

Discussion of the De Generatione Sonorum, a treatise on sound and phonetics by Robert Grosseteste

*Original*

Discussion of the De Generatione Sonorum, a treatise on sound and phonetics by Robert Grosseteste / Sparavigna, Amelia Carolina. - ELETTRONICO. - (2012).

*Availability:*

This version is available at: 11583/2505179 since:

*Publisher:*

Scribd

*Published*

DOI:

*Terms of use:*

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

*Publisher copyright*

(Article begins on next page)

Scribd, 2012, 5 December

## **Discussion of the De Generatione Sonorum, a treatise on sound and phonetics by Robert Grosseteste**

**Amelia Carolina Sparavigna**

Department of Applied Science and Technology, Politecnico di Torino,  
Corso Duca degli Abruzzi 24, Torino, Italy

*Here I am proposing a translation and discussion of the De Generatione Sonorum, one of the short scientific treatises written by Robert Grosseteste. The subject is the sound and the phonetics. In this treatise we find a discussion of oscillations and elasticity of materials and the description of some motions and their combinations too.*

Robert Grosseteste, an English scientist and philosopher of the Middle Age, who was Bishop of Lincoln from 1235 AD until his death, on 9 October 1253, wrote several short treatises. Recently we have discussed the De Iride, on optics [1]. Here we propose the translation and discussion of another short paper on sound and phonetics, the “De generatione sonorum”. In fact, the sound is shortly discussed at the beginning of the treatise, which quite soon departs from the sound to arrive into the main topic, the phonetics, which is the creation of sounds by the mouth to have syllables and words. Besides a little bit of physics of sound, this treatise contains some physics of motion in the discussion of vowels and consonants. That is, Grosseteste uses an analogy with motions and their combinations, rectilinear and circular, and vertical and transversal, in describing how the breath and the organs of speech are creating the voice. In this treatise, we find also a list of motions, subdivided in seven “species”. These are not the seven types of motion (up/down, right/left, forward/back, rotary), proposed by Philo of Alexandria in his treatise On Creation [2]. The Grosseteste’s motions are quite complex, suitable to be applied to describe how parts of some machines can move.

Here, I am subdividing the Latin text in several sections [3]. For each section, it is reported the original text and it is given translation, where who is writing, ACS, applied her knowledge of Latin. Some additional comments are given too. The Latin text is given in the MS UI Gothic characters.

1. INC: Cum sonativum percutitur violenter, partes ipsius sonativi egrediuntur a situ naturali, quas natura sonativi reinclinat ad situm naturalem et fortitudine inclinationis huiusmodi partes egressae a situ naturali sibi in toto redeunt ad situm (sibi) naturalem etiam ultra progrediuntur ad situm sibi non naturalem;  
EXPL: Ex hiis itaque patet, qualiter syllaba est ex uno spiritu et uno accentu indistanter prolata, licet in ipsa sint multae litterae, quia haec unitas est inclinatio continue ad sonum vocalis formandum, super quam inclinationem sicut supra naturalem cadunt inclinationes ad formandas consonantes sicut inclinationes accidentales.

*INC: When a medium able to sound is struck violently, some elements of this medium are moving out from their natural positions, to which they come back constrained by the nature of the medium, and, in such a manner, because of the strength of the attraction, by which the*

*moving parts are affected, they completely return at their natural positions, and even have a further progression towards not natural positions;*

*EXPL: From all these points, then, it is clear how a syllable, is by means of a breathing and an accent, pronounced immediately, although it may have many letters, because this unit is a continuous trend created by the sound of vowels, on which the inflection falls, such as in a natural tendency to pronounce consonant, as well as in the accidental characterization of an inflection.*

“Sonativum” I translated as “able to sound, sonorous”. In the first part of the treatise we find the description of an oscillation of a medium as the origin of sound. For what concerns the Latin words, let us note that “spiritus” is the “breath”, or the “breathing”, and therefore it is the spirit of life. In Greek, on the vowels, we can have a “spirit”, [4], to indicate presence or absence of a “h” sound before a letter. Let us remember that our alphabet was invented by the Semites of the Mediterranean coast, who used simple symbols to represent consonants instead of words. The Greeks used the Phoenicians alphabet, adding seven vowels, which considered as containing “pneuma”, spirits, or "breath of life". The reason is because the sound of each vowel could be pronounced as long as the breath in the lungs. There are three types of vowels: long (eta and omega), dual (alpha, iota, and upsilon), and short (epsilon and omicron).

For what concerns some words in the Grosseteste’s text, “accentus”, “formanda” and “inclinacione vocis”, are words used by Marcus Fabius Quintilianus [5], who was a Roman rhetorician widely referred to in medieval schools of rhetoric: “accentus” is the accent; “formanda” is coming from “formare” which means pronounce, create by means of the mouth. “Inclinacione vocis” is the inflection [6]. From [7], “consonant” is the "sound other than a vowel", coming from Latin consonantem (nom. consonans), and consonare "to sound together, sound aloud," from com- "with" + sonare, from sonus "sound". Consonants were thought of as sounds that are only produced together with vowels, as we will see also in this treatise written by Grosseteste. The adjective “vocal” means "spoken, oral", from Latin vocalis "sounding, sonorous, speaking". As a noun, "a vowel," from vox, "voice". Vowel (n.) is coming from the Old French vouel, from Latin vocalis, in littera vocalis, "vocal letter”.

We have also “inclinaciones accidentales” in the Grosseteste’s text. The “accidence” is the section of morphology that deals with the inflections of words, coming from the Late Latin accidentia, from Latin accidens, accident-, accident [8]. In [7], we find that accidence means a “non essential or incidental characteristic” and also “a part of grammar dealing with inflection”. This is a grammar term of Quintilian. Inflection is the bending, inflection or modification. In the last sentence of this first section, which is the explicit liber, the end of the treatise, Grosseteste is considering the syllables and their changes due to their grammatical inflections. Let us remember that he is writing and talking in Latin, which is an inflected language having declensions.

2. Cum sonativum percutitur violenter, partes ipsius sonativi egrediuntur a situ naturali, quas natura sonativi reinclinat ad situm naturalem et fortitudine inclinationis huiusmodi partes egressae a situ naturali sibi in toto redeunt ad situm (sibi) naturalem etiam ultra progrediuntur ad situm sibi non naturalem; et inclinatio naturalis de novo via conversa reinclinat ad situm naturalem et sic fit tremor subtilis in extimis partibus sonativi. Et hic tremor manifestus est in tactu et visu.

*When a medium able to sound is struck violently, some elements of this medium are moving out from their natural positions, to which they come back constrained by the nature of the medium,*

*and, in such a manner, because of the strength of the attraction, by which the moving parts are affected, they completely return at their natural positions, and even have a further progression towards not natural positions; and the natural inclination of the medium, again, drives back the material at the natural position and so creates a subtle tremor at the ends of the medium. And this tremor is evident by touch and sight.*

And then we find that Grosseteste considered the sound coming from an oscillating body, or, that the source of a sound was a body having oscillating parts. He probably observed how the sound was produced by animals and humans; however, he could have also observed some elastic media struck violently. For instance, let us imagine we are looking laterally the oscillations of a thin blade: when the oscillations have a low frequency, we can easily perceive it by eyes, because our eye is able to see clearly the oscillations up to about 20 Hertz. This situation corresponds to a low sound. It would be great to guess that Grosseteste had observed a tuning fork (diapason) but this instrument was invented in the 1711 by the British musician John Shore [9].

3. Hunc tremorem minutarum partium necessario consequitur in egressione a situ naturali extensio earumdem partium secundum diametrum longitudinalem et constrictio secundum diametrum transversalem; et in reversione ad situm naturalem accidit e contrario abbreviatio diametri longitudinalis et majoratio diametri transversalis. Et haec motio sonativi secundum extensionem et contractionem in partibus minutis, quae consequitur motum localem tremoris est sonus vel velocitas naturalis ad sonum. Et cum tremunt partes sonativi movent aerem sibi contiguum ad similitudinem sui motus et pervenit usque ad aerem sibi connaturalem in auribus aedificatum et fit passio corporis non latens animam et fit sensus auditus.

*Such vibrations of each small part of the medium are necessarily a result of their displacement from the natural position, consisting in an elongation of the longitudinal dimension and a contraction of the transversal dimension; and, conversely, when returning towards the natural position, we have a contraction of the longitudinal dimension and an elongation of the transversal one. And this motion of expansion and compression in each part of the medium, where the local motion of vibration is consequent, is the sound or the natural sounding promptness. And when the parts of the sonorous medium are moving, they move the air near them, which having a similar motion, creates a motion which arrives into the ears and this effect on the body is not hidden to the soul and creates the sense of hearing.*

I translated “*velocitas naturalis ad sonum*”, with “natural attitude to sound or sounding promptness”. We cannot use here a translation containing a locution such as “speed of the sound”. In Latin, “*velocitas*” means velocity in the sense of promptness. In this Grosseteste’s discussion, it is quite interesting the propagation of the sound in the air from a vibrating source. The sound arrives to the air inside the ears and then, it is affecting the body, produce the sense of hearing.

Here we find also a discussion on “diameters”; I rendered “*diametrus*”, medieval variant of diameter, with “dimension”, considering it as a thickness or a width. However, it is possible to imagine that instead of having a tuning fork, Grosseteste had a wire, bent to form a round or elliptic ring, as a medium prompt to sound when stricken. Probably he observed the vibrations of such an ellipse, noting that when the major axis elongates, the minor is reduced and vice

versa. May be, he observed the oscillations of some leaf springs, which are elliptical springs. These springs are given by two circular arcs linked at their tips, and were used as dampers for carts.

I preferred to consider “diametrus” as “dimension”, in order to remember the Poisson modulus of elastic materials. Let us suppose an elastic material and a bar made of it. When the bar is stretched we see usually that to an extension in the direction of the applied tension, corresponds a contraction in the perpendicular directions. When a material is compressed in one direction, it usually tends to expand in the other two directions perpendicular to the direction of compression. This phenomenon is called the Poisson effect, and the Poisson's ratio measures this effect. The Poisson's ratio is positive in the usual abovementioned behavior of materials. However, elastic material can have a negative Poisson's ratio: these are the auxetic materials [10].

4. Primum autem motivum partium sonativi est praedicto modo: aut virtus motiva est intra ipsum sonativum aut extra. Primum autem motivum talis motus non potest intraesse nisi ipsa anima, quia natura non potest esse principium primum talis motus. Et cum non sit talis motus continue habens animam, non erit talis motus ab anima vegetativa, sed a sensibili motiva motu voluntario, quam necessario praecedat imaginatio vel apprehensio. Ergo sonus formatus a primo motivo, in quo est imaginatio, vox est.

*Moreover, we have the first moving reasons of the parts of a sounding medium in this way: either the motive force is internal the very sounding medium or external. But, the very reason of the internal motion can be only in the very breathing, because its nature cannot be the first principle of it. And since it is not such a motion continuous in the animals, it is not produced by vegetative spirits, but it is coming from some perceptible motivations by a voluntary movement, anticipated necessarily by some previous imagination or perception. Then, a sound formed from the first cause, in which imagination exists, is the voice.*

The word motive (n.), is from mid-14 century, "something brought forward," from Old French motif "will, drive, motivation," noun use of adjective, from the Latin motivum "moving, impelling," from motus "a moving, motion," pp. of movere "to move". In [7], it is told that the meaning of "that which inwardly moves a person to behave a certain way" is from early 15 century. Apprehension (n.), "perception, comprehension," is from Old French apprehension or directly from Latin apprehensionem (nom. apprehensio), noun of action from pp. stem of apprehendere. Anima is the breath.

5. Sed cuidam voci dat speciem et perfectionem ipsa figuratio actualis instrumentorum vocalium et figuratio motus spirituum motivorum instrumentorum vocalium. Cuidam vero voci non dat figuratio perfectionem. Illa vero, cui figuratio praedicta dat speciem et perfectionem, erit vox litterata. Et vox, quam complet figuratio unica, erit littera. Quam vero complet figurationes multae, erit ex litteris composita.

*Then, a proper setting of the vocal articulators and of the breath in them give to a certain voice its appearance and perfection. However, to a certain voice, the setting of the speech does not give perfection automatically. In fact, it is the literate voice, to which the abovementioned*

*configuration provides appearance and perfection. And the voice, after completing a specific setting, will pronounce a letter. As well several settings of the voice will be composed by several letters.*

That is, it is not enough to have a voice. Its perfection is coming from its ability to pronounce a speech. In Latin “figuratio” means forming, creation, and also form and creation of words. I rendered with setting, because Grosseteste is writing on the figuratio instrumentorum vocalium, which are the vocal articulators, the organs for the speech.

6. Potentia vero vocis ad hoc, ut scribatur, nihil aliud est, nisi ipsa figuratio instrumentorum vocalium et spirituum, qua littera interius generatur. Ideo possibile est, repraesentari per figuram visibilem assimilatae figurae suae generationis. Et manifestum est, quod, cum ars imitetur naturam et natura semper facit optimo modo, quo ei possibile est, et ars est non errans similiter, melior autem sit repraesentatio per figuras exteriores assimilatas figuris interioribus, quam et secundum artem grammaticam, scribere erat per figuras exteriores assimilatas figuris interioribus ipsas interiores repraesentare. Quod si objiciatur de diversis figuris eiusdem elementi arte inventis, non est diversitas secundum substantiam figurae, sed secundum accidentalialia eius v. gr. figuratio huius elementi A in latino, hebraeo et graeco et etiam in arabico est triangulus. Sed ipse triangulus accidentaliter dicitur a tribus linguis praedictis. Similiter figura huius elementi R in omni lingua est crispatio in figura sensibili, sicut intra formatur lingua et ita de ceteris. Sonus vocalis assimilatur sibi in toto et in parte. Necesse est ergo, ut generetur a motu assimilato sibi in toto et in parte.

*However, the might of the voice, for the purpose on which we are writing, is nothing else but the very configuration of some instruments, vocals and breaths, by which, inside us, the letter is generated. Therefore, it is possible to represent it by means of a visible shape similar to the shape of the setting of its generation. And it is clear, when the technique imitates the nature, that the nature works always in the best possible way, and, on the other hand, the technique is not wandering, it is better a representation by exterior shapes similar to the interior ones, like a representation according to the art of grammar, where the writing was created by using some exterior shapes similar to interior shapes to represent interior settings. If an objection had to be found, it is that we can find many shapes of the same elements in several literal representations, then, let us tell that there is not a different in their essential nature, but just in some non-essential details v. gr. the shape of element A in Latin, Hebrew, and Greek and in Arabic too is a triangle. However, the same triangle is indicated differently by the scripts of the three languages mentioned above. Similarly, the shape of the element R in every language is perceptible in the figure of a ripple, as it is formed by the tongue, and so on. The sound of a vowel is similar to itself totally or partially. It is therefore necessary of being it generated by a motion similar to itself totally or partially.*

That is, the shape of the letters in the grammar is coming from some internal settings assumed when pronouncing them. And then, the letters of the different languages have symbols which are only accidentally different, not substantially [11, pag.192].

In [7], substance (n.) , 1300, "essential nature," from Old French substance (12 century), from Latin substantia "being, essence, material", from substans, prp. of substare "stand firm, be under

or present". Meaning "any kind of corporeal matter" is first attested mid-14century. Sense of "the matter of a study, discourse, etc." first recorded late 14 century.

In the text we have "accidentalia", that is, accidental things; [7] accident (n.) late 14century, "an occurrence, incident, event," from Latin *accidentem* (nom. *accidens*), prp. of *accidere* "happen, fall out, fall upon," from *ad-* "to" (see *ad-*) + *cadere* "fall" (see case (n.1)). Meaning grew from "something that happens, an event," to "something that happens by chance". The philosophical sense "non-essential characteristic of as thing" is late 14 century.

In fact, Grosseteste is proposing that the written letters are in their shapes representing the motions of the articulators when pronouncing the sound of them. In the next section, we will see that Grosseteste is trying to create a list of motions, subdividing in seven types according to their similarity, partial or complete.

7. Sed motus assimilati sibi in toto et in parte sunt septem: motus rectus, circularis et dilatationis et constrictionis. Haec enim duo non differunt, nisi sicut motus rectus ante et retro motus circularis super centrum motum recte, et motus circularis super centrum motum circulariter; et similiter motus dilatationis et constrictionis super centrum motum recte et super centrum motum circulariter.

*But motions, after being assimilated, totally or partially, are seven: and they are straight motion, circular and of expansion and contraction. Of these, two do not differ except in the direction forwards and backwards of the straight motion, (then we have the) circular motion about a center which is moving straight, and the circular motion about a center in circular motion; and likely, the motion of expansion and contraction over a center on straight motion and over a center in circular motion.*

Here we find that Grosseteste is giving some "species" of the motion, that is, assimilating several motions is some fundamental types. The "species" is a classification in logic [7], from Latin *species* "kind, sort" and originally "appearance, sight" related to *specere* "to look at, to see". Assimilate is coming from the Latin pp. of *assimilare* "to make like," from *ad-* "to" (see *ad-*) + *simulare* "make similar," from *similis* "like, resembling". Assimilation (n.) is "act of assimilating" from Latin *assimilationem* "likeness, similarity", noun of action from pp. stem of *assimilare*. Let us remember that "motus" is of the fourth declension, the plural is *motus*. Super means over, on, about, around.

The seven Grosseteste's types of motion are not the seven motions (up/down, right/left, forward/back, rotary), proposed by Philo of Alexandria in his treatise *On Creation*. The Grosseteste's motions are quite complex: I have rendered the Latin text supposing Grosseteste was guessing a combination of motions. Therefore I am proposing Grosseteste was describing the seven following motions. Three motions are the straight motion, in the two directions, forwards and backwards, and the circular motion about a center at rest. The fourth is the circular motion about a center which is moving on a straight line. This is the description of a cycloid, even prolate or curtate. Let us remember that a cycloid is the curve traced by a point on the rim of a circular wheel as the wheel rolls along a straight line. It is then a curve generated by a curve rolling on another curve. Probably Grosseteste knew how to describe the motion of a point on a circular wheel. After, the fifth motion given by Grosseteste is a circular motion about a center in circular motion. This seems the description of an epicycloid, which is a plane curve produced by tracing the path of a chosen point of a circle, called an epicycle, which rolls around a fixed circle. This is the motions of the planets in the heavens as described by Ptolemy. The last two are periodic motions, of expansion and contraction, on a straight line and on a circumference.

Grosseteste's types of motion are quite complex, suitable to be applied to describe, besides the motion of celestial bodies, how parts of some machines can move. It is possible, that in the renaissance of sciences in the 12th century, stimulated by the translation of texts from other cultures, that is the ancient Greek and Arabic works, some scholars tried to develop a suitable language to describe mechanics and technology. Of course, we can have several interpretations of the Grosseteste's definitions, in particular for the last two. Here I am proposing for the first a wave-like motion, and we will see it in section 9; for the other motion we can imagine a wave-like motion on a circumference as in a De Broglie wave (of course, just in the shape).

8. Propter hos septem motus posuerunt antiqui Graeci septem vocales. Sed istae duae super centrum motum recte et super centrum motum circulariter licet sint possibles in imaginatione, tamen sunt difficiles aut impossibiles in re. Propter hoc non remanent nisi motus quinque possibles aut factibiles in operatione.

*Because of these seven movements, the ancient Greek set seven vowels. However, the two motions about a center in straight motion and about a center moving on circular motion, are possible to imagine, but are difficult or actually impossible. Because of this fact, just five motions remain, which are possible or operationally feasible.*

9. Igitur palam est, quod in motu recto spirituum motivorum et per arteriam vocalem figuratur J. Quandoque idem tamen rectus motus non est minus continuus, quia tunc non faceret tenor tremorem, sed est frequentissime iens et rediens. Motus vero circularis facit figuram. Omnis vero motus circularis super centrum recte motum motu centri, subtendit cordam et motu cuiuslibet puncti circumferentia describit arcum super cordam et ita facit figuram pyramidalem. Motus autem constrictionis facit figuram V i. e. duas lineas in centro concurrentes. Motus vero dilatationis et constrictionis super centrum motum recte motu recto subtendit basim trigoni. Et omnis punctus, cum sit dilatatio, quia movetur, motu duplici, describit unum latus trigoni a basi usque ad conum; et cum sit constrictio, describit reliquum latus a cono usque ad basim; et ita fit figura A. Et cum sit alterum tempus, quo formatur sonus vocalis et sonus consonantis. Et etiam sunt duo tempora discontinua, quia inter quoslibet motus contrarios est quies media: eo modo dicitur consonans, quasi cum alio sonans; et quasi per se non possit audiri, cum eius generatio praecedat, vel subsequatur tempore generationem vocalis.

*Therefore, it is evident, that by the breath moved in a straight motion and through the trachea the vocal J is molded. Sometimes however, there is less continuity of this same straight movement, not because the continuity is becoming trembling, but, very frequently, because it is going and coming. The true circular motion creates the form (O). Every true circular motion, about a center in straight motion, subtends a chord and any point on the circumference describes an arc on the chord, and so a pyramidal shape is created. And the motion of contraction creates the letter V i.e. two lines concurrent towards a center. In fact the motion of expansion and contraction over a center of motion moving on a straight line subtends the basis of a triangle. And each point, which is moving in such a double motion, when there is the expansion, describes one of the sides of the triangle from the base up to the cone, and when there is the constriction, describes the other remaining side from the cone to the base; and then*

*it is given letter A. And in either occasions, we can create the sound of a vowel and the sound of a consonant. And even we can have two discontinuous occurrences too, because, between opposite motions as we like, there is a pause, a stationary point, in the middle: then, we have consonants which are so called because they seems to sound with another, and it is not possible to ear by themselves, but by generation of a vowel in the following occurrence.*

As told in [12], Grosseteste tells that the art of grammar imitates the nature, and nature does everything in the best way possible, the letters of the alphabets have a shape representing the shape created inwardly by the articulators when we are speaking. And here we have several examples of these letters created according to nature.

When Grosseteste writes about the “*motus circularis super centrum recte motum motu centri, subtendit cordam et motu cuiuslibet puncti circumferentia describit arcum super cordam et ita facit figuram pyramidalem*”, I have imagined a piece of a cycloid, made of arcs and related chords. Two of these pieces could give the letter “m” in uncial script, where “m” is formed with curved strokes.

In the last part of this section, I rendered “tempus” with “occasion”, “occurrence”. In Ref. 11 (pag.9), it is told that Grosseteste is using several terms, among then “tempus, proportio, sonus vocalis, motus contrarios, sonus consonantis” that could be also understood as a musical conceptual language. We can argue that Grosseteste, in the discussion of the voice, he had in mind also the voice singing the chants of the liturgies of Catholic Church.

10. *Ad hoc respondeo: quod virtus motiva, qua formatur vocalis continue a principio syllabae usque ad finem eius, inclinatur spiritus et instrumenta ad formandum sonum vocalis sibi similem et etiam movet spiritus et instrumenta. Cum autem dictam inclinationem concomitatur inclinatio aliqua ad formandum sonum consonantis, egreditur in spiritibus et instrumentis motus unus compositus proveniens a duabus inclinationibus, sicut cum ponderosum inclinatur ad motum deorsum, et cum hoc impellitur ex transverso, consequitur in ipso motus egrediens a diversis inclinationibus aliis a motu naturali. Sed quia continua est inclinatio motus naturalis, semper est reversio ad motum naturalem. Manifestum est igitur, quod in motu, quo formatur sonus consonantis est motus et inclinatio ad formandum sonum vocalis materialiter et ita in sono consonantis est sonus vocalis materialiter; est tamen sonus naturalis sicut motum soni consonantis, sicut inclinatio ponderosi naturalis, cum impellitur ponderosum ex transverso, magis, est de motiva inclinatio multociens quam violenta et eadem plus dat motui actuali speciem et formam, quam inclinatio naturalis.*

*To this I reply: the motive force, which is giving the vocalization, from the beginning of the syllable to its end, inclines the breathing and the articulators to create the vocal sound like its sound, and therefore moves breathing and articulators consequently. When, however, the said inclination is concomitant to reproduce the sound of a consonant, a composed motion resulting from two inclinations exits from the breathings and movement of the articulators, as it happens when a heavy body tends to move downwards, and it is pushed transversally, and the heavy body moves on a motion following some inclines different from the natural movement. Since, however, the inclination of a natural motion is continuous, the movement is always returning to the natural one. It is clear, therefore, that in the movement, by which the sound of consonant is formed, there is the inclination to form the vowel sound considerably, and so in the sound of a consonant, there is the sound of a vowel substantially; at last, a natural sound is like the motion*

*of the sound of a consonant, like the natural inclination of a heavy body pushed transversally, it is the motive inclination, several times excited, however not vehemently, that gives features and forms to the actual motion, rather than the natural inclination.*

Here Grosseteste uses the analogy with the motion of a heavy body, which is falling or which is falling after receiving a transversal push. In the first case, we are pronouncing a vowel, but, when we have a combination of two motions, horizontal and vertical, we have a syllable, where the natural motion is altered by the consonant. Let us note that Grosseteste is also observing that the body returns to the natural falling. Of course, this is rough description of the superposition of vertical and horizontal motions, and of the fact that acceleration prevails. In any case, the initial conditions are giving the “shape” to the motion.

11. Potest tamen hoc, quod dicit Priscianus, quod vocales sunt sicut animae et consonantes sicut corpora, ad hoc referri, scil. quod sonus consonantis non habet esse in auditu et extra os, nisi per sonum vocalis actualem. Cum enim diversum sit tempus formationis consonantis et vocalis eiusdem syllabae, necesse est, quod sonus consonantis possit formari in ore sine sono vocalis. Sed, ut dicit Isidorus, nisi sequatur sonus vocalis intus inclusus, murmur litterae sonabit et extra os ad auditum non pervenit. Ex jam dictis patet, quod motus formativus consonantis minus elongans inclinationem ad actualem sonum vocalis ab actu suo, semivocalis erit formativus; sed motus, qui plus elongat dictam inclinationem ab actu suo mutae erit formativus. Ex hiis itaque patet, qualiter syllaba est ex uno spiritu et uno accentu indistanter prolata, licet in ipsa sint multae litterae, quia haec unitas est inclinatio continue ad sonum vocalis formandum, super quam inclinationem sicut supra naturalem cadunt inclinationes ad formandas consonantes sicut inclinationes accidentales.

*Yet it can be what Priscian said, that vowels are like the breath of life and consonants like bodies, related to this, namely, that the sound of a consonant cannot be heard outside the mouth, except by the actual sound of a vowel. However, since the times of the formation of a consonant and of a vowel in the same syllable are different, it is necessary that the sound of the consonant can be formed in the mouth without the sound of a vowel. But, as Isidore says, unless followed by the sound of vowel within the syllable, a grumbling of a letter shall sound and, outside the mouth, it does not arrive to the ear. From what has been said, it is clear that when the movement for the formation of a consonant results in a shorter inclination to form the active vowel, a semivowel will be produced; however, when this movement is prolonged, in fact, it turns out to be speechless. From all these points, then, it is clear how a syllable is, by means of a breathing and an accent, pronounced immediately, although it may have many letters, because this unit is a continuous trend created by the sound of vowels, on which the inflection falls, such as in a natural tendency to pronounce consonant, as well as in the accidental characterization of an inflection.*

Priscianus Caesariensis, who lived in the VI century, commonly known as Priscian, was a Latin grammarian. He wrote the *Institutiones grammaticae* on the subject. This work was the standard textbook for the study of Latin during the Middle Ages. Isidore of Seville, (c. 560 – 4 April 636), was Archbishop of Seville for more than three decades, and wrote on etymology.

In phonetics and phonology, a semivowel is a sound, for instance the English “w” or “j”, that is phonetically similar to a vowel sound but functions as the syllable boundary rather than as the nucleus of a syllable [14]. In fact, the description given by Grosseteste is similar to what we read in the Wikipedia item, and the same of for the discussion on syllables and sonorants [15]. As a conclusion of this discussion of the Grosseteste’s treatise on the generation of the sounds, it is clear the he widely used the analogy with physical motions. It is quite interesting the combination of motions, rectilinear and circular, and vertical and transversal. For this reason, a further study of the Grosseteste’s works can help in understanding the development of the language of physics.

## References

- [1] A.C. Sparavigna, Translation and discussion of the De Iride, a treatise on optics by Robert Grosseteste, arXiv, 2012, History and Philosophy of Physics, <http://arxiv.org/abs/1211.5961>
- [2] Philo of Alexandria was a Hellenistic Jewish philosopher. Philo used the allegory to attempt a fusion of Greek and Jewish philosophy. Philo's Treatment of the Number Seven in On Creation, by Robert Kraft, University of Pennsylvania, <http://ccat.sas.upenn.edu/rak/courses/999/PHILONUM.HTM>
- [3] The Latin text is that given by “The Electronic Grosseteste”, <http://www.grosseteste.com/cgi-bin/textdisplay.cgi?text=de-generatione-sonorum.xml>, DE GENERATIONE SONURUM, which is reporting the printed Source: Die Philosophischen Werke des Robert Grosseteste, Bischofs von Lincoln, W. Aschendorff, 1912, pp. 7 - 10.
- [4] [http://en.wikipedia.org/wiki/Greek\\_diacritics](http://en.wikipedia.org/wiki/Greek_diacritics)
- [5] <http://en.wikipedia.org/wiki/Quintilian>
- [6] L. Castiglioni, S. Mariotti, Vocabolario della Lingua Latina, Loescher Ed., 1972.
- [7] D. Harper, Online Etymology Dictionary, 2012 <http://www.etymonline.com/index.php>
- [8] <http://www.thefreedictionary.com/accidence>
- [9] [http://en.wikipedia.org/wiki/Tuning\\_fork](http://en.wikipedia.org/wiki/Tuning_fork)
- [10] <http://en.wikipedia.org/wiki/Auxetics>; see also, A.C. Sparavigna Phonons in conventional and auxetic honeycomb lattices, Phys. Rev. B 76, 134302 (2007), and references therein.
- [11] Nancy E. Van Deusen, Theology and Music at the Early University: The Case of Robert Grosseteste and Anonymous IV, BRILL, 1995.
- [12] Vivien Law, The history of linguistics in Europe: from Plato to 1600, Cambridge University Press, Jan 30, 2003.
- [13] The Etymologies of Isidore of Seville, Cambridge University Press, Jun 8, 2006. Isidore compiled this work between c.615 and the early 630s. The result was an encyclopedia, arranged by subject matter. This book includes Rhetoric. Isidore provides etymologies for most of the terms he explains.
- [14] <http://en.wikipedia.org/wiki/Semivowel>
- [15] <http://en.wikipedia.org/wiki/Syllable>, <http://en.wikipedia.org/wiki/Sonorant>