



University of Al-Mustaqbal
College of Science
Department of Medical
Physics



Phonetics

Second stage

Acoustics

First lecture

Hamzah Abbas

2025- 2026

Acoustics:

Linguistic sounds are studied in the light of two sciences, the first of which is called **phonology**, also called **phonetics**. The other is called organizational phonology, or formative phonology, and is called phonology. The first science studied sounds in terms of them being actual spoken events that have a specific auditory effect, without considering the values of these sounds, or their meanings in the specific language. It is concerned with the audio material and not with the phonetic laws. It is concerned with the acoustic material, not with the acoustic laws, and with the properties of this material, or the sounds as noise, not with their functions in The phonetic structure of a language. As for the second science, phonology, it is concerned with organizing the audio material and subjecting it to standardization and codification, that is, researching sounds in terms of their functions in language.

Aspects of phonology:

The speech process goes through five steps, or successive, interconnected events, some of which lead to each other, until communication takes place between the speaker and the hearer. These events - in the order of their occurrence - are:

1. The psychological events and mental processes that take place in the speaker's mind before or during speech
2. The process of producing speech represented in sounds produced by the device called the speech apparatus
3. The sound waves and vibrations occurring between the speaker's mouth and the listener's ear
4. The organic processes to which the listener's auditory system is subjected
5. The psychological events and processes that take place in the mind of the listener when he hears speech and receives the sound waves and vibrations transmitted to him through the air.

The phonologist is supposed to consider the five steps mentioned, in order to understand the aspects of his subject, but most of the phonology students saw that

the first and fifth aspects, because the two aforementioned aspects are psychological and mental aspects, and the subject of the linguist is the study of actually spoken linguistic events. Because these mental psychological processes are complex and mysterious

It is clear from the above that speech sounds have three related aspects, one of which cannot be imagined without the other. These aspects are:

1. The aspect of producing sounds, or the pronunciation aspect, referred to as the physiological, organic aspect of sounds.
2. The aspect of transmission, diffusion or the physical aspect.
3. The sound reception side, or the auditory side, which is represented by the vibrations that affect the listener's eardrums.

Departments of phonetics:

These three aspects mentioned above fall within the field of general phonology, and as a result of this pluralism, many branches of phonology have emerged, differing in their goals and methods, and the most important of these sections are:

Physical phonology:

It researches the sounds of language in terms of their material or physical characteristics as they pass from the speaker to the listener. This science presents the sound frequency, the amplitude of the vibration, the nature of the sound wave, the loudness of the sound (tone), and its type (timbre). It relies on the laboratory aspect and researches the sounds of the language, using the experimental method. It also uses electronic instruments to reveal the characteristics of these sounds, such as a spectrograph that determines the type of sound, its strength, and its tone. The artificial palate is also used to study palatal sounds. This science is also called: laboratory phonology, or experimental phonology, which is an auxiliary science to physical phonology.

Speech phonology:

It investigates the process of producing linguistic sounds, the place of their pronunciation, and the method of producing them. This science is also called physiological phonology, or functional phonology.

Auditory phonology

It investigates the human hearing system, the auditory process, and the method of receiving and perceiving linguistic sounds.

We also have general phonology, which studies linguistic sounds in general, that is, without linking them to a particular language. As for special phonology, it searches for the sounds of a specific language and not others, such as the sounds of the Arabic language.

1-The physical study of sound:

Sound is a well-known physical phenomenon, and it is a series of waves and vibrations that are transmitted to the ear through material media, which are solid, gaseous, and liquid materials. However, it does not travel in a vacuum, but rather is transmitted through the vibration of matter, where sound arises as a result of the vibration of molecules, and is collected in The ear so we hear it.

1-1 The concept of sound:



Sound: It is the auditory effect caused by a physical phenomenon caused by the vibration of a body, which causes the air surrounding it to vibrate. The vibrations spread in all directions in the form of waves, moving away from the source. When they reach our ears, they move to the brain, which translates them into sounds. Thus, sound needs three elements. :A vibrating source, a transmitting medium, and a receiver. What is sound physically?

Specialized books indicate that sound is:

((A series of disturbances in the physical environment to which the human ear is sensitive)).

There is another definition that says that sound:

((A natural phenomenon that is perceived by the sense of hearing, and it occurs from the friction of one body with another, resulting in that friction, sound vibrations that are transmitted in the surroundings of this source, until they reach the ears of the listeners)).

There are many other definitions, published in scientific and specialized books, and we do not want to go into them further... We will suffice with the definitions mentioned above, which confirm that sound is formed as a result of a series of disturbances in the physical environment.

We can come up with a very simple example to indicate this: If we take one end of a wooden board or a thin steel strip and fix that board in a fixed place on one side, then let the other end go freely...then we hit the free end, we will see that end vibrating quickly. This vibration occurs slightly. . . Any sound occurs. . .

This experience is similar to all other experiences, such as striking a violin string, or vibrating the thin skin of a tambourine or a drum, etc.

This experiment confirms that sounds of all types, pitches and intensity are generated by the vibration of matter...

The vibration of the plate or thin steel strip, as stated above, requires the completion of (work), and this work depends on the amplitude of the plate's vibration. The greater the energy of the plate, the greater the amplitude of its vibration, and the amplitude of the long wave it causes is also correspondingly large. It is worth noting that sound occurs when it occurs as a result of the presence of a vibrating body... and that the tremors caused by a body may not be perceived by the eye in some cases... and these tremors are transmitted in a gaseous medium (air), a liquid (water), or something solid. (like wires) until they reach human ears...

There is no doubt that air is the medium through which tremors are transmitted in the form of waves from the sound source until they reach the human ears in most cases.

So: There must be physical media available in order for these tremors to be transmitted in the form of waves to the human ear, and these tremors or waves cannot be transmitted in a vacuum.

1-2-The importance of phonology and the need for it:

Physical acoustics provided an opportunity to address noise pollution and remove its psychological effects. Architectural acoustics emerged, which is concerned with providing calm inside rooms, and environmental acoustics, which is concerned with controlling environmental noise pollution: cars and airplanes. It also helped in the development of acoustics in the design of equipment, telephones, and other devices. High-fidelity audio Phonology brings together, among its many branches, a branch called acoustic phonology... which is the science that deals with, and is concerned with, the study of the material or physical characteristics of speech sounds as they are transmitted from the speaker to the hearer...

There are those who call the word (acoustic) as (audio)...that is, what relates to sound in terms of its transmission in the form of waves in the air to the listener's ear, and its auditory effect is demonstrated. While there are those who divide acoustic phonetics (that branch that deals with the transitional properties of speech) into the physical side and the physiological side related to hearing and sound perception.

Whatever the case may be. . . The vocal process passes through three stages

A- The existence of a body in a state of oscillation (a physical issue)

B- The existence of a medium in which the oscillations emanating from the oscillating body are transmitted (also a physical issue)

C- The presence of a body that receives these vibrations (a physiological issue)

From this standpoint, we will try to shed some light on sound from a physical perspective... and then we will include it at the end, to show what are the benefits expected from studying sound physically, so that it will be of good help to us, in the overall process of the art of public speaking. That is the final result of a distinguished human activity, armed with science, experience and knowledge.

Physical characteristics of linguistic sounds:

Sound is a means of communication between living organisms, as they communicate through the sense of hearing, and sound is not only what comes out of the larynx. In ancient times, humans used to rely on tools that make loud sounds, such as drums and flutes, in order to communicate with others. This phenomenon has many characteristics that distinguish it.

Questions for discussion and review:

1. What is the difference between phonetics and phonology?
2. The process of producing speech represented in sounds produced by the device called the.....

A-speech apparatus B- nasalization C- the tongue D-(B and C) E-All

3. The sound waves and vibrations occurring between the speaker's mouth and.....: A- the listener's ear B- Head C- the nose D- Hand E- Nothing

5- Which branch of phonetics studies how sounds are produced by the vocal organs?

A. Articulatory Phonetics B. Acoustic Phonetics C. Auditory Phonetics D. Sound Phonetics

6. Which branch of phonetics focuses on how sounds are received and processed in the brain?

A. Articulatory Phonetics B. Acoustic Phonetics C. Auditory Phonetics D. Applied Phonetics

7. Which of the following is NOT part of phonetics?

A. Places of articulation B. Spelling rules C. Sound wave analysis D. Auditory perception