Insect Behavior

Session 1

Introduction

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Phylum Arthropoda

• Huge group, > 1,000,000 species.
• estimate: 1,000,000 spp. arthropods
  1,190,000 spp. animals
• ~ 84% of all animal species are arthropods!!
شاخه بندپایان شامل ۶ زیر شاخه می‌باشد

- SP Trilobata
- SP Chelicerata
- SP Crustacea
- SP Uniramia
Insects (920,000 species) = 85% of all known animal species

The relative abundance of species of animals on earth
(adapted from Southworth, 1978)
Insects comprise a major proportion of the world’s biota, and beetles make up a major proportion of the Insecta.
Entognatha

Apterygota

Insecta

Paleoptera

Pterygota

Neoptera

Endopterygota (holometabolous Neoptera)
Biology  Entomology

Forensic Entomology  Medical Entomology

Agricultural Entomology
ANIMAL BEHAVIOR
Behavior: What is it?

- Behavior:
  - Everything an animal does & how it does it

آنچه حیوانات انجام می‌دهند و یا روشی که موجود انجام می‌دهد تا خودش را با محیط افراد سازگار کند
Behavior: What is it?

Ethology: William Morton Wheeler in 1902
- The scientific study of how animals behave, particularly in their natural environment.

The term was first popularized in English by the American myrmecologist William Morton Wheeler in 1902.
Charles Darwin might be called the first modern ethologist; his book, *The Expression of the Emotions in Man and Animals*, continues to influence ethologists today.
Insect Behavior


رفتارهای پیچیده حشرات (Complex Behavior)

جفت گیری، ساختن لانه، تخم گذاری، شکار طعمه

رفتار زنبور در ساختن لانه

تعدادی حیوانات دارای یکسری از ارتباطات پیچیده با افراد هم گونه (Intraspecific Communication) و با افراد دیگر گونه‌ها (Interspecific Communication) با محیط فیزیکی هستند.
What Is Insect Behavior?

Insect behavior encompasses the relationships an insect has with members of its own species, with members of other species, and with the physical environment.

Adaptive behavior ensures survival and survival ensures evolutionary success.
$h^2 = R/S \approx 0.8$ in this example
What Is Insect Behavior?

آنچه حشرات انجام می‌دهند و یا روشی که حشره بکار می‌برد تا خودش را با محیط افراد سازگار کند رفتار حشرات گفته می‌شود که دامنه‌ای وسیعی از فعالیت‌های حشرات را می‌پوشاند.

**Individual matters**

General locomotion, grooming and feeding, how it moves, orients, disperses, and feeds, including the role of the nervous and endocrine systems in integrating behavioral responses.

**Communication activities**

defensive, reproductive, and social behaviors, all of which are mediated by communicative codes.
What Is Insect Behavior?

1- The theory of evolution by natural selection,
2- Development of a systematic comparative method,
3- Studies in genetics and inheritance.

In the 1930s
1- Comparative Animal Psychology and Physiology

Mechanisms controlling behavior

2- Ethology

functional significance and evolution of behavioral traits, especially in natural settings

3- Behavioral ecology

the biological relationships between an organism and its environment, especially from an ecological and evolutionary viewpoint

4- Behavioral genetics and behavioral genomics

four great disciplines have contributed to the study of behavior physiology (particularly neurophysiology), ecology, ethology, and psychology.
دلایل مطالعه‌ی رفتار حیوانات

1- پایه‌ریزی اصول مشترک برای رفتار تمامی حیوانات
2- مطالعه‌ی رفتار حیوانات به منظور بقاء و محافظت گونه‌های در خطر انقراض
3- مطالعه‌ی رفتار حیوانات برای زمینه‌های اقتصادی (پرداتور، ابریشم، پازیتوئید)
4- مطالعه‌ی رفتار حیوانات اهلی برای رفاه و آسایش بشر
Why insects communicate?

1- Recognition of kin or nest mates.
2- Locating or identifying a member of the opposite sex.
3- Facilitation of courtship and mating.
4- Giving directions for location of food.
5- Regulating spatial distribution of individuals, aggregation or dispersal; establishing and maintaining a territory.
6- Warning of danger; setting off an alarm.
7- Expressing threat or submission.
8- mimicry.
Any Questions?
Like other animals, insects use their five senses to acquire information about their environment (taste, touch, vision, hearing, olfaction (smell)). So insects communicate by:

Types of insect communication

- Visual communication
- Chemical communication
- Tactile communication
- Acoustic communication
Insect Senses

- Touch
- Hearing
- Smell
- Taste
- Vision