Chapter 10.3: Phenomenon and Application of Reflection of Sound Waves

1. Phenomenon of Reflection of Sound Waves

- **Echo**: Produced when sound waves are reflected from a hard surface back to the listener.
    - The reflected sound sounds the same as the original but takes more time to reach the listener's ear.
    - Common in enclosed spaces like halls, empty rooms, caves, tunnels, and gorges.

Example Sentence: An echo occurs when sound waves bounce off hard surfaces and return to the listener, often experienced in large empty halls or caves.

2. Application of Reflection of Sound Waves

- **Ultrasound**: Sound waves with a frequency of more than 20,000 Hz.
    - Not audible to humans but can be heard by animals like bats.
    - Used for navigation by bats.
- **Sonar**: Sound reflection technology used in shipping to detect underwater objects.
    - Also used in medical sectors and fisheries for various applications.

Example Sentence: Sonar technology utilizes the reflection of sound waves to detect objects underwater, and ultrasound is commonly used in medical imaging.

3. Limitations of Hearing

- **Human Hearing Range**: 20 Hz to 20,000 Hz.
    - Range narrows with age as sensitivity to high frequencies decreases.

- **Animal Hearing**: Different animals have different hearing ranges.
  - Bats: 2,000 Hz – 110,000 Hz
  - Dogs: 67 Hz – 45,000 Hz
  - Dolphins: 100 Hz – 130,000 Hz
  - Elephants: 16 Hz – 12,000 Hz
  - Horses: 55 Hz – 33,500 Hz

Example Sentence: Humans have a hearing range between 20 Hz and 20,000 Hz, which becomes narrower with age, while animals like bats can hear frequencies as high as 110,000 Hz.

4. Devices to Overcome Human Hearing Limitations

- **Stethoscopes**: Help doctors listen to a patient's heartbeat.
- **Megaphones**: Amplify the voice to be heard from a distance.
- **Hearing Aids**: Amplify sounds entering the ear.

Example Sentence: Devices such as stethoscopes and hearing aids help to overcome the limitations of human hearing by amplifying sound.