EVOLUSI SERANGGA

ENTOMOLOGI

Prepared by Suput@ 2000

Faculty of Agriculture Gadjah Mada University

http://www.talkorigins.org/origins/faqs-evolution.html

Evolusi Serangga

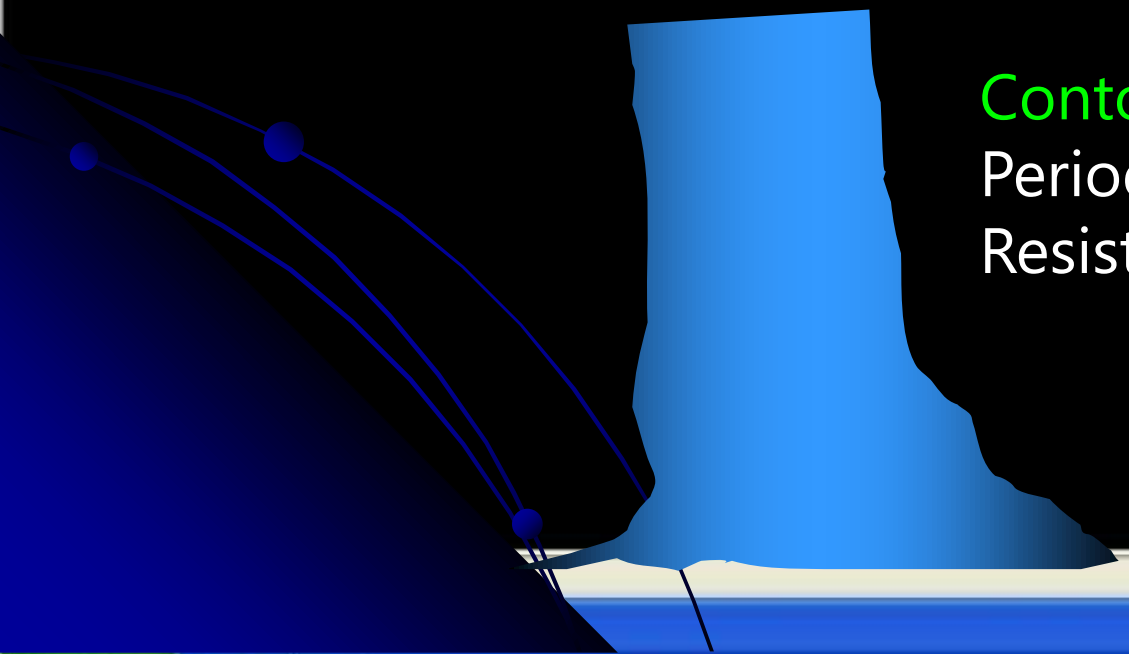
Evolusi serangga diduga terjadi dari tiga proses secara berturut-turut

1. Mikroevolusi
2. Spesiasi
3. Makroevolusi

serangga

Mikroevolusi

Evolusi serangga terjadi didalam populasi karena proses tekanan seleksi



Contoh:

Periode industri di Eropa

Resistensi terhadap insektisida

Spesiasi

Evolusi serangga yang terjadi pada waktu yang cukup lama lebih lama dibanding mikroevolusi

Contoh:
Isolasi reproduksi

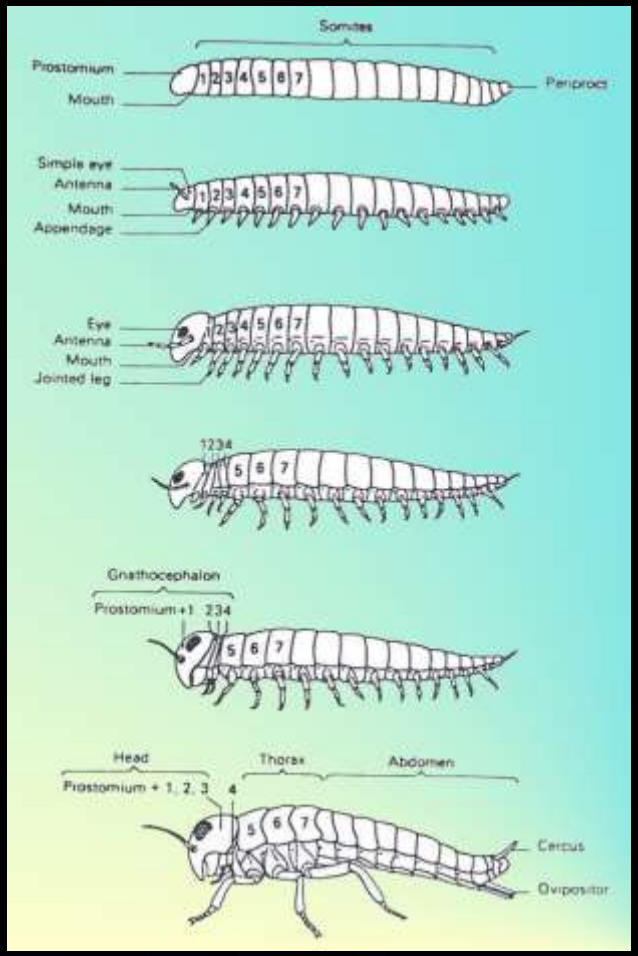
Makroevolusi

Evolusi serangga yang terjadi pada waktu yang sangat lama melampaui batas waktu geologi

Evolusi Serangga

1. Evolusi serangga tak bersayap
2. Pertumbuhan sayap Paleoptera
3. Pertumbuhan sayap Neoptera
4. Akhir tahap evolusi

Evolusi serangga tak bersayap



- **Peredaran darah terbuka**
- **Trachea**
- **Tipe alat mulut**

Pertumbuhan sayap Paleoptera

Ada 2 teori:

1. Serangga darat

   serangga sering loncat dan meluncur, *paranotal lobes* nya mampu mengepak menjadi sayap

2. Serangga air

   serangga mempunyai insang yang menutupi tubuhnya digunakan untuk mengepak-ngepak dan akhirnya menjadi sayap

Pertumbuhan sayap Neoptera

Adaptasi serangga bersayap pada ruang yang sempit dan sayap sebagai pelindung tubuh

"terdapat banyak niche dan musuh alami baru"

Akhir tahap evolusi

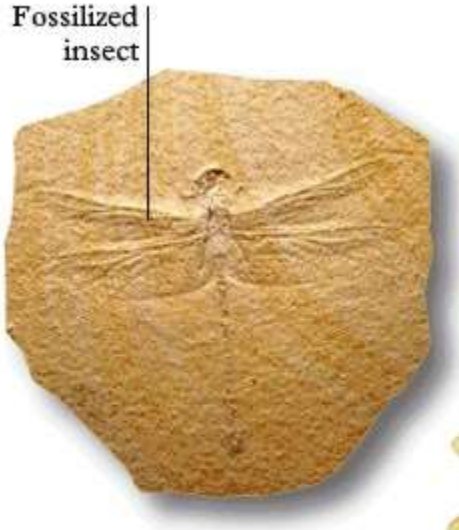
Serangga melakukan metamorfosis

Simple Metamorphosis
- No Metamorphosis (ametabolous development)
- Incomplete Metamorphosis (hemimetabolous development)
- Gradual Metamorphosis (paurometabolous development)

Complete Metamorphosis
- (holometabolous development)

Intermadiate Metamorphosis
- (paurometabolous & holometabolous development)

Fosil Serangga

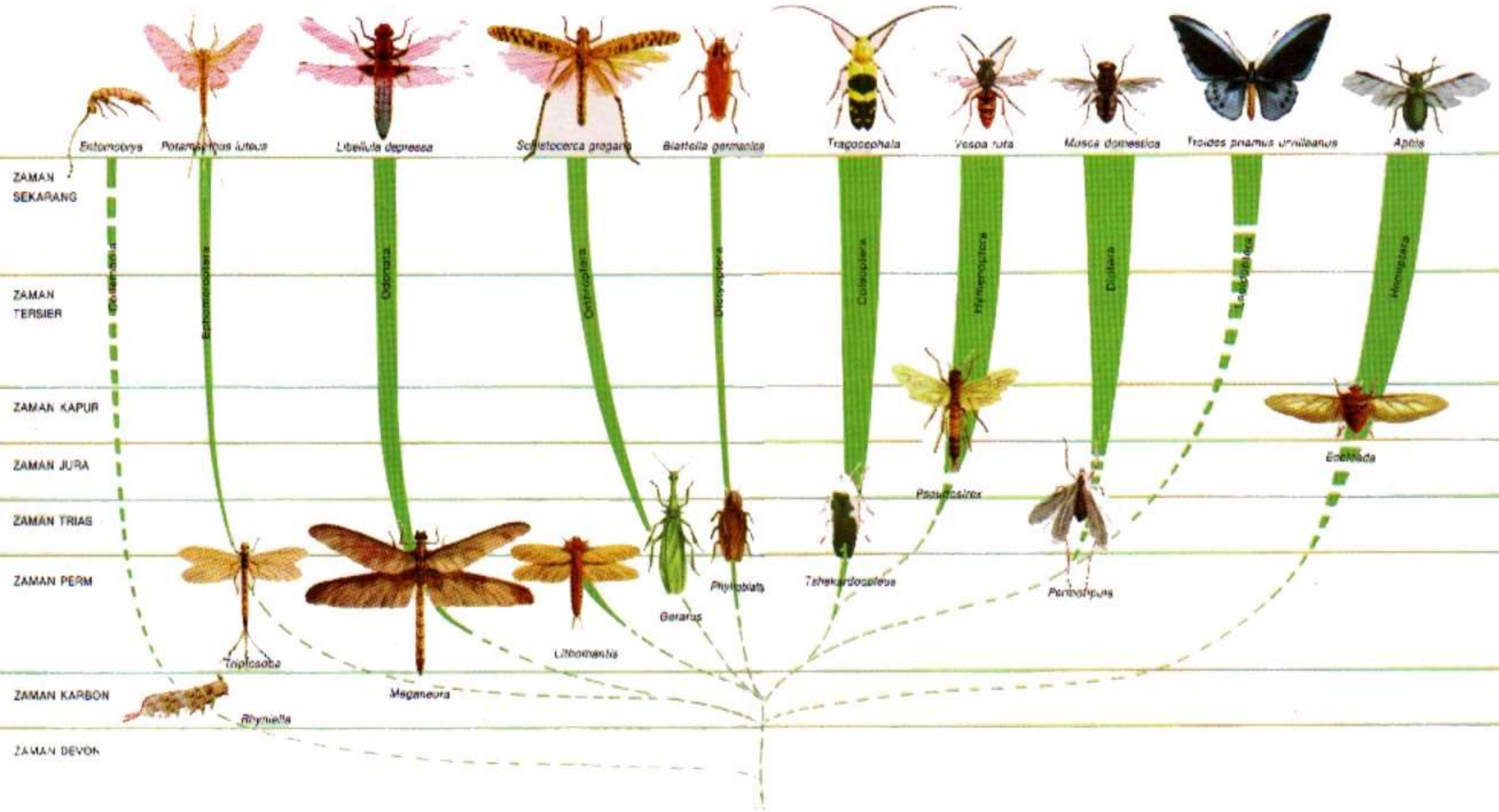


MEGANEURA
This extinct insect had a wingspan of 27 inches (69 cm). It was the largest winged insect ever known on Earth.

HAVING APPEARED 350 million years ago, insects now form the most abundant group on Earth. They evolved from wingless ancestors but developed the ability to fly. About 130 million years ago a huge increase occurred in the numbers and variety of insects. New groups, such as bees, ants, and butterflies, thrived on the flowering plants that also first appeared at that time.

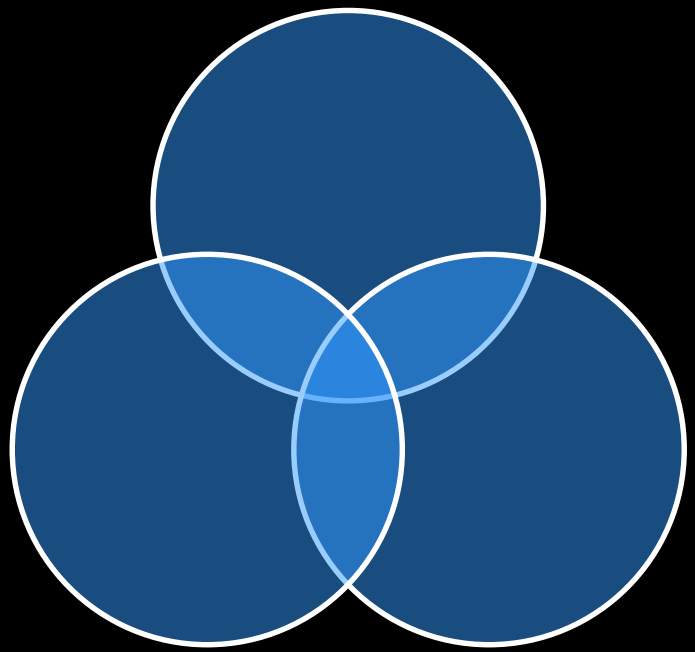
DAMSELFLY
This insect is, although smaller, very similar to the extinct Meganeura.

Filogeni Serangga



Sistem Penamaan Serangga

NOMENKLATUR



Carolus Linneaus (1758) → Systema Natural

Tatanama pada tumbuhan dan hewan digunakan sistem penamaan binomial

Fabricius (1775) → Systema Entomologia

Tatanama pada serangga digunakan sistem penamaan binomial

Artinya adalah pemberian nama ilmiah spesies/jenis serangga dengan dua kata/nama yaitu istilah umum [nama Genus] plus istilah khusus [nama Spesies], kedua nama ini harus ditulis miring atau digaris bawah atau ditulis berbeda dengan tulisan yang lain

Zootaxa

2016 impact factor: 0.972

ABOUT THE AUTHORS

Robert W. Sites

Suputa

New species of *Nesocricos* and *Tanycricos* (Hemiptera: Heteroptera: Naucoridae: Cheirochelinae: Tanycricini) in the mountains of West Papua, Indonesian New Guinea

Robert W. Sites, Suputa

Abstract

Two new species of Tanycricini are described from mountain streams of Indonesian New Guinea. Both species were collected at 1,348 m elevation from Ingging River in West Papua. *Nesocricos ingging* Sites **n.sp.** was represented by macropterous and submacropterous forms. *Tanycricos inequalis* Sites **n.sp.** was represented by macropterous and brachypterous forms. *Nesocricos evops* La Rivers is reported from the Baliem Valley of Indonesian New Guinea.

Keywords

Insecta; Hemiptera; new species; distribution; Naucoridae; New Guinea; Indonesia

- **Identifikasi**
  Pemilahan/membedakan antar organisme
- **Taksonomi**
  (*taxis*=susunan; *nomos*=hukum)
  Pengidentifikasian, pendeskripsian, dan pemberian nama organisme berdasarkan aturan nomenklatur zoologi
- **Klasifikasi**
  Susunan organisme pada group taksonomi
- **Sistematika**
  (*systema*=susunan menyeluruh dari beberapa bagian/aspek)
  Pengembangan lebih lanjut dari klasifikasi yaitu mempelajari hunbungan dan diversitas organisme

Nama spesies serangga menggunakan sistem penamaan binomial yang secara umum diklasifikasikan ke dalam tujuh kategori utama, yaitu:

Kingdom : Animalia
Filum : Artropoda
Klas : Insekta
Ordo : {32 Ordo; sebagian besar berakhiran *ptera*}
Famili : {≥ 1.000 Famili; semuanya berakhiran *idae*}
Subfamili : {semuanya berakhiran *inae*}
Genus :
Spesies :

Sebagai contoh, kumbang moncong

[*Hypomeces squamosus* Fabricius] diklasifikasikan sebagai berikut:

Kingdom : Animalia
Filum : Artropoda
Subfilum : Mandibulata
Klas : Insekta
Subklas : Pterygota
Infraklas : Neoptera
Divisi : Endopterygota
Subordo : Polyphaga
Ordo : Coleoptera
Superfamili: Curculionoidea
Famili : Curculionidae
Subfamili : Brachyderinae
Genus : Hypomeces
Spesies : *Hypomeces squamosus*

Nama Serangga

Sebagai contoh hama padi “Walangsangit”

Nama Ilmiah

Leptocorisa acuta Thunberg {nama ilmiah dipakai di Seluruh Dunia}

Nama Umum

Walangsangit	{Indonesia}
Rice Bug	{Inggris}
Reiswanze	{Jerman}
Chinche Común del Arroz	{Spanyol}
Rijstwants	{Belanda}
Gundhi Bug	{India}
Gundi Poka	{Bangladesh}

Nama Lokal

Walang Sangit	{Jawa}
Kungkang	{Sunda}
Tenang	{Madura}
Pianggang	{Sumatera}
Empangau	{Kalimantan}

Carilah yang salah !

Kepik ijo merupakan hama yang sering dijumpai pada tanaman padi, kedelai, dan kakao. Hama ini secara ilmiah disebut nezara viridula, subfamili heteroptera, famili pentatominae, dan spesies viridula.

Nama Penemu Spesies

Contoh:

Dacus (Bactrocera) affinidorsalis n. Sp. / Sp. n. / Sp. nov.
Dipublikasikan oleh Hardy pada tahun 1982

Direvisi oleh Drew and Hancock pada tahun 1994
Bactrocera (Bactrocera) affinidorsalis (Hardy)

Contoh direvisi lagi oleh x pada tahun 2004
Dacus (Bactrocera) affinidorsalis Hardy

Working *smarter* & Working *together*

~*untuk efisiensi*~

- Tradisional morphological-taxonomy
- Teknik molekuler *tidak* untuk menggantikan konvensional: data molekuler untuk analisis sistematika
- Spesialis sangat esensial untuk identifikasi dan informasi pengetahuan biologi
- PestNet@yahoogroups.com
- Informasi teknologi: Paradigma berubah dari paper ke digitalisasi
- Net working sharing data--Image transfer

Pertumbuhan dan Perkembangbiakan Serangga

Prepared by Suput@

ENTOMOLOGY

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QUIZ berhadiah!

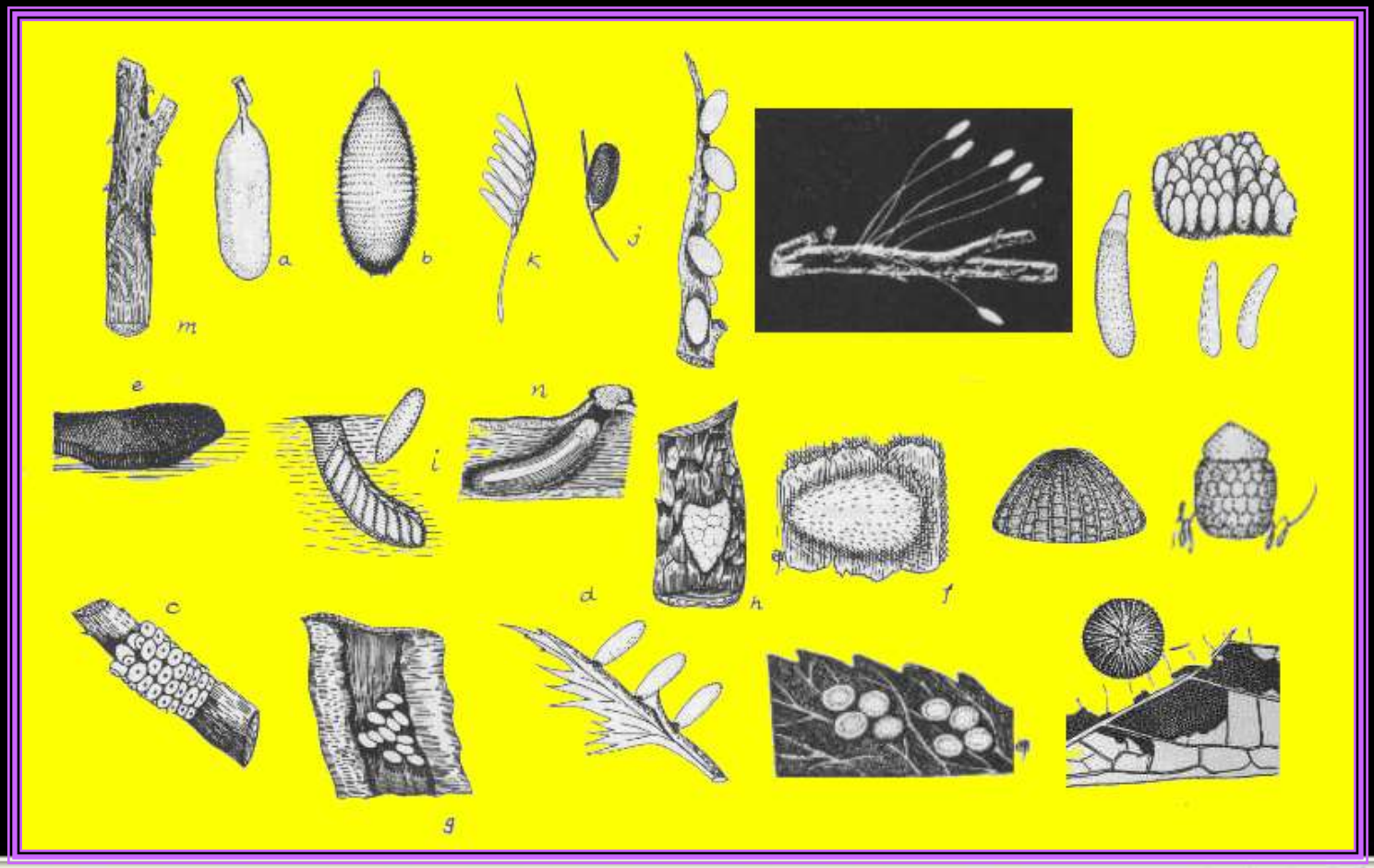
1. Apakah perbedaan yang prinsip antara ovovivipar dan vivipar?
2. Apa yang anda ketahui tentang metamorfosis, ada berapa macam? Sebutkan!
3. Apakah perbedaan antara hemimetabola dan paurometabola? Berikan contoh serangganya!

Types of Insect Reproduction

- Oviparity
- Ovoviviparity
- Viviparity

Fecundity, Fertility

Morphology of Insect Eggs



Types of Insect Reproduction

Oviparity

Types of Insect Reproduction

Oviparity

Types of Insect Reproduction

Oviparity

Types of Insect Reproduction

Oviparity

Types of Insect Reproduction

Viviparity

Types of Insect Reproduction

- Polyembriony
- Parthenogenesis
  1. Arrhenotoky
  2. Thelytoky
  3. Amphitoky
- Paedogenesis

Three Phases of Insect Development

- Embryo
- Immature
- Adult / Imago

Three Phases of Insect Development

- Embryo
- Immature
- Adult / Imago

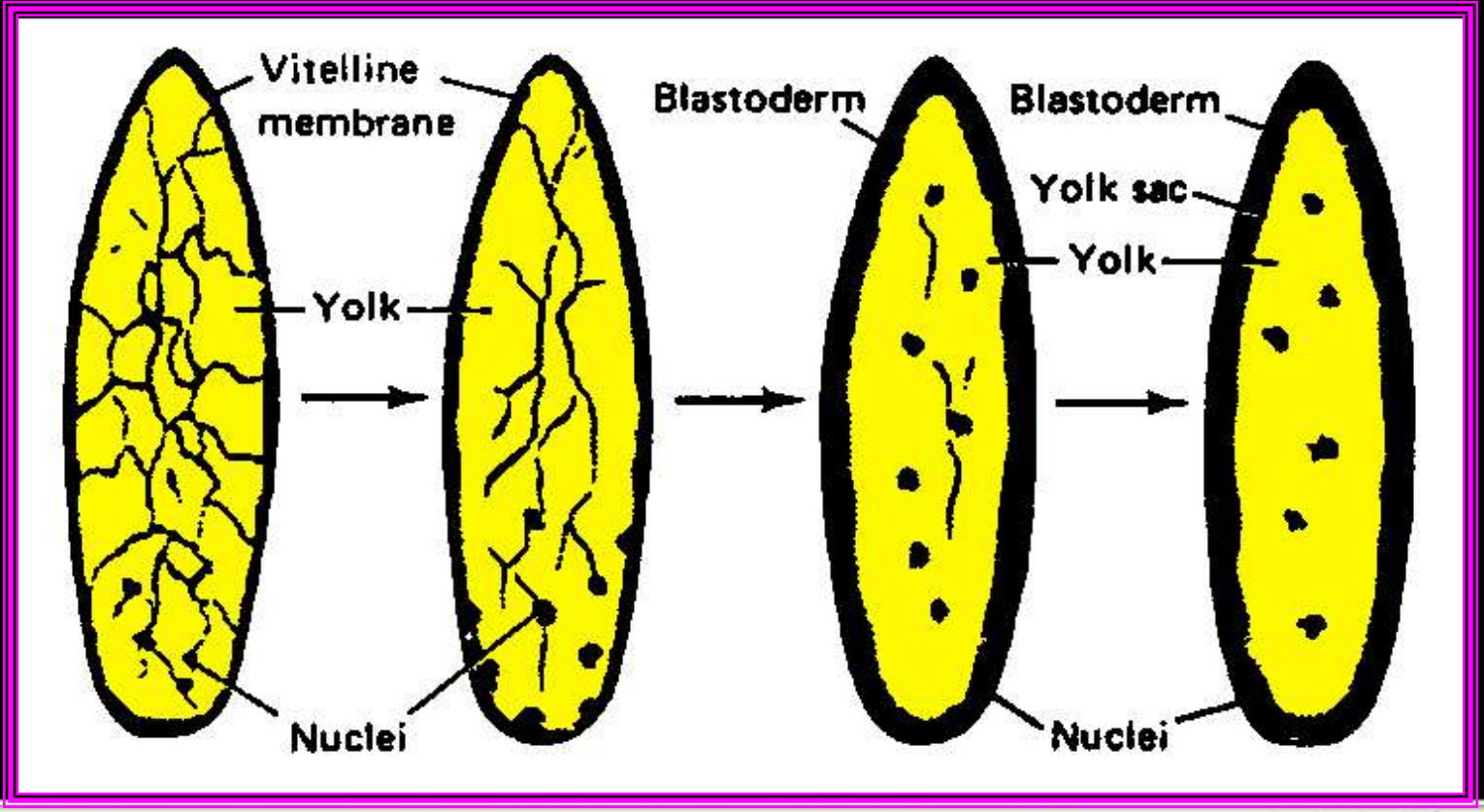
Stages in Insect Embryology ... 1

- Egg Fertilized
- Cleavage nuclei migrate to egg surface
- Blastoderm - a thin cellular layer
- Sperm production
- Fertilization
- Vitellogenesis or yolk formation in egg
- Formation of egg chorion or "shell"

Stages in Insect Embryology … 2

- Germ band forms
- Germ band invaginates into yolk
- Three primary tissues develop

Embryonic Development in an Insect



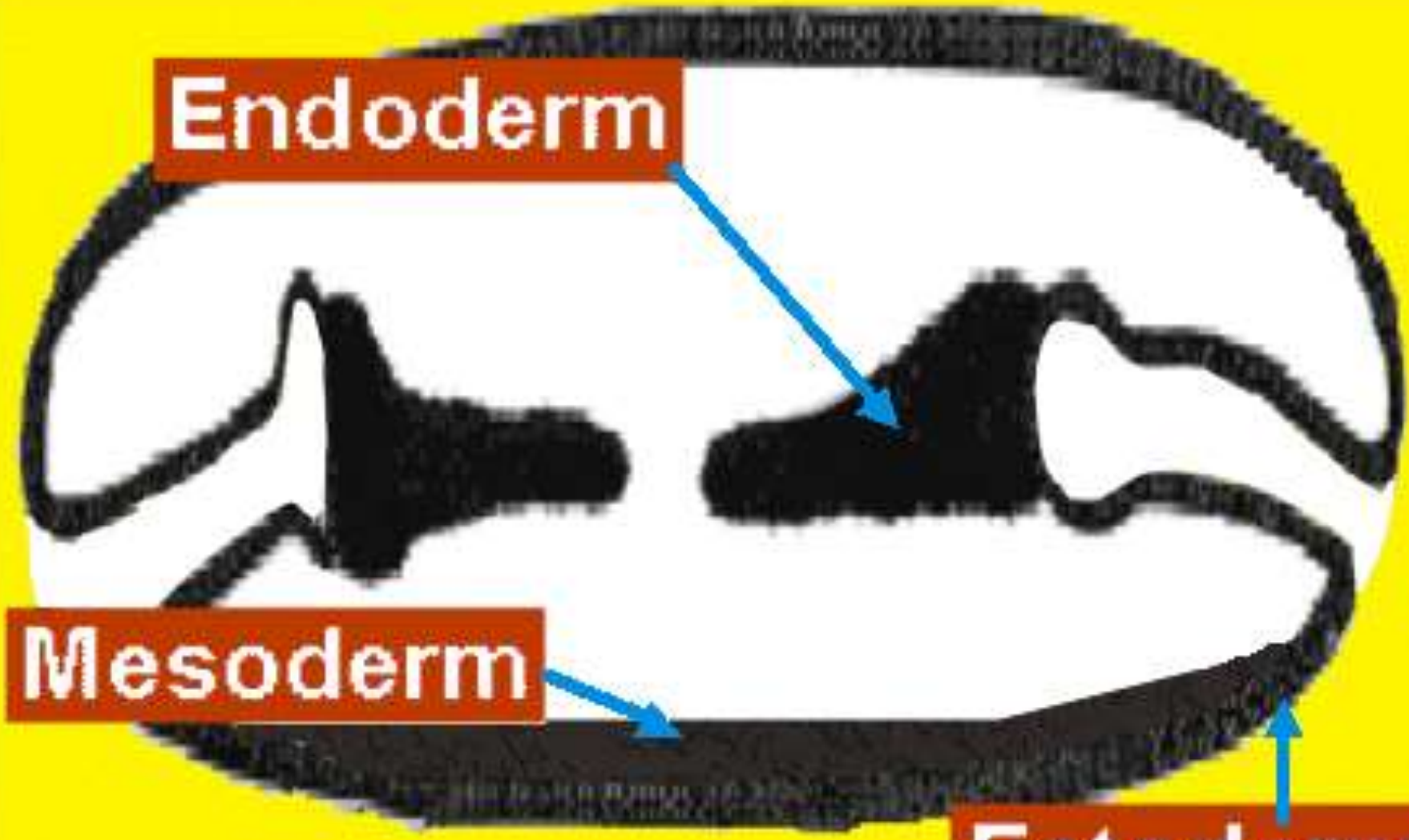
Stages in Insect Embryology ... 2

- Germ band forms
- Germ band invaginates into yolk
- Three primary tissues develop

Three Primary Tissues Develop

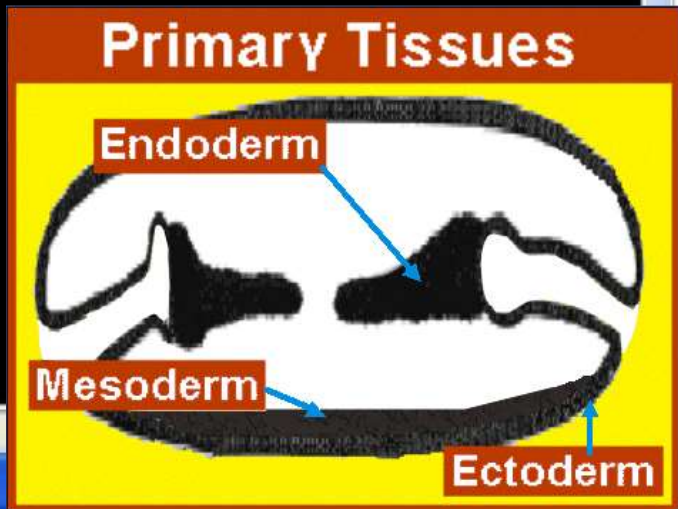
- Mesoderm
- Endoderm
- Ectoderm

Primary Tissues



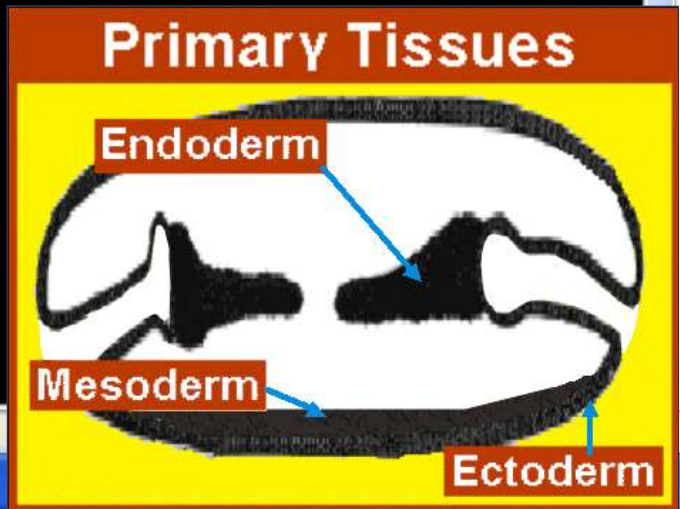
Mesoderm

- Inner layer
- Muscles, fat bodies, gonads



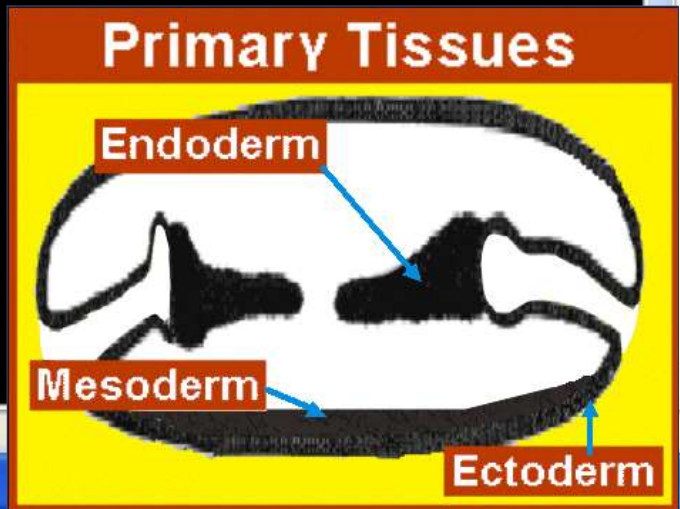
Endoderm

- Middle layer
- Gut or digestive tract



Ectoderm

- Outer layer
- Fore gut, Hind gut, Wings, Tracheal lining

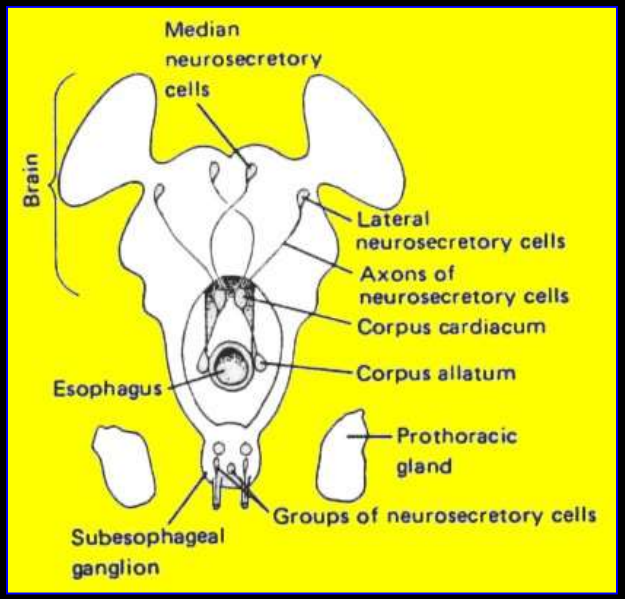


An Egg is Hatching

The Reproductive Processes is Controlled by Endocrine System

The Endocrine System

A relatively fast internal communication system related to nervous system



Chemical messengers or "hormones" in hemolymph

Hormones secreted by cells, often in the brain

Endocrine Control of:

- Reproductive processes, development, breaking diapause,
- Behavior-Migration, mating, egg laying,
- Homeostasis-sugar, fat and protein production and use

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- Reproductive processes, development, breaking diapause,
- Behavior-Migration, mating, egg laying,
- Homeostasis-sugar, fat and protein production and use

Three Phases of Insect Development

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- Immature
- Adult / Imago

Three Phases of Insect Development

- Embryo
- Immature
- Adult / Imago

Types of Larvae

Leg:

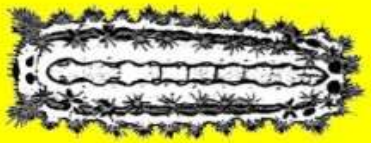
- Polypod
- Oligopod
- Apodous

Form:

- Eruciform
- Flatyform
- Scarabaeiform
- Campodeiform
- Elateriform
- Vermiform

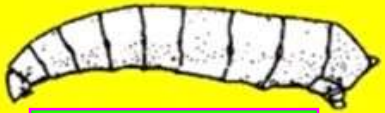
Polypod

Eruciform



Flatyform

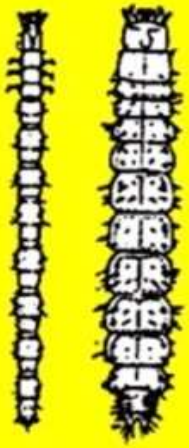
Apodous



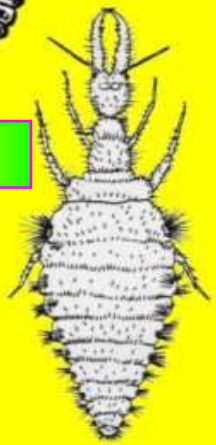
Vermiform

Oligopod

Scarabaeiform

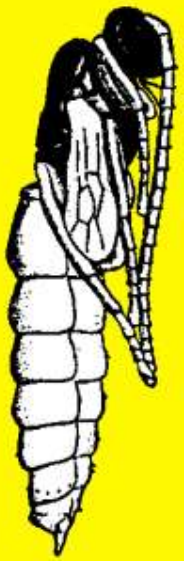


Elateriform

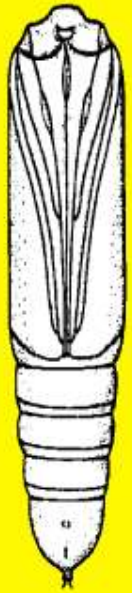


Campodeiform

Types of Pupae



Exarate



Obtect

Coarctate

How Insects Grow

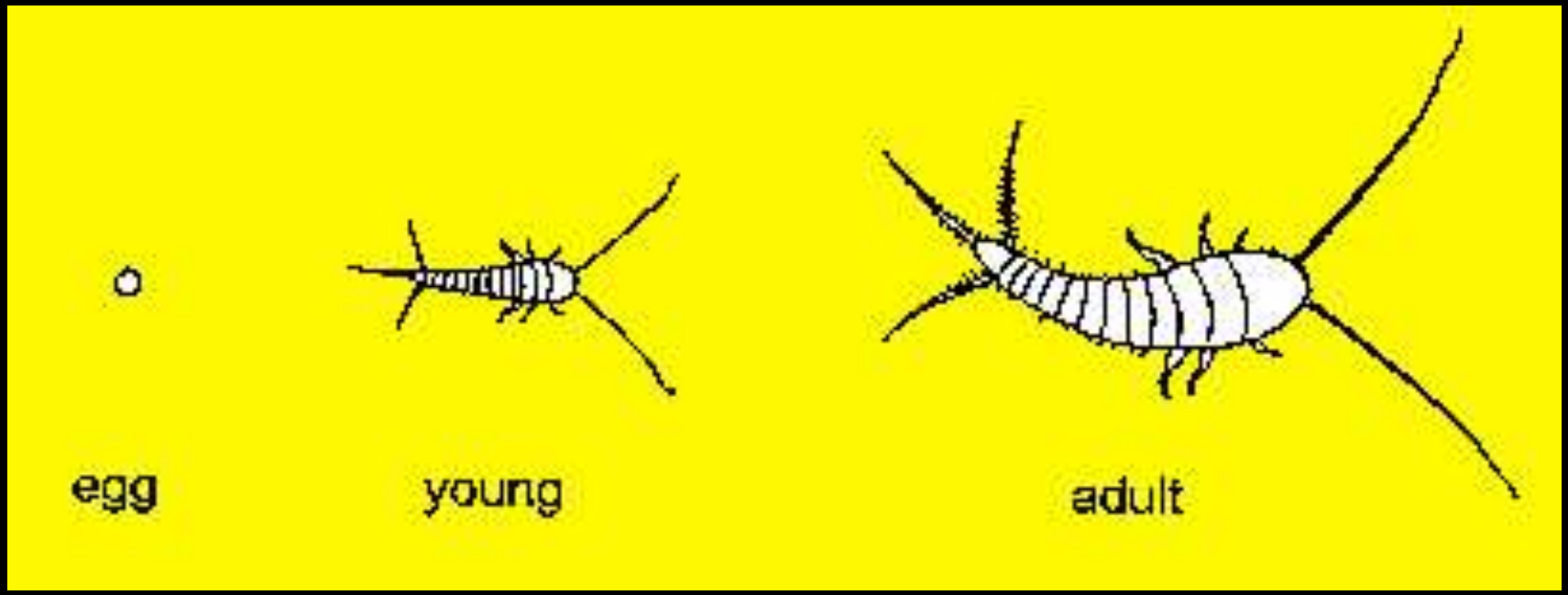
- METAMORPHOSIS

Types of Metamorphosis

- **Simple Metamorphosis**
  - No Metamorphosis (ametabolous development)
  - Incomplete Metamorphosis (hemimetabolous development)
  - Gradual Metamorphosis (paurometabolous development)
- **Complete Metamorphosis**
  - (holometabolous development)
- **Intermadiate Metamorphosis**
  - (paurometabolous & holometabolous development)

Simple Metamorphosis

No Metamorphosis



Simple Metamorphosis

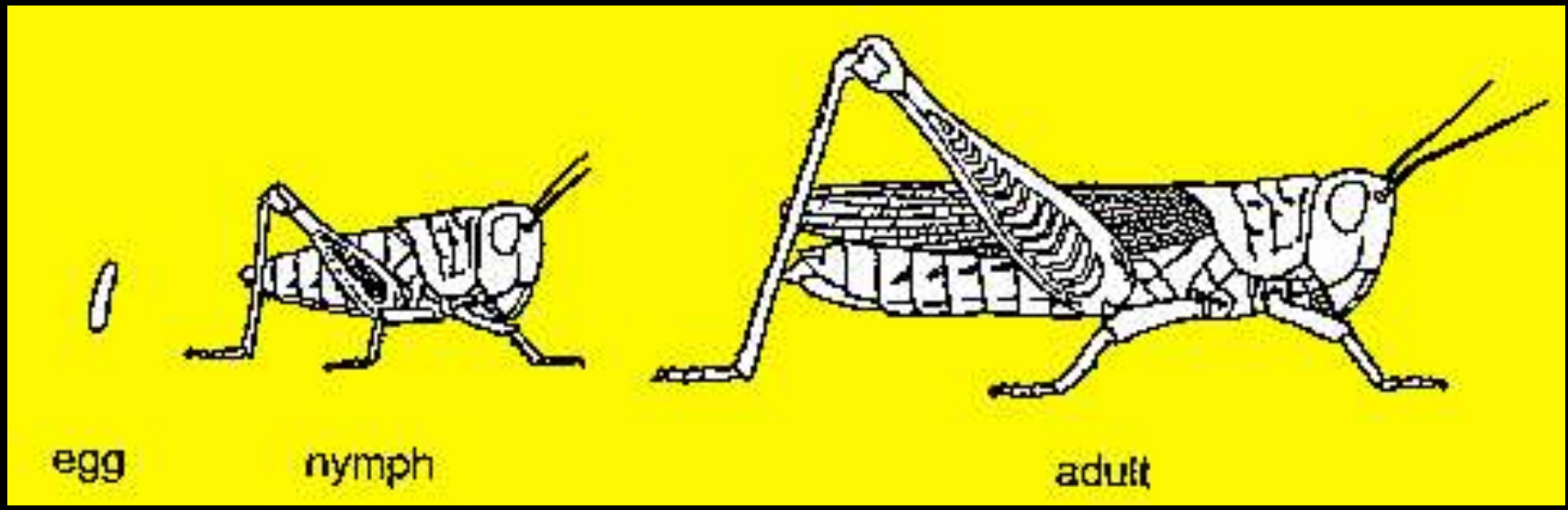
Incomplete Metamorphosis

egg

dult

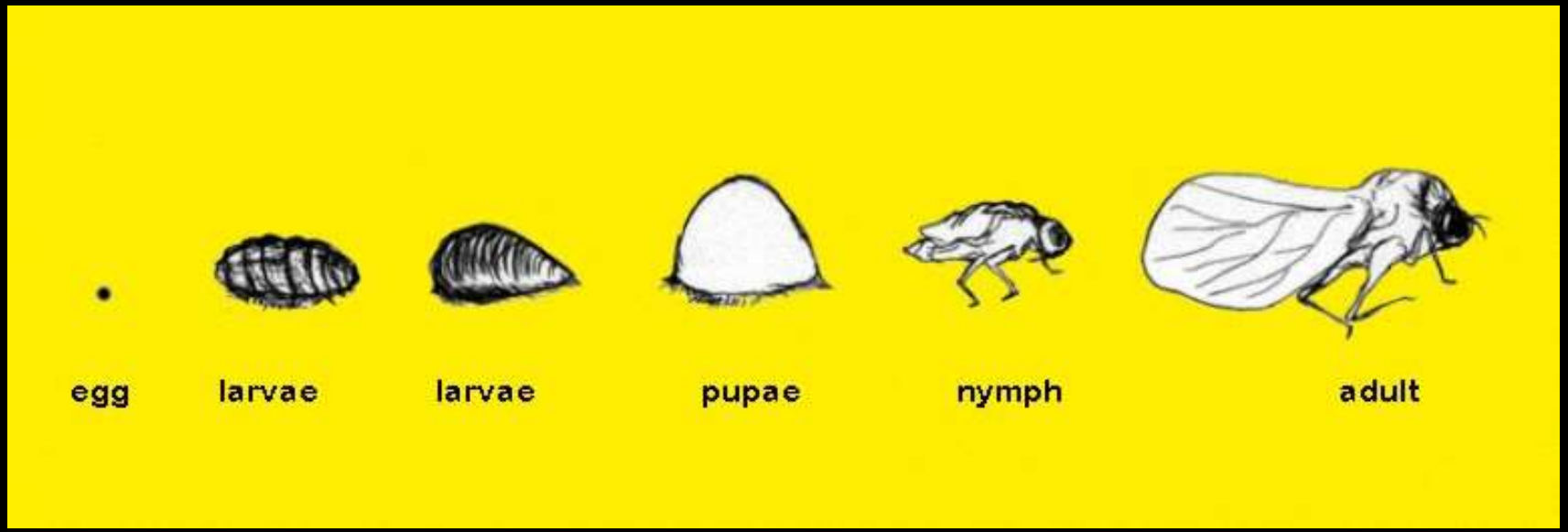
Simple Metamorphosis

Gradual Metamorphosis



Complete Metamorphosis

Intermadiate Metamorphosis



How Insects Grow

- **METAMORPHOSIS**
  - **Molting or "ecdysis"**

    Shedding the old skin or "exuvium"

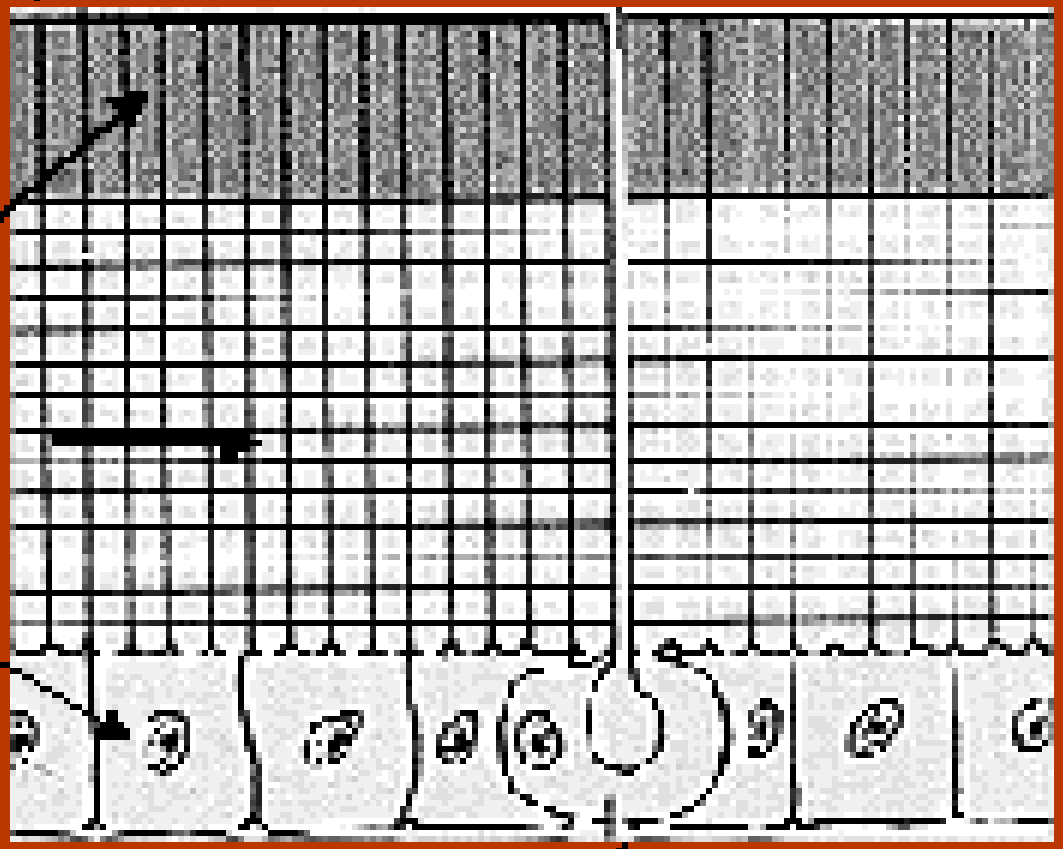
How Insects Grow

- METAMORPHOSIS
  - Molting or "ecdysis"

    Shedding the old skin or "exuvium"

Section of Cuticle

- Epicuticle
- Exocuticle
- Endocuticle
- Epidermis



- Basement membrane

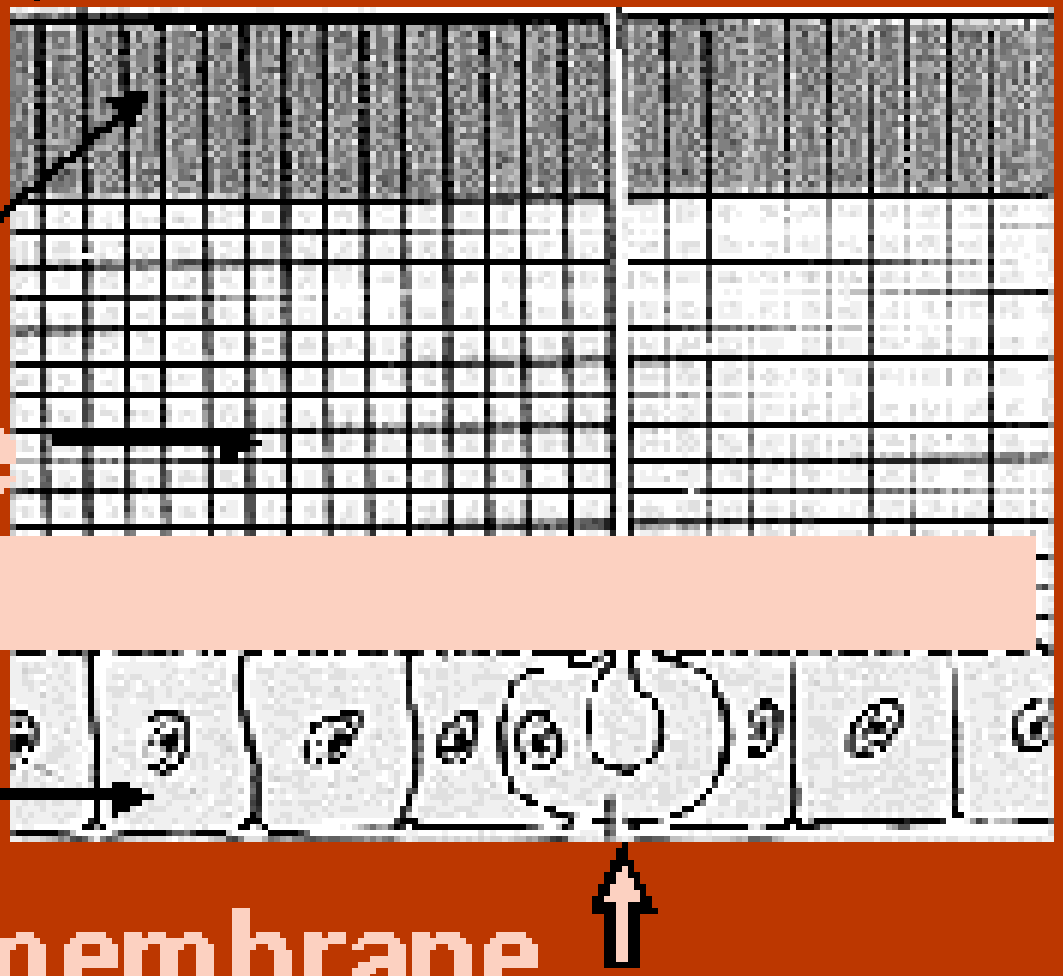
1
Stages in Molting

Apolysis

cuticle separates from epidermal layer and molting gel deposited

Section of Cuticle

- Epicuticle
- Exocuticle
- Endocuticle
- Molting gel
- Epidermis
- Basement membrane

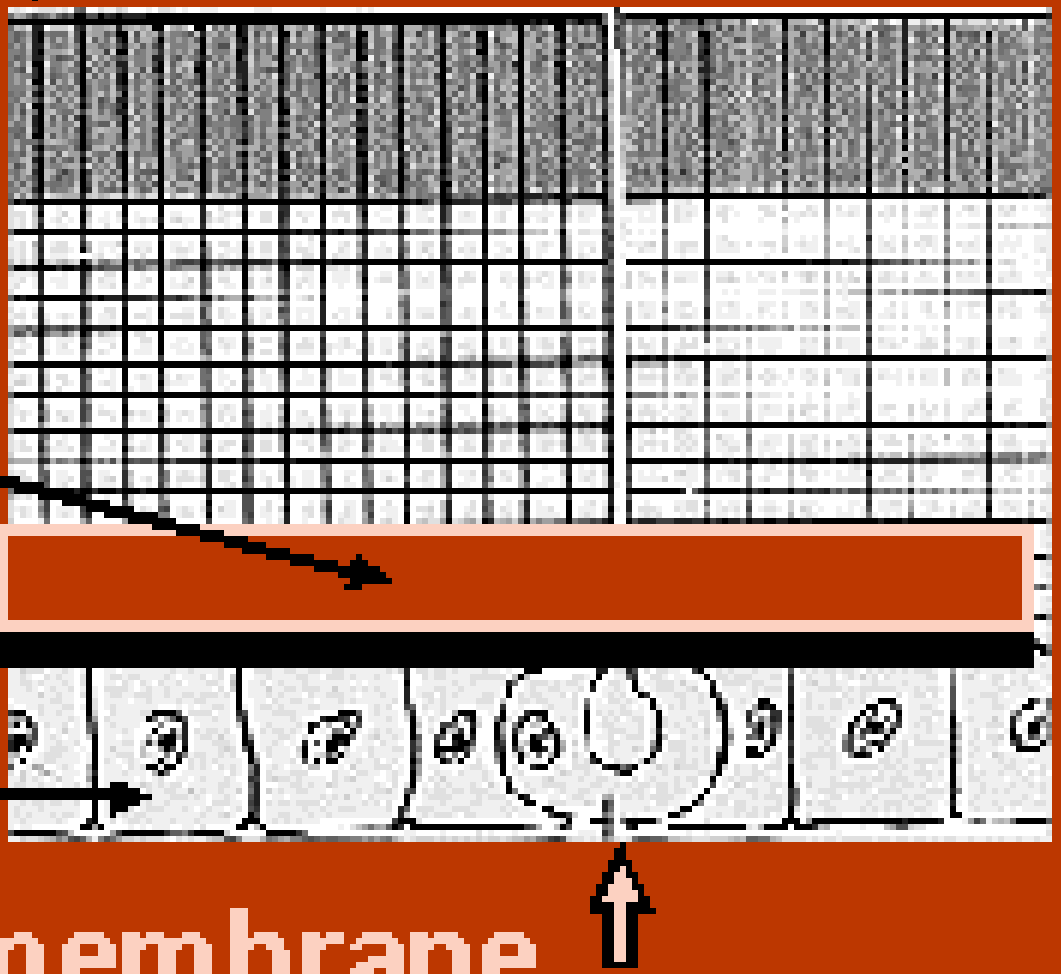


2
Stages in Molting

New epicuticle forms below molting gel

Section of Cuticle

- Epicuticle
- Molting gel activates
- Epicuticle
- Epidermis
- Basement membrane



Endocrine Control of Molting

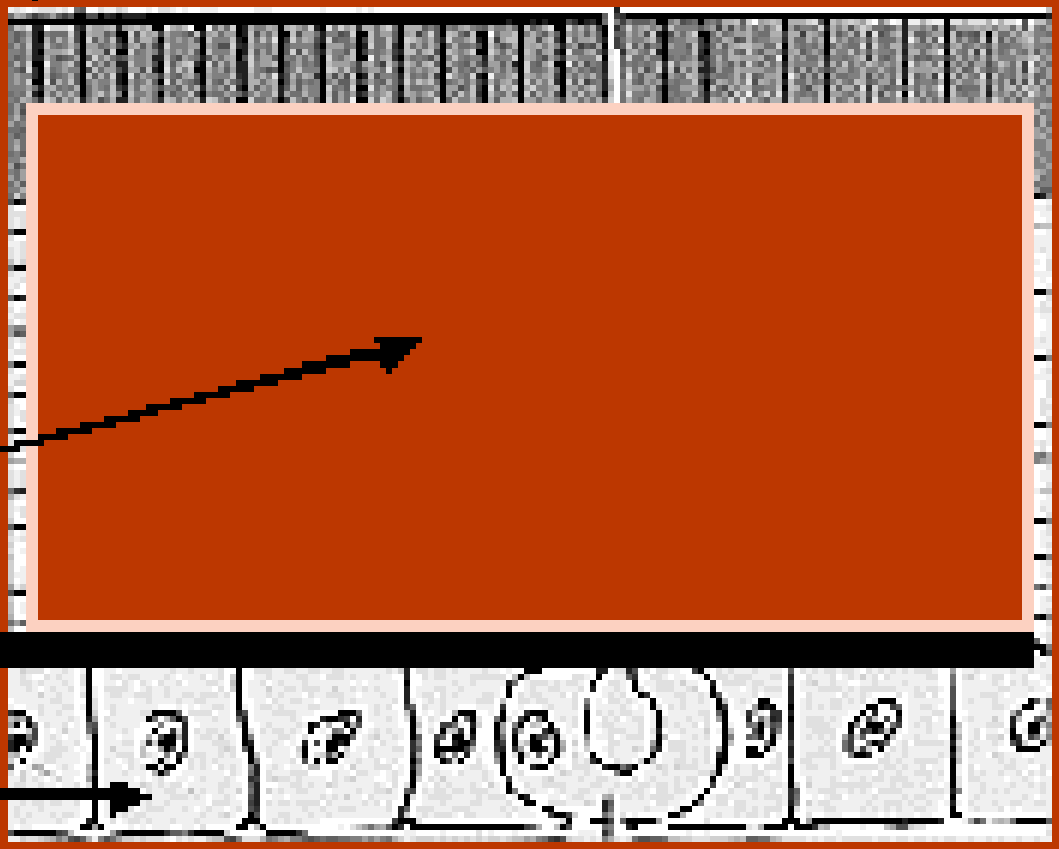
- PTTH "prothoracicotropic hormone" stimulates the prothoracic gland to release molting hormone (ecdysone)
- Ecdysone activates
  - Apolysis
  - New epicuticle and procuticle deposition

3
Stages in Molting

Molting gel is activated and digests old procuticle

Section of Cuticle

- Epicuticle
- Procuticle
  digested
- Epicuticle
- Epidermis

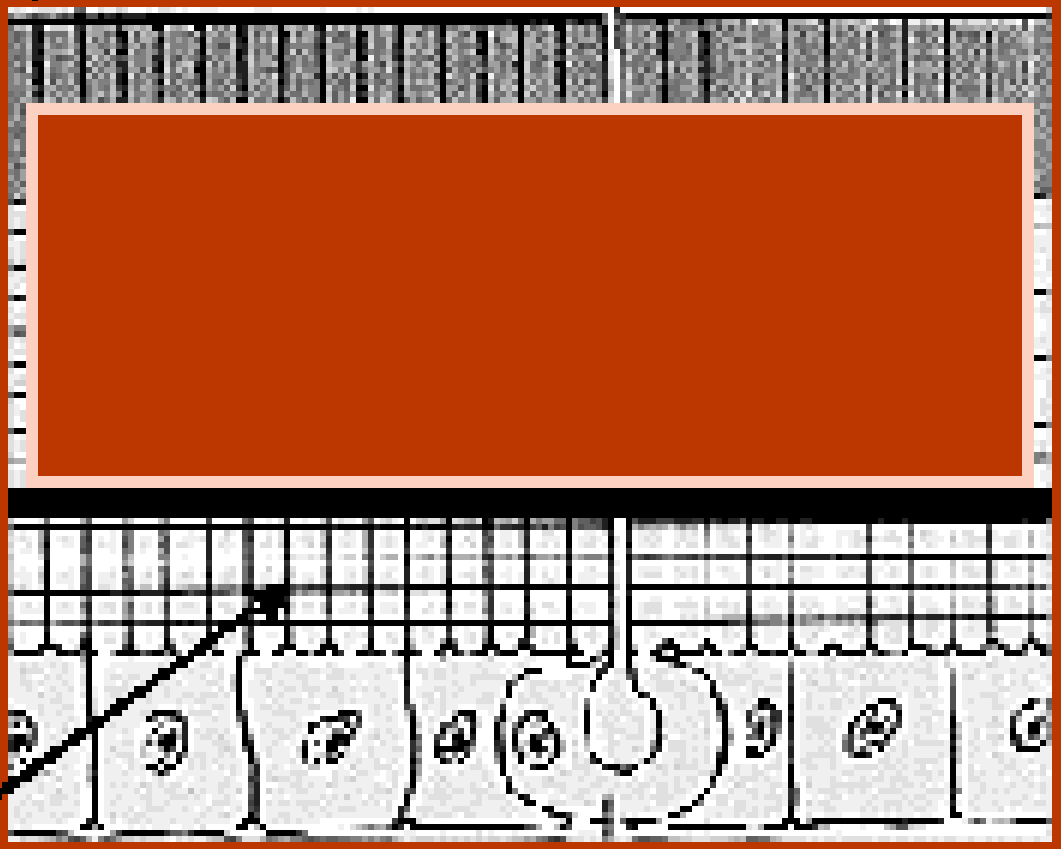


4
Stages in Molting

New soft procuticle forms under new epicuticle

Section of Cuticle

- Old epicuticle
- New epicuticle
- New procuticle



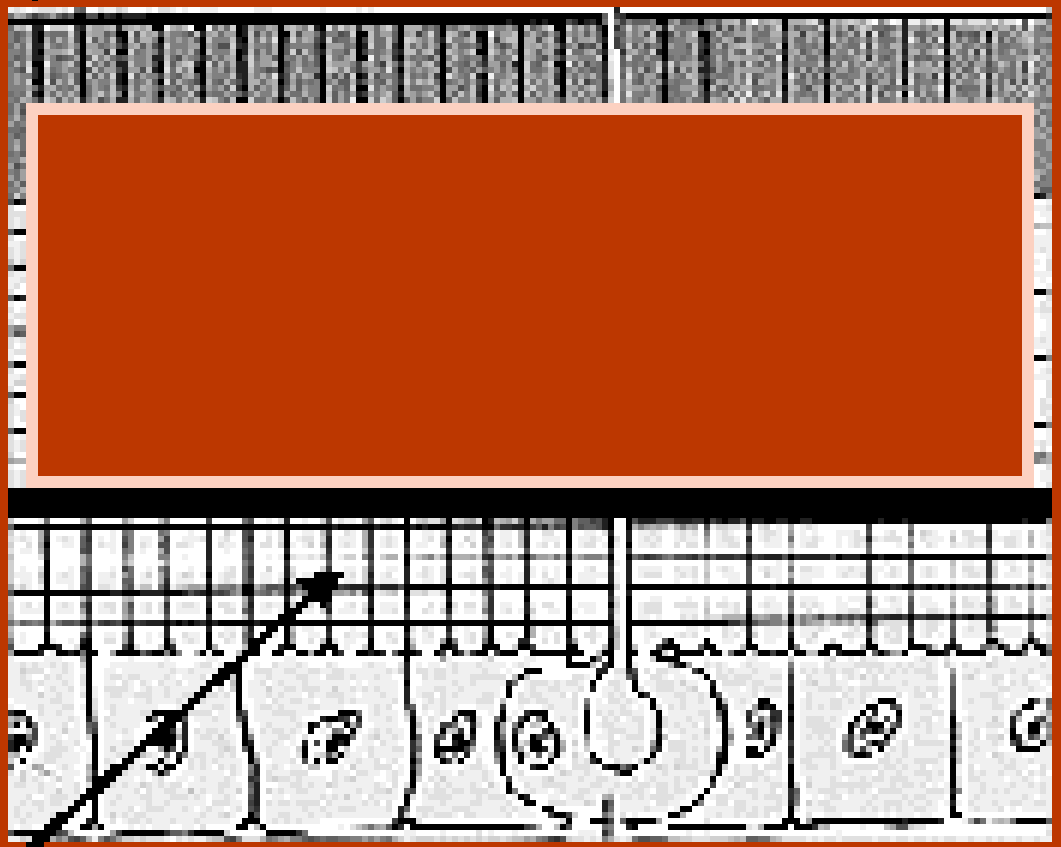
5
Stages in Molting

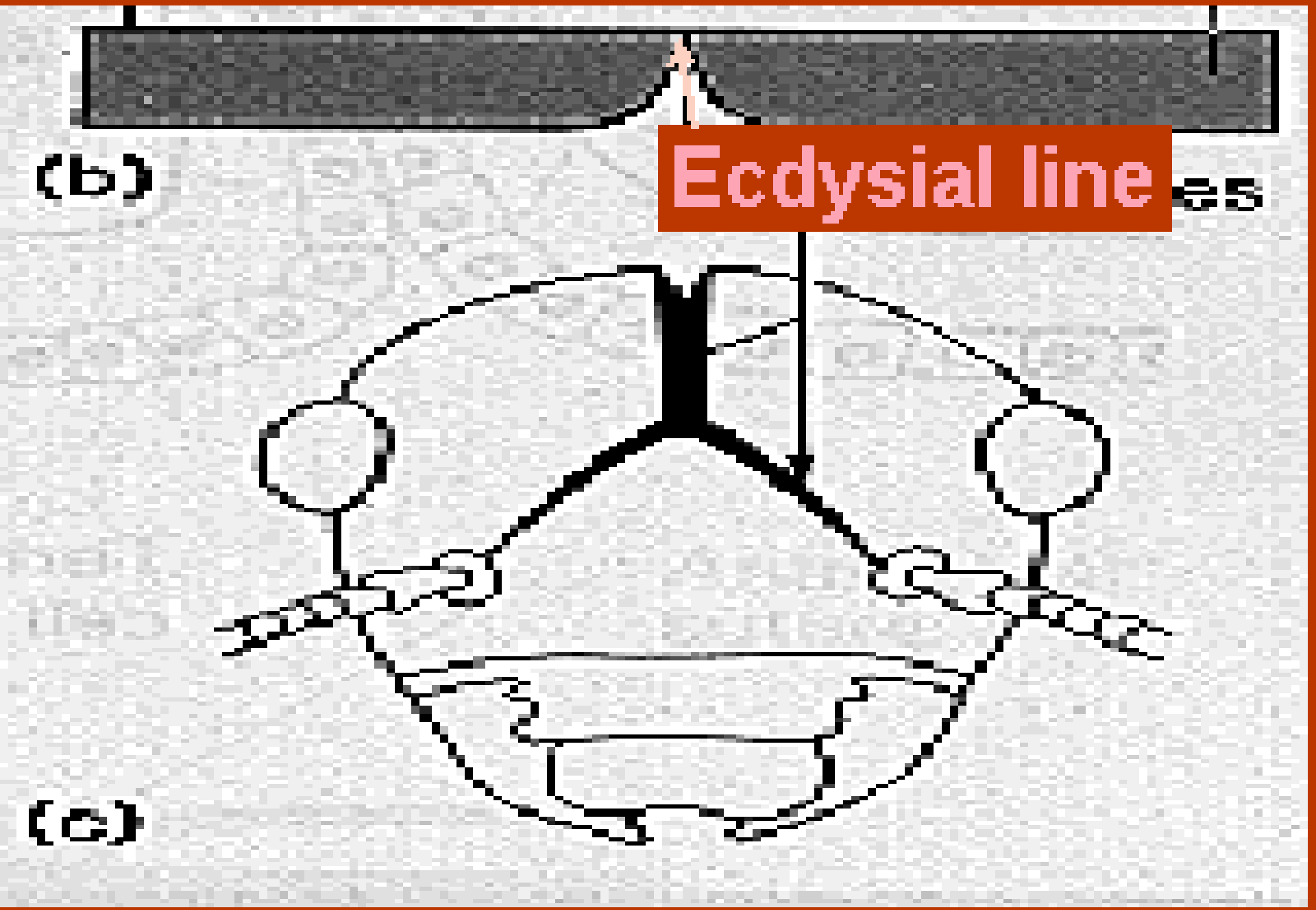
Ecdysis

”old skin is shed”

Section of Cuticle

- Old epicuticle
- New epicuticle
- New procuticle




(b)
Ecdysial line
(c)

Larvae of Lepidoptera (Molting Process)

Ecdysis

Endocrine Control of Molting

- **Eclosion hormone** from brain stored in corpora cardiaca, when released, acts on the ventral nerve cord
- **Eclosion hormone activates :**

  - **Ecdysis**

    "Shedding the old skin"

6
Stages in Molting

Expansion

"growth occurs"

New procuticle

Three Phases of Insect Development

- Embryo
- Immature
- Adult / Imago

Three Phases of Insect Development

- Embryo
- Immature
- Adult / Imago

7
Stages in Molting

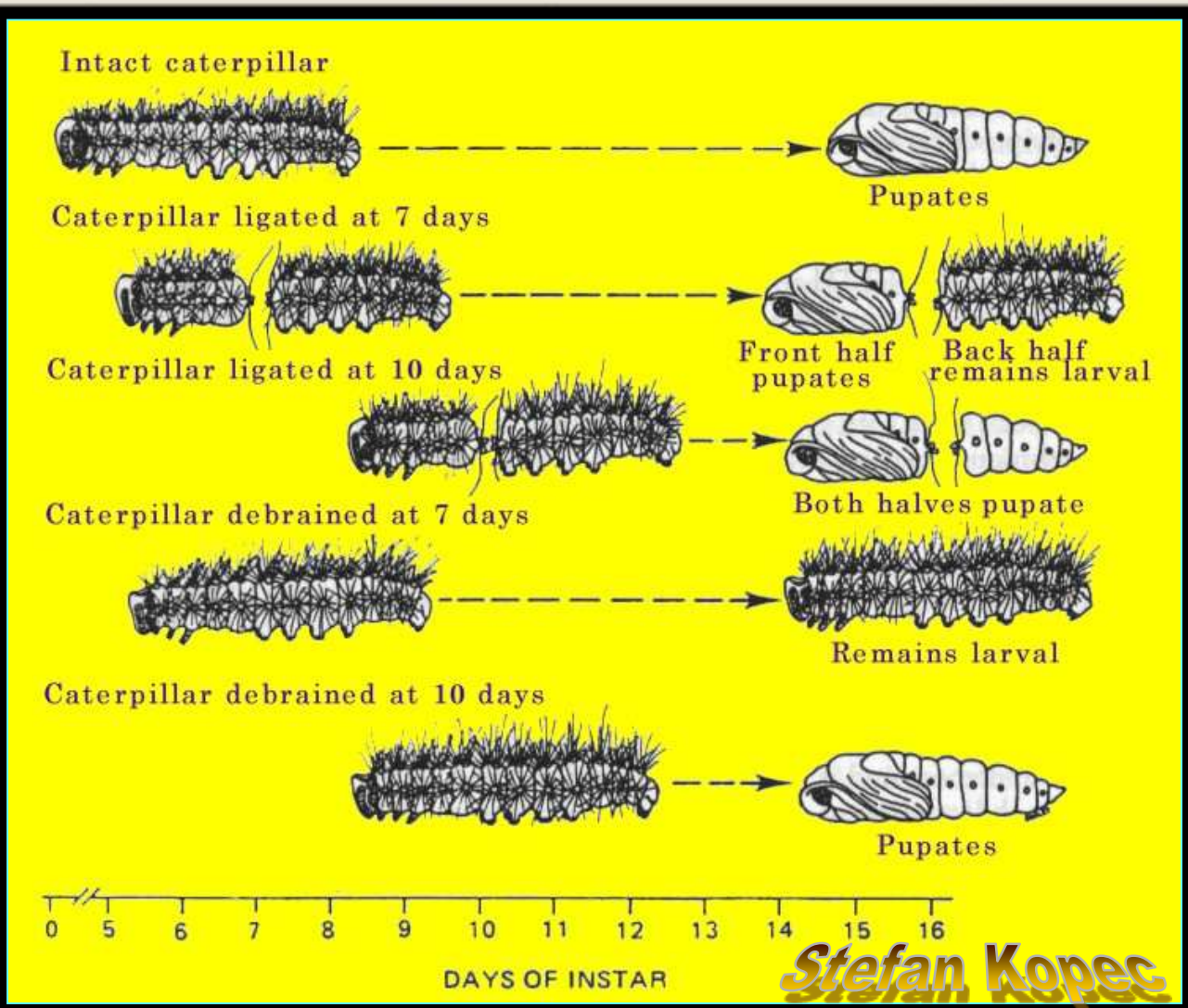
Hardening and Tanning
Endocuticle deposition

Cicada (Molting Process)
Immature to Adult

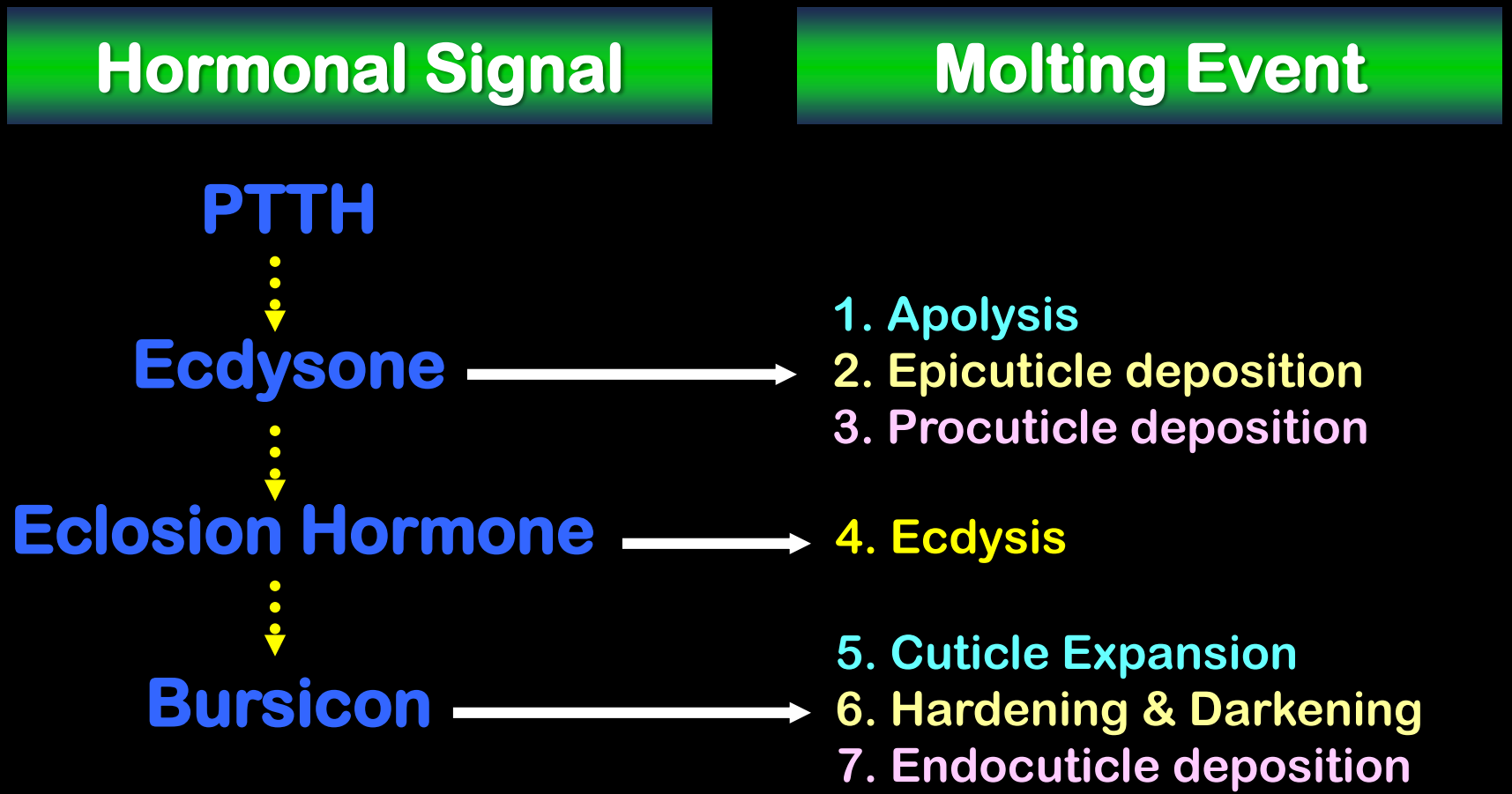
Metamorphosis

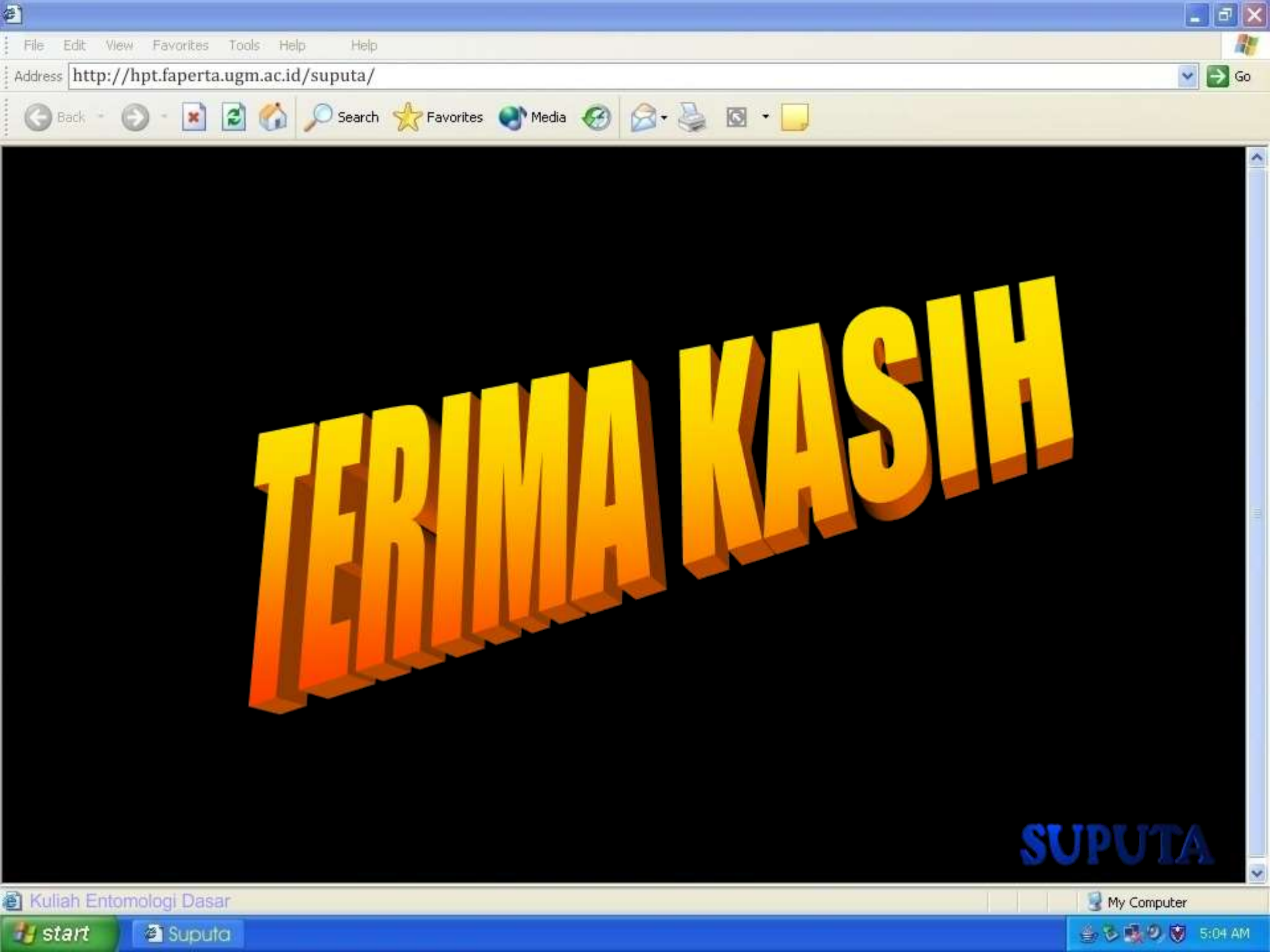
Endocrine Control of Molting

- **Bursicon**, also released from the brain, stimulates :
  - Cuticle expansion
  - Hardening and darkening
  - Endocuticle deposition



SUMMARY

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