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GUSTATORY AUDITION ; A HITHERTO UNDE- SCRIBED VARIETY OF SYNÆSTHESIA.

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During the lifetime of this *Journal* there have appeared on its pages a goodly number of cases presenting one or another of the various forms of synæsthesia. While such accounts do not yield any facts of profound import for psychology, they do yet have their distinct value in impressing us with the myriadfold divergencies of human nature, and it is just for this purpose of contributing to the 'varieties' of mental experience that the following case is presented. As far as I can ascertain, its peculiar variety is new in the annals of synæsthesia. Its singularity consists, I may say at once, in the experiencing of gustatory qualities following upon the hearing of words spoken by the human voice, or of musical and other non-vocal sounds.

As it stands, however, the statement just made is by no means a correct description of the case. Perhaps the best way of putting the matter would be to say that the word 'gustatory' must here be taken in a very wide sense as referring to all the possible experiences that the sense organs of the mouth can give. To speak with full accuracy one must say that a 'mouth-experience' of one sort or another is the accompaniment of certain auditory impressions. These 'mouth-experiences' include the four taste qualities, the cutaneous qualities of pressure and temperature, and such tactual-motor qualities as find their expression in designations of texture, consistency, and the like. Now it is only because we have no single adjective by which we commonly describe this variety of possible mouth-experiences that the word 'gustatory' is here used with the latitude indicated. Its use enables us to avoid an uncouth terminology, and with the explanation given no obscurities are likely to arise. One further fact should be added. Olfactory qualities are entirely absent from the synæsthesia, and we are concerned, therefore, with pure 'mouth-experiences' without any of those numerous fusions which popularly pass for 'tastes.'

Hitherto we have had descriptions, plentiful enough along certain lines, of colored sounds, odors, tastes and temperatures, and of total pain, pressure, and temperature. But I am not

aware that we possess any records recounting the type that I have just indicated.

I.

The subject of the case in question is a young woman, now about to graduate from college, who, as far as she can tell, has always had these experiences, the fact that they were peculiar to herself first coming to notice about four years ago. Since that time their number and definiteness have somewhat increased, owing to the numerous questions put to her by her companions as to the 'taste' of this or that name or word. But though the experiences have increased in number, I am convinced that they have not lost their original naïve character, as the facts to be cited will, I hope, show. The case has been under my observation for somewhat over two years.

Two sense defects of the subject should be noted. First, there is a slight deafness, or slowness of hearing, which becomes more pronounced at some times than at others. Secondly the subject is anosmic. No rigid tests have ever been made to determine whether the sense of smell is entirely wanting, but medical examination directed to the sense of hearing revealed a thickened mucous membrane of diminished sensitiveness, and the subject herself believes that her anosmia is complete. Coffee burning upon a stove is not noticed, though she may be close by. Camphor placed in the nostrils gives only a stinging sensation. Ammonia can be sniffed without discomfort. And, as with all anosmics, foods are discriminated on the basis of the pure taste qualities, or by the characters of texture, astringency, and so on, which any food-complex may possess. These sensory defects are worth noting for their possible significance in connection with the theory of this special case of synæsthesia.

The following list of the 'gustatory' equivalents of spoken words was in part compiled at my request and in part written down by myself in the course of various interviews with the subject. In the latter case the words were spoken by me, and almost immediately the equivalent was given in concise, discriminating terms. Only occasionally was there some hesitation and a groping after the name of the precise food which descriptively satisfied the subjective experience. Because of the unusualness of the case, it has seemed best to transcribe in its entirety the list of 150 words that is before me in my notes.¹ The only change made is the arrangement of the words in their alphabetical order.

¹ Some further equivalents may be found in Table V.

TABLE I.

Gustatory Equivalents of Words Heard. (English.)

Ah!	Something soft.
Albert,	Not definite.
Alice,	Spanish Cream, with sprinkling of sugar.
Alfred,	Corn-bread in milk.
amethyst,	Bitterness.
Amy,	Ketchup (especially vivid).
Anne or Annie,	Apple sauce stiff with sugar.
Austrian,	White frosting on cake.
Arthur,	Small particles of delicate meat, probably lamb.
Bailey,	Marshmallows.
beast,	(see 'ease').
Belfast,	Juicy beefsteak.
Ben,	Like biting something, as if taking celluloid between the teeth.
Benjamin,	Spice cake (dark).
Bess,	Crumbs of butter. Cool.
Blanchard,	Dried catnip.
box,	Nothing definite.
boy,	Gum drops.
Browning,	Rather rich. Inclines to bitter. Might be over-done gingerbread.
Buddha,	A taste of its own, vivid but indescribable.
Cæsar,	Dry meat.
Carrie,	Onions or asparagus cooked in milk.
cause,	Hot, soft corn-bread.
Charles,	Buttered toast, not dried through.
Clara,	Lobster claws.
cox,	Sensation of irritation in throat.
crease,	Baked sweet potato with much butter.
dice,	Cool, salty.
discrete,	Warm new cake.
distinct,	Preserved pears.
Dolly,	Molasses candy, moist, fluid, taffy-like.
Dora,	Hash.
Dorothy,	'Velvet' molasses candy.
doubt,	Raw apples.
Dwight,	Beefsteak, brown, a little burnt. Or, spruce gum.
ease,	Not clear at first. Then, dry meat, when spoken quickly and sharply. If spoken more slowly, softer, pliable, creaky, like puffed rice.
Edith,	Potato soup.
Edgar,	Boiled eggs, with suggestion of the shell.
Edna,	Boiled eggs.
Edward,	Soft eggs.
Eleanor,	Chicken 'stuffing.'
Eliza,	Piece of twine in mouth.
Elizabeth,	Shreds of well-done roast beef.
Elsie,	Corn-bread in milk.
Emma,	Pie crust.
Eulalia,	Eu=olives. lalia=cooked fruit or jelly.
Eunice,	Intensely sour. Draws the jaws so that there is decided pain.
Eve,	Meat of nuts.
Ethel,	Sensation of putting thimble on tip of tongue.
Evelyn,	Fresh catnip.

fancy,	Cold Boston Baked Beans.
fast,	(see 'Belfast').
feast,	(see 'ease').
Fillebrown,	A serial experience. Water, then, quickly, ginger-bread.
Florence,	Maple sugar.
found,	Lamb.
Francis,	Baked Beans.
French,	Charlotte Russe.
George,	Something thick, like a charcoal tablet.
Gladys,	'Velvet' molasses candy.
grin,	French toast, or fried bread.
Hall,	Like rubber end of pencil pressed against tip of tongue.
Hannah,	Dry, nut-like.
Harriet,	Cooked cherries, inclined to bitterness.
Harris,	Nothing.
Harry,	Nothing definite.
Hawthorne,	Agreeable, little sweet, little bitter, smooth, elusive.
Helen,	Blanc mange.
Helene,	Raw oat meal.
he,	Dry meat.
Henry,	Celery.
Hi!	Something cold.
hope,	Celery.
ice,	Like itself.
idle,	Thin, salty broth (lamb?).
Inez,	Boiled cabbage (or greens) with vinegar.
intelligence,	Raw sliced tomato.
interest,	Stewed tomato.
Irving,	Rich sort of word. Cottage pudding with thick, sweet sauce.
Italy,	Very small white pickled onions.
James,	Dry, brittle.
Jessie,	Cool, round rolling pieces, possibly nuts.
John,	Crust of soft, moist gingerbread.
Josephine,	Oranges.
Joy	Rich cream candy.
Joyce }	
Judith,	Shreds of very salt boiled ham.
Katherine,	Tea grounds, or spices.
Kitty,	Soft inside part of a baked apple.
Lena,	(see 'Helene').
Lida,	Mutton tallow.
light,	Soft juicy lobe of a grape, when spoken quickly. Chicken gravy, when spoken slowly.
Lillian(=Lilly),	Sweet apple jelly.
Lola,	Stewed prunes.
loud,	Boiled new potato.
Louise,	Bananas.
Luke,	Not definite.
Lulu,	Floating islands.
Mabelle,	Maple sugar.
Margaret,	Lima beans.
Maria,	Dry browned part of custard.
Marion,	Meat of walnuts.
Marjorie,	Rich cream candy.
marry,	Raisins.
Mary,	Stewed blackberries.

Maud,	Yolk of eggs in salad.
men,	Hash.
Miriam,	Cool, pleasant.
moccasin,	Chicken.
Molly,	Sweet custard.
Nancy,	(see 'fancy').
Newcomb,	Ginger cookies.
noise,	Cold camphor-ice.
Oh!	Sweet.
Oo!	The dip of milk toast.
ox,	Nothing definite.
parlor,	Honey on bread. (Especially vivid.)
Patrick,	Nothing definite.
Phœbe,	Small pieces. Walnuts broken up.
Pierce,	Crisp, fatty part of fried bacon.
Polly,	(see 'Molly').
Rachel,	Ginger cookies.
Ralph,	Moist, cool. Raw cucumbers. (Vivid.)
rejoice, }	Rich cream candy.
Royce, }	Like itself.
rice,	Sweet, spicy, as if fumes were passing up through
Rosalie,	the nostrils.
Rosamond,	Almonds.
Ruth,	White grapes.
Sampson,	Potato salad. (Vivid.)
Sarah,	Cold metal between the lips.
Savage,	Raw apples.
Scott,	Skin of a baked apple.
Silas,	'Si' is indefinite. 'las' is candy.
Stella,	Celery.
story,	Stewed cranberries.
Susan,	Milk toast.
Tabby,	Bananas.
Tappan,	Nothing.
town,	Tongue.
tox,	(see 'cox').
tress,	(see 'Jessie').
Union.	Olives.
Uriah.	(see 'Maria').
Vivian,	Moistened bread.
who,	Thick, salty cream.
William,	Cool, clear water.
women,	Hash.
Zechariah,	'Zech' is something hard.
Zedariah,	'diah' is something stiff, then yielding.

It should be clearly understood that the equivalents above given are meant in each instance to refer to the fact that the subject feels as if she were actually having in the mouth the described substance or some substance possessing the quality indicated.

An examination of the list will reveal the fact that all the possible qualities of gustatory, cutaneous, and tactual-motor experiences are represented. Very rarely, if ever, are the experiences confined to isolated qualities. Rather they are com-

plex, often highly so, but no more complex than the real experiences would be. A few words are gathered together here, in order to show clearly the presence of the several different qualities.

TABLE II.

Representative words yielding the various sense qualities.

Sweet: Dolly, Irving, joy, parlor.

Sour: Eunice, Inez, Italy, Josephine.

Salt: idle, Judith.

Bitter: amethyst, Browning, Harriet.

Cold: noise, Sarah, William.

Hot: cause, discrete.

Pressure: Ethel, Hall.

Pain: Eunice.

Tactual-motor: Ben, Bess, Clara, Kitty, John, Phœbe.

The color characterizations, as, for example, in the equivalents of Austrian, Benjamin, Dwight, Italy, and Ruth, are inserted solely for the purpose of more exactly describing the object referred to. They must not be taken to indicate the presence of subjective photisms accompanying the other experience.

These synæsthesias are often experienced in the ordinary course of listening to conversations, lectures, etc. Short sentences do not behave as units in producing 'tastes,' but sometimes the compound words will be effective, causing the appropriate 'tastes' to appear serially. Similarly, long words frequently behave in this fashion, parts of a word evoking quite distinct and separate 'tastes.'

The speed with which a word is pronounced is sometimes an important condition. Thus the word *light* pronounced quickly, with little accentuation on the vowel, equals "the soft, juicy lobe of a grape;" pronounced slowly, with vowel prolonged, it equals "chicken gravy." And *ease* gives "dry meat" when spoken quickly and sharply; while, if spoken more slowly, its equivalent is "something softer, pliable, creaky, like puffed rice." It follows from this that the same word has different 'tastes' when spoken by different individuals. There is no evidence, however, that in general vowels are the more influential parts of words.

The direction of the experience is always from sound to 'taste,' the reverse being possible only as the connections are remembered.

When requested to state the gustatory equivalent of a word, the subject will frequently pronounce the word to herself before making reply. Enquiry as to the purpose of this elicited the fact that such pronunciation serves often to reinforce the auditory excitation and thus make the gustatory qualities more vivid and more readily describable.

The best condition for the appearance of the synæsthesia seems to be a state of natural hunger. Thus a noon lecture arouses distracting and, since the 'tastes' are in no way satisfying, extremely tantalizing experiences, as does also table conversation before the subject herself is served with food. When faint or jaded, the synæsthesia is less pronounced. The presence of food in the mouth does not interfere with the vividness of the experience.

II.

With the exception of knowing that high piano notes gave a banana flavor, the subject was not aware that any sounds other than proper names and English words were involved in her synæsthesia until special tests were made. The following Tables present the results of these tests, in which nonsense syllables, foreign words, and non-vocal sounds were used. These Tables are self-explanatory and need no special comment.

TABLE III.

*Further Gustatory Equivalents of Vocal Sounds.*Nonsense Syllables.¹

bik,	Something stiff and brittle.
bod,	Something sour with the texture of a pickle.
dep,	Meat, roast beef, well done.
dob,	Something soft, smooth like silk.
gur,	Sweet, like spice cake, crumby, dry.
hes,	Small particles, minced meat.
lor,	Liver.
niv,	Something with the texture of cooked pears.
sut,	Mutton fat.
tof,	Something sweet. (At back of mouth, on palate.)
vux,	Something stiff, about like Graham crackers.
yoz,	White part of egg beaten stiff. (Texture vivid.)
zaf,	Meat flavor, salty, hard, probably corned beef.
zod,	Something damp and solid.

Italian Words.

canto,	Sweet, stiff, hard, splintery candy.
vita,	Something crunchy and sour.
nostra,	Something soft and agreeable.
cammin,	Something stiff and hard with caramel flavor.
del,	Something sweet, pleasant, cool, clear, delicate, like milk that has been poured over a baked apple.
mezzo,	Olive oil.

French Words.

dont,	Something sweet, dry and rough.
exemple,	Something with the texture of felt.
une,	Something sour and juicy.

¹ The following yielded nothing whatever: biv, dik, hed, lat, lim, mup, sax, tem, tez, vaz, vip, wal, wat, yez, yol, yux.

<i>montrer</i> , ¹ <i>aucune</i> ,	Custard-like, salty, an omelet. Dry fragments or crystals of something, like lumps of camphor.
German Words.	
{ Ge- stalten, schwankende, wieder,	Gum. Something rich and sweet. The filling of squash pie, soft and sweet. Something stiff, with quality of pop-corn, mildly sour.
<i>gezeigt</i> , Blick,	Something soft, not very pleasant. Something stiff, dry and tasteless, like raw macaroni.
{ trü- ben, dem, einst, sich, früh, die, zu, fest, dies, mal, wohl, { Ver- such,	Something sweet and delicate. Something brittle between the teeth. Cooked cocoanut. Something a little salty. Soft shreds of meat, moist and oily. A clear sweet juice. Something stinging and fizzy. Gravy. Something sweet. (Like English 'ease' and 'beast'). Melted butter. Something rich, overrich. Cooked apple, as in pie, drier than in baked apple. Gravy.

TABLE IV.

Gustatory Equivalents of Non-vocal Sounds.

Various Musical Instruments.	
A D tin whistle,	A clear sweet flavor, like Christmas candy or sugar and water. The higher the note, the less pronounced the sweet.
A C mouth organ,	Sweet and peppery at the lowest notes. The sweet increases for one-third of the upward range and then diminishes. The peppery flavor rapidly decreases and vanishes one-third of the way up.
Tuning forks, 256 vibrations, 512-1024 "	As if warm air were resting upon the tongue. Warm, and clear sweet; the former ceasing at the fourth note and the latter steadily diminishing.
Piano, A ₂ -E ₁ , E ₁ -F, F - g, g - c ⁴ , c ⁴ - c ⁵ ,	Like toast soaked in hot water. Sweet, rather strong (like licorice)—a troche. Mild, gravy-like. Banana (smooth, slippery). Thin, insipid.
Violin, Lowest three notes, From there up,	Troche flavor. Grows sweeter, loses strength, becomes clear, delicate and sweet in flavor.
(Several other less important instruments gave results more or less similar.)	

¹ The italicized portions of words contributed nothing to the 'tastes' experienced.

Noises. Several dull, flat noises evoked nothing. The rubbing of a nail on a file evoked an experience of temperature in the mouth, this being hot or cold according to the kind or degree of scraping.

III.

But what evidence have we that an actual case of synæsthesia is here being reported, and not a case of artificial association due to a lively dramatic fancy? This is a point that must be raised, for it is very easy to entertain a suspicion that these phenomena are essentially ungenueine. Now, of course, in matters of this kind general impressions and personal knowledge of the subject count heavily. And on both these grounds I have no hesitation in asserting my conviction that the above-cited equivalents are the expression of a genuine synæsthesia. But since such personal impressions are sometimes unlikely to carry conviction to others, there are, fortunately, several considerations of a less personal nature which can be brought forward. The following facts are more compatible with the theory of synæsthesia than with that of mere suggested imagery. (1) The subject herself, an accurate, careful and discriminating person, testifies that the 'gustatory' part of the experience comes quite unsolicited. It is *found*, not manufactured. This, it is affirmed, is unquestionably true now and as far as can be recalled it has always been so. In support of this account of the matter the following instance is given as illustrative. The subject, while at work in the library, finds herself tasting roast beef. Casting about for the auditory cause, she hears the murmur of men's deep voices coming from an adjacent alcove. (2) The food-equivalent of the 'gustatory' qualities experienced must often be sought for with some diligence before an adequate description of the matter can be given to the questioner. That is, the experience and the naming of it in terms of a given food are quite distinct affairs. This search was repeatedly evident in the course of obtaining the several lists, and occasionally, in fact, only the qualities themselves were given. Added to this is the fact that, as the subject reports, "some words produce a 'taste' which I seem never to have experienced before either in the pronouncing of words or in eating. Thus the equivalent of *Buddha* (the only specific instance recalled by the subject) is said to be "vivid but indescribable," suggesting olives, but not to be designated accurately by any known food. These facts are to the subject herself most strongly confirmatory of the correctness of her introspective analysis. (3) Many of the experiences are given quite definite locations in the mouth. Thus the equivalents of *Ethel* and *Hall* (tactual) are felt at the tip of the tongue; of *tox* (irritation) at the back of the

throat; of *Judith* (salt) at the sides of the tongue; of *Sarah* (cold) on the lips; of *amethyst* (bitter) "at the back of the mouth, on the roof, where the root of the tongue seems to hit it;" of *Hi* (cold) at the rear of the tongue; of *Miriam* (cool) on the anterior surface of the tongue; of *dice* (cool and salt) along the edges of the tongue; of *Florence* (sweet) over the tongue as a whole; of *Harriet* (bitter) across the rear of the tongue. As to the acid equivalent of a word, the subject says the effect is sometimes to "draw the jaws together." The sour is located along the edges and at the sides of the tongue. (4) When in doubt, the subject has a way of slightly pressing the cheeks inwards with the fingers until the satisfactory equivalent comes. This points to the sensory rather than to the imaginary character of the phenomenon. (5) The erratic nature of the matter, many words and sounds evoking no 'tastes' whatever, is precisely like that of the well known synæsthesias. (6) The subject testifies that the experience has a character intermediate between the reality of sensation and the unreality of fancy, imagined tastes seeming to be "in the head" rather than in the mouth. And (7) the equivalents possess a constancy which would hardly be possible apart from a true synæsthesia. After an interval of six months a number of words were given at random from the original list, with the result that the identical equivalents were described in almost precisely the same language.

IV.

In the hope of getting some basis for a theory of this case an examination of the data was next made with a view to ascertaining whether similarities of sound are connected with like 'gustatory' complexes. I may say at once that no great success attended this examination. (a) As a preliminary experiment I chose certain monosyllables, as given in the list below, representative of labial, dental, and other word elements, and pronounced them as distinctly as possible to the subject. The variety of 'gustatory' qualities given under each class shows that *articulatory similarity is not paralleled by 'gustatory' similarity*. This negative result is not, however, without value, since it may be taken to be confirmatory of the fact that the true excitement of the 'gustatory' qualities is auditory and not articulatory in character.

TABLE V.

Equivalents of Words Similar in Articulatory Character.

	Babe,	Elusive, cool.
	Pipe,	Cool.
(Labial)	Maim,	Quite salty. Fumes pass through the nose.

(Labial)	Valve, Fife, Did, Cease=ees=ease,	Soft. Melted molasses candy. Cool, slightly sour. Stewed tomato. (See Table I).
(Dental)	Thin, Tent=content, Church,	Not definite. Stiff, sharp, candy. Meat, soft, lamb.
(Palatal)	Cake, Gag,	Like itself, but stiff cake. Cool. Nothing.
(Nasal)	Sing, Nun,	Gingerbread, spicy, warm. Strong. Dry baked beans, à la New York.
(Lingual)	Lul, Far,	Trifle sour. Meat, beefsteak, not very juicy.

(b) The auditory similarities yielded, upon examination, a few fairly well marked correlations, but not a sufficient number to be at all satisfactory. Occasionally a prominent vowel sound seems to be effective in various settings. Thus *Ool*, *who*, and *Susan* all suggest the eating of milk-toast; *he*, *ease*, and *Cæsar*, dry meat; *William*, and the first two syllables of *Fillebrown*, water; *Edna*, *Edgar*, and *Edward*, boiled eggs; *Bess*, *Tress*, *Jessie*, small pieces of something (*Phæbe*, however, does the same); *joy*, *Joyce*, *rejoice*, *Royce*, and *Marjorie*, rich cream candy (though *boy* 'tastes' like gum-drops). On the other hand *Dolly* does not wholly agree with *Polly* and *Molly*; and *Hi!*, *dice*, *fife*, *idle*, *Inez*, and *pipe*, though suggesting cold more than any other quality, are connected irregularly with both salt and sour. Still more distracting is it to find that identical 'tastes' are joined to very diverse sounds. Thus one 'gustatory' equivalent does duty for all members of each of the following groups: *Henry*, *Hope*, *Stella*; *Dora*, *men*, *women*; *Alfred*, *Elsie* (though *Albert* is indefinite); *Newcomb*, *Rachel*; *Florence*, *Mabelle*; *Dorothy*, *Gladys*; *Louise*, *Tabby*. From a careful examination of the entire list from which the above examples are taken I am convinced that it is idle to seek any rigid uniformity of connection between given auditory qualities and their 'gustatory' equivalents. And, indeed, perhaps the very complexity of both items of the experience would render this search fruitless, even if definite correlations existed.

V.

In attempting to decide whether the above-cited experiences are to be explained by the physiological or by the psychological theory, we are, apparently, in no better and in no worse case than in respect to all varieties of synæsthesia. No decisive facts are at hand. In this regard and in all essential respects, the phenomena here are typical, as any one acquainted with the literature of synæsthesia must have recognized. To conjecture that the subject's sensory defects—deafness and

anosmia—are directly or indirectly responsible for this special case, these being perhaps indications of a more or less extensive cross-circuiting of cortical currents in the regions concerned, is, after all, to indulge in mere speculation. It is, however, alluring to think that the slowness of hearing is due to the deflection of neural tensions from the appropriate auditory centres of the cortex into those regions that subserve the sense impressions of the mouth. This conjecture would be substantiated in a measure if it could be found that a decrease of auditory acuteness is accompanied by an increase in the number and vividness of the synæsthetic experiences. For upwards of a year the subject has had this particular problem before her, and although an increased vividness of the 'gustatory' phenomena does sometimes accompany the diminished acuteness of hearing, she is not willing to assert that this is not due to a more careful directing of the attention upon these phenomena. As the matter stands, therefore, this particular conjecture must be looked upon at present as lacking the desired support. Nevertheless, one who inclines, as does the present writer, to the physiological as contrasted with the psychological explanation of synæsthesias in general may find good evidence for the former, it seems to me, in the facts above cited concerning the constancy of the gustatory equivalents; the dependency of the experience upon individual fashions of pronunciation; the repeated difficulties in putting the experience, itself perfectly definite and vivid, into words which adequately describe it; and, lastly, the frequency with which the 'tastes' can be given precise localizations within the mouth. Still, here no less than in all known cases of synæsthesia, we can only regret that our theory is so lame while our facts are so secure.