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eggs, but the experiments provide no new evidence on the determination of the worker caste. The results are in accord with a preponderance of the observational and experimental data of numerous investigators.

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THE LAND SNAILS OF WINONA COUNTY

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ABSTRACT

The paper presents a brief account of the species of land snails most common to Winona County, together with a description of some of the environmental conditions in which the various species are most frequently found. *Hendersonia occulta*, fossils of which are abundant in glacial deposits of the last geological period but of which there are few living specimens this far north, has been found occasionally in this area.

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A GENETIC STUDY OF CONGENITALLY MISSING TEETH

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The hereditary lack of teeth in man may not be a detrimental trait, but it is important to many people, particularly those whose features are altered by the defect. A study on dental anomalies has been made possible by aid given by the Committee on Human Heredity of the National Research Council and by the Dight Institute of the University. This is a report on the first one hundred cases of "congenitally missing teeth" which have been collected from approximately 5,000 patients at the University of Minnesota Oral Diagnosis Clinic. Sixty-two of the hundred cases involve only a few teeth, from one to four. Some cases were extreme, lacking from sixteen to thirty teeth, and with one exception are not included in the genetic study.

The incidence of missing teeth varies for the different types of teeth, with the upper lateral incisors (2's), the second bicuspids (5's), and the third molars (8's) being most often missing or peg-shaped. In this study, 1.2% of the people were deficient for the upper 2's, and 0.8% for the 5's. The data on 8's include only those cases which also had other teeth lacking; and 0.8% of the people had that condition. Except in the extreme cases, no individual was found who lacked upper central incisor or lower cuspid teeth. The other teeth were missing with relatively low frequencies.

Missing or peg-shaped upper lateral incisor teeth are usually easily detected. Several genetic studies on the defect have been re-

ported; but the investigators have often differed in their interpretations as to the type of heredity involved. In part, the differences in interpretation may be due to the variations in the expression of the trait. Some individuals lack both of the upper lateral incisor teeth; others lack only one; and others retain one or both as peg-shaped or runt teeth.

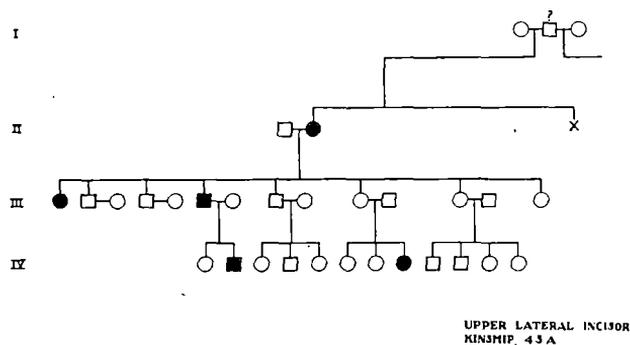


FIGURE I. Inherited Dental Anomaly, Upper Lateral Incisors.

A part of one of the family histories collected in the study is shown in Fig. 1. In the pedigree chart, the people who are known to have missing upper 2's are shown in black. The man in generation I probably had the anomaly, since the defect has appeared in both lines of his descendants. The trait behaves in this family as a dominant, autosomal character. However, in generation IV one child with the defect had parents who are reported to have had a normal complement. The child's mother is dead; and information on her has come from a sister (III-1) who has the defect and is very conscious of it. Probably the mother of the child had no observable spaces in her arch; but it is difficult to know whether the case represents a true "skip" or a layman's misinterpretation. Some arches are small; and the absence of the upper lateral incisors causes the remaining teeth to be evenly arranged, giving an impression of a perfect arch. There is also a possibility that a retained deciduous tooth might have been mistaken for a permanent tooth.

The types of heredity involved in the absence of other teeth are not well determined. Among the persons with missing lower central incisors, some had parents with the teeth present. Whether the deficiency of the lower central incisors is due to a recessive type of heredity or to a dominant with considerable variation in penetrance has not been fully determined. Second bicuspid (one to four) are missing relatively frequently; and the incidence among sibs and other relatives indicates that heredity is a factor. Due to the difficulty in recognizing the anomaly, caused by the variation in expression and by the tendency for the premolar to occupy the space ordinarily

filled by the bicuspid, the collection of family histories is incomplete, and an attempt at present to interpret the type of heredity would only be speculation.

Frequently, a person with one tooth deficiency will also lack another type of tooth. Approximately two-thirds of the ninety individuals with missing teeth, excluding the extreme cases, lack more than one kind of tooth. Sixty persons show anomalies of the upper 2's; but forty-one of them also lack other teeth. Twenty-nine of the forty-one cases involving the 5's are also multiple in nature. Sixteen cases (0.32% of patients) involve both missing 5's and upper 2's, a higher incidence than that expected purely on chance. The indications are that the hereditary tendency often involves a greater disturbance than merely the absence of one kind of tooth. In one interesting history of multiple tooth deficiency, a mother lacks fourteen teeth, eleven molars and three of the second bicuspid; and one of her two daughters lacks all of her molars and second bicuspid teeth. The mother did not know of any other member of the kinship with a similar deficiency.

A hereditary trait may have an increased value in subsequent studies if the trait can be recognized early in life. In dental studies, one wonders how often the deciduous teeth express the anomaly which will occur in the permanent set.

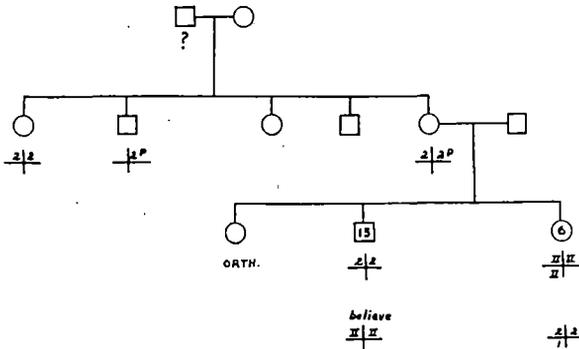


FIGURE II. Missing Upper Lateral Incisors in Deciduous and Permanent Sets.

Figure 2 shows a family history of abnormal upper lateral incisors. Members with the anomaly are shown by the symbol $2|2$, with 2' indicating a peg rather than a missing tooth. The youngest child in generation III lacks the deciduous II's; and x-rays show that she will not have the permanent 2's. The mother reported that the same condition was true for the thirteen year old boy. In another family, a young boy lacks his deciduous II's and x-rays indicate that he will lack his permanent 2's; but there is no information regarding the deciduous sets in the other affected members of the family. However, cases are known in which only the permanent 2's are absent, the

deciduous set being complete. Further study is required in order to determine whether the contrasting conditions for the two sets of teeth indicate variations in manifestation, different times of gene action, or other causal conditions.

Indications of a possible relationship between deciduous and permanent lower incisors have been observed, although the data are too meager for an accurate interpretation. So far, no relationship has been found between the missing bicuspids and the deciduous set of teeth.

Once the types of heredity have been established for the dental anomalies, the traits can be used in linkage studies with other hereditary conditions. By linkage relationships, one can hope for a future advantage in determining the probability that a given person in a kinship will develop a familial diseased condition. Linkage studies in man, or the mapping of genes, are now being made by several investigators.

The desired use of linkage data in man can be best shown by an example. In a family showing hereditary ataxia, a member of generation IV had three ataxic ancestors. In the kinship, ataxia develops at an average age of twenty-four; but a child of an ataxic person cannot feel free until he is at least thirty. The person in generation IV knew that he had a 50:50 chance to become ataxic; yet he produced a child when he was only twenty-six years old. If from linkage studies, the person could have been told that he had a 9:1 chance, for example, to become ataxic, he probably would have postponed the production of children until he had passed the age of onset for the disease.

The dental studies are made to determine the part heredity plays in the development of teeth. They also have broader purposes. The information will be of use to the persons involved, to the dental profession in their care of the deciduous teeth, and possibly to the medical profession in future predictions which will make for early recognition and treatment of other serious anomalies.

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A REPORT ON IMPACTIONS AND CONGENITAL ABSENCE OF TEETH, WITH SPECIAL EMPHASIS ON THE THIRD MOLAR AMONG ONE HUNDRED AND SIXTY-TWO UNIVERSITY OF MINNESOTA MALE STUDENT ATHLETES

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ABSTRACT

The findings presented here are based on a study of X-rays of 162 university students from the athletic department. The study is

limited to the presence or absence of third molars. This group has formerly been reported on in a comparative study with other university students as to cary frequency and strength of the muscles of mastication; also general trends and pattern of congenitally missing teeth in 100 patients from the dental clinic at the School of Dentistry, University of Minnesota.

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STUDIES ON THE EFFECTS OF INDOLEBUTYRIC ACID IN NUTRIENT SOLUTIONS ON THE ROOT MORPHOLOGY OF THE BILOXI SOYBEAN

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ABSTRACT

In these studies previously germinated soybeans were grown in water cultures (containing complete nutrient solutions) and in addition indolebutyric acid in different concentrations. Indolebutyric acid showed a twofold effect on the roots of soybeans. Firstly, indolebutyric acid caused the initiation of a larger number of roots per unit area. Secondly, indolebutyric acid showed an inhibiting effect on the elongation of both primary and secondary roots.

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CYTOLOGICAL STUDIES ON THE EFFECT OF ISO- PRENE ON THE EMBRYOLOGY OF THE CHICK BRAIN

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—and—

M. M. KEITH
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ABSTRACT

The purpose of this study was to determine the effect of the very reactive compound isoprene on the chick brain. In addition to the practical use of this compound and compounds related to it in the