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The Sophistical Tongue Map

I remember when I was a little girl, in Kindergarten or so, I was taught the tongue map. The tongue map is a map of different sections of your tongue where you can taste different flavors, like salty, sweet, sour, etc. I remember specifically doing one or two projects about the tongue map in primary school. The tongue map was drilled in my head. It wasn't until my senior year of high school, when I decided to take human anatomy and physiology, when I discovered that the tongue map was, in fact, a myth. The tongue map has been century-long mistranslation and misinterpretation of information which inevitably led to years and years of students around the United States being taught wrong concepts.

The tongue map misconception was created in the paper *Zur Psychophysik des Geschmackssins* in 1901 by a German scientist by the name of David P. Hänig. Hänig's purpose of this book was to experiment on the different sensitivities and fungiform papilla (FP), more popularly known as taste buds, densities across the tongue's surface (Feeney and Hayes). He did this by dropping a series of different types of taste (sweet, salty, sour, bitter, etc.) on different areas of the tongue. He believed that the sensitivity and FP density is at its most at the tip and edges of the tongue (what he called the "taste map") (Munger). His hypothesis was concluded correct, as the inner parts of the tongue took a longer time to register the taste but that wasn't what was wrong about Hänig's conclusions. What was wrong was the misrepresenting of

information, which inevitably created the tongue map myth. As a writer from the Center for Smell and Taste at the University of Florida, Steven D. Munger says, “It was more of an artistic interpretation of his measurements than an accurate interpretation of them. And that made it look as though different parts of the tongue were responsible for different tastes, rather than showing that some parts of the tongue were slightly more sensitives to certain tastes than others.”

(Munger). What makes matters even worse though is a representation of the tongue map made by Harvard psychology professor Edwin G Boring in the 1940s in his book *Sensation and Perception in the History of Experimental Psychology* (Munger). This lead to an even bigger uproar in miscommunication of information through the masses by being “presented in a way that made people think that each section of the tongue had large differences in its ability to taste flavors” (Marshall). Throughout the years, information had been passed on and altered which led to the masses believing that only each part of the tongue could only taste one flavor.

The truth behind the tongue map is the higher concentration of FP (tastebuds) on different parts of the tongue. When Hänig first presented his information, he meant to come across that the concentration of FP differs around the tongue, so you are able to taste more intensely in these more concentrated areas, not necessarily that every taste has a designated area on the tongue. These areas of higher concentrations of FP are located on the tip and sides of the tongue. Another reason for a higher sensitivity at the tip and sides of the tongue is one of the two cranial nerves responsible for taste perception called the chorda tympani branch of the facial nerve (Munger). This nerve is located underneath the surface of the tongue at the tip and sides of the tongue which causes a higher intensity of taste at these areas. Though there is a minor difference in different sections of the tongue that can taste different flavors more intensely than the others, this difference is so minute that it is of no significance in scientific research and experiments.

Since Hänig's findings and Borings reinterpretation, scientists have now found a fifth taste named *umami*. *Umami* is a term that means "savory" in Japanese and "it is associated with the flavors in meat, seaweeds, and ripened cheeses" (Kalumuck). Recent experiments done suggests that sensitivity of *umami* is most found at the base of the tongue. This also supports Hänig's findings of a spike of sensitivity to bitterness also at the base of the tongue. This shows that the highest concentration of FP on the areas of the tongue map may not be the only reason for sensitivities of tastes. This leads to the finding of a second cranial nerve responsible for taste perception, the glossopharyngeal nerve. This nerve is located at the back of the tongue, and is responsible for the sensitivity of bitterness and *umami* at the base of the tongue. This further research shows that the modern-day tongue map, the correct version only showing levels of sensitivity and concentration of FP, does not only have the highest sensitivity at the tip and sides of the tongue, but also at the base. So, picturing it, the tongue map looks like a big outline of the tongue.

Scientists, more recently, like to argue the integrity of the tongue map. There have been recent studies, in which the chorda tympani is numbed and test subjects are given sweet stimuli. Not only can the subjects taste sweetness but, in some cases, subjects report that the sweetness was even more intense. This of course disproves the original misrepresented tongue map, but it does not in any way disprove the correct modern-day tongue map. The tongue map proves that you can taste flavors most intensively at the tip and sides, not that you only have FP (taste buds) on the tips and sides. So, numbing the chorda tympani in theory should decrease the intensity of a flavor, not remove the ability to taste it in whole. Some scientists also claim that the findings of a large sensitivity of *umami* and bitterness at the back of the tongue attacks the integrity of the tongue map, since when Hänig first made his claim, he only supported the largest concentration

of FP and sensitivity at the tip and sides of the tongue. One should look at it not necessarily as the information found on bitterness and *umami* “debunks” or contradicts the tongue map, but as since we have found more information over the years, the tongue map has simply shifted or altered. Karen Kalumuck from the Exploratorium Teacher Institute states that sensitivities on the tongue will “vary somewhat from person to person,” of course, but generally, the tongue’s highest sensitivities are going to make an outline around the tongue. While it is true that tongue maps may differ from person to person, it does not necessarily follow that it invalidates the modern-day tongue map. Differences in tongue maps between different people are so minute that it cannot invalidate the tongue map. And if there are outliers within the tongue map statement, these outliers would be so insignificant compared to the population who does have a tongue map of that of an outline around the tongue, that it becomes not enough proof to discredit the tongue map.

Yes, the tongue map is a real, correct matter, but what scientists now know as a tongue map is not the same misconception a majority of the population was taught years before. The tongue map that is more popularly known, that only certain sections of the tongue can taste certain flavors, is false. But what is true, is what Hänig originally was trying to present: a tongue map in which the tongue has the highest sensitivities at the tip and sides of the tongue. Though, information has altered throughout the year to account for the taste *umami*, the tongue map has not been proven wrong, better yet the locations on the tongue have been altered.

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