the successful use of chronologies.
2. Prepare an up-to-date hand-out for each student. It is important that recent discoveries be included.
3. Develop and display enthusiasm for the chronology.
4. Relate personal stories in class about the scientists and events listed in the chronology.
5. Show pictures of the scientists. These pictures may be from: a) a personal collection (The author has a group of autographed pictures from the personal collection of the late F. D. Richey. Some of the pictures were made and autographed at the Genetics Congress at Cornell University in 1932.) b) slides or transparencies, and c) books (an example are pictures in Gardner's (4) book). Newspapers use pictures to create interest. Why not put this psychology into use with chronologies?
6. Take time to discuss the scientist's work and its significance. The preface or introduction to each paper in Peter's (7) "Classic Papers in Genetics" not only states the significance of the paper but also states why it was selected. His introduction motivates the reader to study the paper.
7. Use bulletin board to display relevant material. Use test questions to motivate students to read the bulletin board. Assign individuals or groups of students to prepare bulletin-board displays of the chronology.
8. Use individual or group assignments to have students present oral or written reports on what they discovered about the scientist or his work.
9. Prepare and assign a crossword puzzle (5) based on the chronology.
10. Bring objects to class that can be associated with the scientists under study. The author has a copy of Bateson's (1) 1902 book that he takes to one of his classes when the class is learning about Mendel and Bateson. When the class is studying Johannsen and the Pure Line Theory, he often takes a petri dish containing several seeds of the garden bean.
11. Use cassette tapes. An interview of a scientist may be obtained at a national or regional meeting. Another possibility is to send a cassette to the scientist along with a letter requesting some statements that can be used in class on tape relative to his work. Most scientists will be flattered and will be glad to fulfill the request.
12. Arrange for a telelecture or a teleinterview (6).
13. Use movies. An example is the movie, "Gregor Mendel," from the Univeristy of California Extension Media Center. Professor Richard M. Eakin portrays Gregor Mendel in a humorous way as he discusses Mendel's famous experiments. The movie is included in the series, "Great Scientists Speak Again." Another example is "The DNA Story" that stresses the model building of Watson and Crick, their mistakes, and methods of formulating the hypothesis relative to the structure of DNA (John Wiley and Sons).
14. Test the students on chronology.
    a) Instructor might devote an entire written test or a part of a test on chronology.
    b) Instructor might conduct a "chronology bee" patterned after the "spelling bee" in our earlier schools.
    c) Instructor might ask impromptu oral questions in class at appropriate times.
    d) Instructor should use good judgement in determining the weight of the student's chronology performance on his overall quarter or semester grade. The instructor must realize that the chronology is only one part of the course. He must not fall into the trap of "the tail wagging the dog."

Excerpts from a chronology are presented in Table 1 for two reasons: a) as an example of a chronology; b) for use by teachers of plant breeding. The full chronology is available on request. The author uses this chronology in a plant-breeding course (senior and graduate level). Note the word "chronology" is purposefully omitted from the title. The word "discoveries" is used instead of "events."

Table 1. Some discoveries from 1900-1910 and from 1975-1980 in relation to plant breeding.[1]

Year	Discoverer and discovery
1900	DeVries (Holland), Correns (Germany), Von Tschermak (Austria) . Rediscovery of Mendel's paper and supporting data.
ca 1900	Haberlandt. Articulates the theory of producing plants from single cells.
1901	DeVries. Suggests the mutation theory.
1902	(a) W. W. Sutton. Points out relationship between cytological behavior and Mendelian inheritance. (b) McClung. Shows accessory chromosome and sex determination in insects. Relationship between a character and a particular chromosome. (c) Bateson. Publishes his book, **Mendel's Principles of Heredity**, and a translation of Mendel's paper. Cambridge.
1902	Coker Pedigreed Seed Company. Begins a plant-breeding program for the southern United States.
1903	Johannsen. Proposes the pure line theory.
1905	East and Shull (independently). Begin studies on the effects of self-and cross-fertilization. East, corn and tobacco. Shull, corn.
1906	Bateson, Saunders, and Punnett. First case of linkage. Blue vs. red flower and round vs. long pollen in sweet pea.
1908	Nilsson-Ehle. Multiple factors for seed color in wheat.
1909	Emerson. Multiple alleles in beans and maize.
1909	Sylven. Experiments with self-pollinated progeny and windpollinated progeny of Norway spruce.
1910	Morgan and co-workers. The chromosome theory of heredity.
1910	(a) East and Shull. Publish papers on corn genetics. (b) East. Gives Mendelian explanation of quantitative inheritance.
1910	Bruce and (Keeble and Pellew). Hybrid vigor a result of dominant favorable growth factors.
1974	Green and Phillips. Plant regeneration from tissue cultures of maize.
1975	Sommer, Brown, and Kormanik. Plantlets from pine tissues cultured in vitro.
1976	Khorana et al. First to synthesize a gene that does the work of its normal counterpart (tyrosine tRNA in **E. coli**).
1976	Efstratiadis et al. First to synthesize an animal gene (rabbit hemoglobin).
1976	Wright. **Introduction to forest genetics.** Academic Press, New York.
1976	Jugenheimer. **Corn improvement, seed production, and uses.** John Wiley & Sons, New York.
1977	Guzman. Rediscovers a perennial teosinte, **Zea diploperennis**, in Mexico. Hitchcock made the original discovery in 1910. Has same chromosome number as corn and can be crossed with corn.
1978	Berg, Mulligan, and Howard. First transplant of a functional gene from one mammal to another (gene splicing). Rabbit hemoglobin gene ► virus DNA ► monkey cells.
1978	Russell et al. Identify a powerful new mutagen, (diethylnitrosourea, ENU).
1980	Walden. (ed) **Maize breeding and genetics.** John Wiley & Sons, New York.
1980	Cline et al. First successful use of genetic engineering in living animals; transplanted a gene from bone-marrow cells of one set of mice into cells that subsequently populated the bone marrow of other mice.
1980	Fehr and Hadley. (ed) **Hybridization of crop plants.** Amer. Soc. Agron., Madison, WI.

1 **Excerpts from a chronology devised and used by the author in his plant-breeding course at the University of Georgia.**

Conclusions

Yes, fellow colleagues, the use of a chronology can be a valuable asset to your course. Applying the suggestions presented here can make those discoveries that are relevant to your course and students "come alive" in the classroom. To help us begin, we might remember the often quoted words, "The foundation for any achievement is Desire with a capital D".

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