

# Tongue Rolling in the Classroom

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Tongue rolling, the ability to shape the tongue into a longitudinal trough, is a trait that is commonly used in the classroom as an example of human inheritance. This polymorphic trait is easily determined and its mode of inheritance is presumed to be simple.

According to Sturtevant (1940), who first described the inheritance of tongue rolling, the ability to do so is due to a pair of alleles. The ability to roll one's tongue is dominant to the inability to do so. According to this hypothesis, children of tongue rollers can be found to be unable to roll their tongue, but children of non-rollers should always be non-rollers. This was found to be untrue in our classes.

From the pedigrees of hundreds of students, we found a few tongue-roller students whose parents were

unable to roll their tongue and students whose parents were tongue rollers but whose own parents were non-rollers. Intrigued by these results we surveyed the literature that revealed that the ability of tongue rolling is far from being a simple Mendelian trait. Though Hsu (1948) and Garhes (1952) confirmed Sturtevant's original hypothesis, a few researchers had doubts. Matlock (1952) studying 33 pairs of identical twins observed seven pairs who were discordant. From these observations he had to conclude that tongue rolling is not entirely hereditary. Reedy, Szczes, and Downs (1971) compared 193 pairs of identical and fraternal twins. They concluded that the data were inconsistent with the hypothesis of chance fluctuations and that the ability to roll one's tongue was

strongly influenced by hereditary factors. However, Martin (1975) from a comparable study that included 47 identical and fraternal twins did not find any statistical evidence for greater concordance in identical twins. He concluded that there was no evidence for a genetic basis for tongue rolling.

We decided to pool the data of Matlock, Reedy, Szczes, and Downs and Martin (table 1). The Chi Square of the pooled data is 1.89. Because the probability is greater than 5 percent, we have to conclude that there is no evidence for a greater concordance in identical twins. This can be further confirmed by another statistical test, which estimates the differences between the proportions of concordance in the fraternal and identical twins by calculating the con-

TABLE 1. Pooled data of Martin, Matlock, and Reedy, Szczes, and Downs, concordance studies for tongue rolling in samples of identical (monozygotic) and fraternal (dizygotic) twins.

	<u>Both Rollers</u>	<u>Non Rollers</u>	<u>One Roller One Non-Roller</u>	<u>Total</u>
Monozygotic	76	24	22	122
Dizygotic	<u>91</u>	<u>24</u>	<u>36</u>	<u>151</u>
Total	167	48	58	273

Chi-square = 1.89  
p > .05

TABLE 2. Percentage of concordance twin pairs studied by Martin, Matlock and Reedy, Szczes, and Downs.

	<u>Concordant</u>	<u>Discordant</u>	<u>Total</u>	<u>Proportion of Combined Concordance Pairs</u>
Monozygotic	100	22	122	0.819*
Dizygotic	<u>115</u>	<u>36</u>	<u>151</u>	0.761*
Total	215	58	273	

\*The difference between those proportions is not significant (see text).

fidence intervals (Dixon and Massey, p. 232). The differences (table 2) are between -0.010 and +0.126. Because these limits cover zero, there is no sufficient reason to reject the hypothesis that the concordance among identical twins is the same as among fraternal twins.

It is obvious from these results that tongue rolling ability is not inherited as a simple Mendelian dominant-recessive trait. It is hard to believe, however, that this trait is without genetic basis at all because no pre- or post-natal environmental factor that can influence tongue rolling is known. We have to agree with Sturtevant (1965) that more research on

this subject is needed. But we do not agree with Barnes and Mertens (1976) that to teach human diversity we need traits whose modes of inheritance are well known. On the contrary, tongue rolling should be used to exemplify the idea that most human traits are complex and to force the students to reject a common belief that any trait is inherited in a simple dominant-recessive fashion.

## References

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# The Keystone Species Concept

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The Keystone Species Concept, first proposed 10 years ago by Paine (1969), has so far failed to make its appearance in any ecology textbook with which I am familiar. According to the concept, certain individual species populations are the keystone of the community structure and their activities and abundance determine the stability of the community. In other words, the community structure may be viewed as a house of cards; if you remove the wrong card (A Keystone Species), you change the entire structure of the house.

This keystone species may be either plant or animal. If it is a plant, it will probably be a basic primary producer, perhaps a climax species. But if the species is an animal, it is likely to be a tertiary consumer, i.e., a carnivore.

MacArthur (1955) reminds us that not only does community stability improve as the number of links in the

food web increase but also that if the number of prey species for each predator remains constant, then an increase in the number of species in the community will increase stability. Thus a direct relationship appears to exist, that is, increased diversity = increased stability and decreased diversity = decreased stability.

An ecosystem is least stable whenever one species preys upon other species located at the same or a lower trophic level. The ecosystem is most stable when the higher trophic levels prey upon the various lower trophic levels that are available to them. Instability results whenever the abundance of one species affects the abundance of any other species (MacArthur 1955).

Earlier work by Newell (1963) supports the concept of a Keystone Species because it can be used as a valid explanation for the widespread extinctions that occurred at the close of

the Permian, Triassic, and Cretaceous periods or at other times when mass extinctions occurred. These times of widespread extinctions generally affected many quite unrelated groups in separate habitats. But since the health and well-being of a community commonly depend upon a comparatively small number of key species, their absence or demise could lead to the extinction of many ecologically dependent species.

Major floral extinctions have not coincided with the major faunal extinctions. The three principal land floras, the ferns and mosses, gymnosperms, and angiosperms, appeared during a short time-span of rapid evolutionary development then followed by long periods of stability. Fossil plants, good indicators of past climatic conditions, do not provide evidence to support climatic change as a reason for the widespread extinctions in the animal kingdom.