



## Liberal Arts : Biology “Global Warming”

Bahan diambil dari berbagai sumber

Heddy Julistiono

### Karakter universal keanekaragaman hayati



- Memiliki satu kemiripan umum (serupa tapi tak sama)
- Interaksi (asosiasi berbagai mahluk menjadi satu, interdependensi, interkoneksi)
- Adaptasi
- Regulasi (proses benar dan baik untuk manusia)
- Berpasang-pasangan di segala level

Video5 ecosystem



Hey! I'm a walking stick. I look just like a stick you'd find on the ground.

• **Physical adaptations** are body structures that allow an animal to find and consume food, defend itself, and to reproduce its species.

• **Physical adaptations** help an animal survive in its environment.

[www.thesciencequeen.net/Adaptations.ppt](http://www.thesciencequeen.net/Adaptations.ppt)

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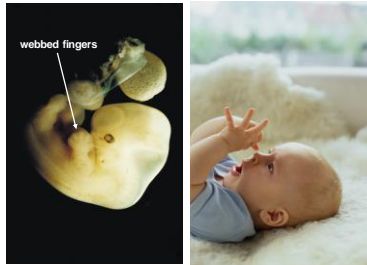
**Behavioral Adaptations** allow animals to respond to life needs.



[www.thesciencequeen.net/Adaptations.ppt](http://www.thesciencequeen.net/Adaptations.ppt)

### Contoh regulasi pada proses siklus sel

- Apoptosis adalah kematian sel yang terprogram
  - Kejadian normal pada makhluk hidup
  - Disebabkan oleh enzim bunuh diri yang diproduksi sel
  - Terjadi pada proses perkembangan janin bayi

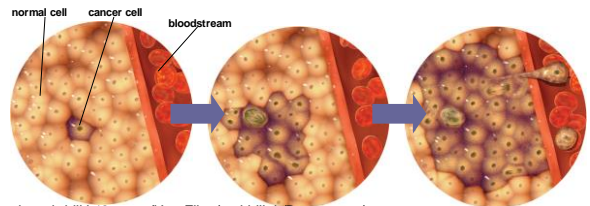


rh.rock-hill.k12.sc.us/UserFiles/rockhill\_h/Documents/

### 5.3 Regulation of the Cell Cycle

#### • Pembelahan sel yg tidak terkontrol pada cancer.

- Cancer cells form disorganized clumps called tumors.
  - Benign tumors remain clustered and can be removed.
  - Malignant tumors metastasize, or break away, and can form more tumors.



rh.rock-hill.k12.sc.us/UserFiles/rockhill\_h/Documents/

### (cuplikan *Timeline*) Sejarah pembentukan planet

Bumi kering tanpa air dan kehidupan

Bumi "dikirimi" air melalui tabrakan dgn komet es (air)

(Perdebatan: Earth Planetary Sci. Lett. 313–314 (2012) 56–66)

Terbentuk makhluk hidup sederhana dalam air **tanpa O<sub>2</sub>**

Terbentuk cyanobacteria penghasil O<sub>2</sub>

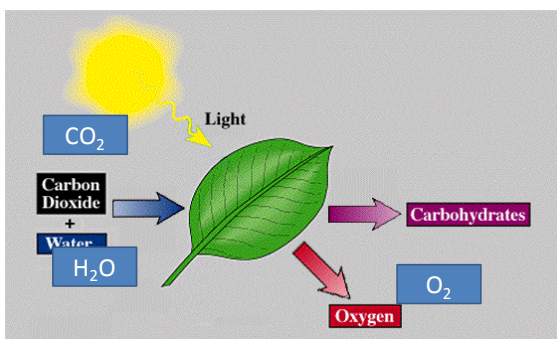
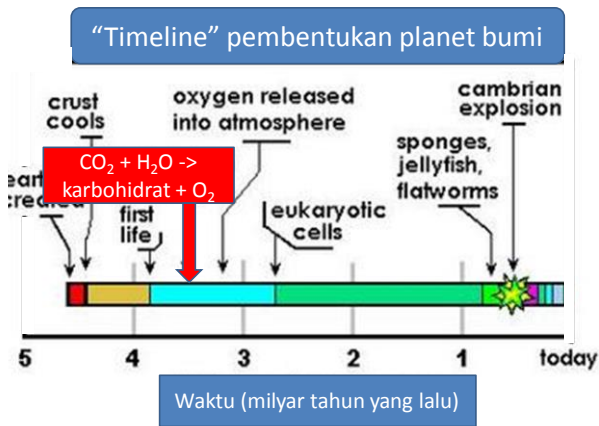
Bencana oksigen(O<sub>2</sub>)

Terbentuk tumbuhan penghasil O<sub>2</sub> penyerap CO<sub>2</sub>

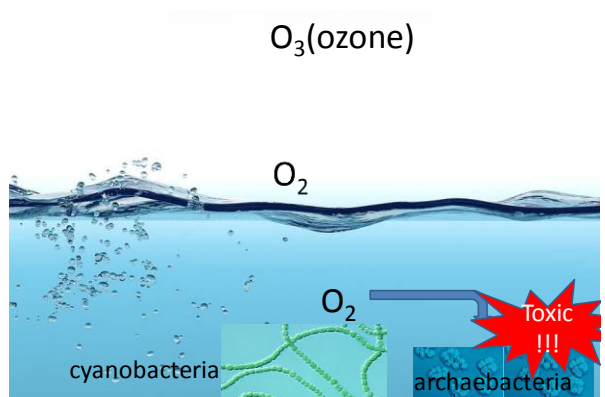
O<sub>2</sub> terakumulasi di atmosfer jadi ozone

Muncul makhluk hidup dari air ke darat

vi  
de  
o




Fotosintesis : karbon dioksida dan air menjadi karbohidrat dan oksigen



Peran aktivitas manusia dalam proses Pemanasan Global :

- Pembongkaran kembali gas rumah kaca yang telah tertimbun selama proses kolonisasi keanekaragaman mahluk hidup,
- Beberapa contoh aktivitas untuk menanggulangi pemanasan global

## Apakah hubungan antara Fotosintesis – bahan bakar fosil – global warming

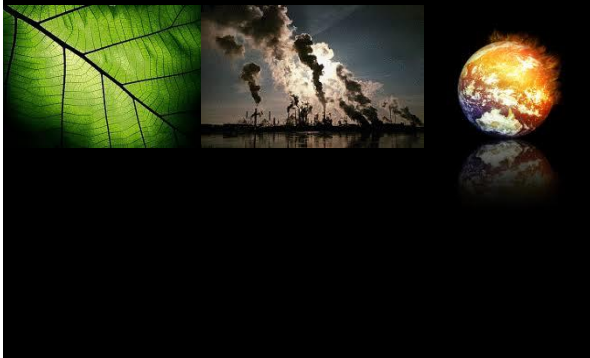


Manusia membongkar tumpukan  $\text{CO}_2$  yg tersimpan berkat fotosintesis (pembakaran Bahan Bakar Fosil -bensin, gas, -batubara)

sehingga mengakibatkan “rumah kaca”

Manusia melubangi lapisan ozon ( $\text{O}_3$ ), yg bahan penyusunnya ( $\text{O}_2$ ) dihasilkan dari fotosintesis sehingga bumi kurang terlindungi dari sengatan UV matahari

## Bagaimana hal tersebut terjadi ?



University of BRISTOL

Minyak dan Gas



[http://en.wikipedia.org/wiki/Image:Moscow\\_traffic\\_congestion.JPG](http://en.wikipedia.org/wiki/Image:Moscow_traffic_congestion.JPG)

[http://upload.wikimedia.org/wikipedia/commons/6/6e/Oil\\_well.jpg](http://upload.wikimedia.org/wikipedia/commons/6/6e/Oil_well.jpg)

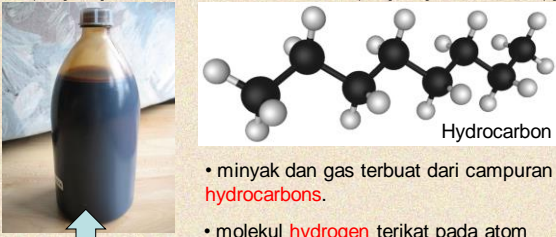
[http://en.wikipedia.org/wiki/Image:Centralum\\_Biandirella.jpg](http://en.wikipedia.org/wiki/Image:Centralum_Biandirella.jpg)

[http://en.wikipedia.org/wiki/Image:Oil\\_platform.jpg](http://en.wikipedia.org/wiki/Image:Oil_platform.jpg)

YOUR PLANET. OUR CARE.



### Origin (1): Kimia



en.wikipedia.org/wiki/Image:Petroelum.JPG

en.wikipedia.org/wiki/Image:Octane\_molecule\_3D\_model.png

Crude Oil

Hydrocarbon

- minyak dan gas terbuat dari campuran **hydrocarbons**.
- molekul **hydrogen** terikat pada atom **carbon**.

### Origin (2): Plankton



cache.etsy.com/eb/image/63610

10,000 macam mahluk ini = bahan bakar!

Plankton tumbuhan

Plankton hewan

- minyak dan gas berasal dari **tumbuhan dan hewan mikroskopik** yang hidup di lautan

### Origin (3): peledakan populasi



serc.carleton.edu/images/microbelle/topics/red\_tide\_genera.v3.jpg

Dinoflagellate bloom

- sekarang, plankton masih dapat dilihat di permukaan laut
- Blooms of certain plankton called **dinoflagellates** may give the water a red tinge

### Origin (4): di dasar laut



upload.wikimedia.org/wiki/pedia/en/U04Plankton.jpg

Dasar laut

Ketika **plankton mati**, jasadnya rontok ke dasar lautan membentuk massa organik

en.wikipedia.org/wiki/Image:Nem0328.jpg

Hewan memakan plankton dan mati, rontok ke dasar laut

### Origin (5): lempeng

• akumulasi bahan organik mati pada dasar laut

• sedimen mengandung bahan organik **Lempeng (black shale)**

upload.wikimedia.org/wikipedia/en/0/04/Plankton.jpg

YOUR PLANET EARTH

© Earth Science World Image Bank

### Origin (6): pematangan

Timbunan Black Shale **menimbulkan panas**

Bahan organik berubah jadi kerogen, **bentuk padat** dari hydrocarbon

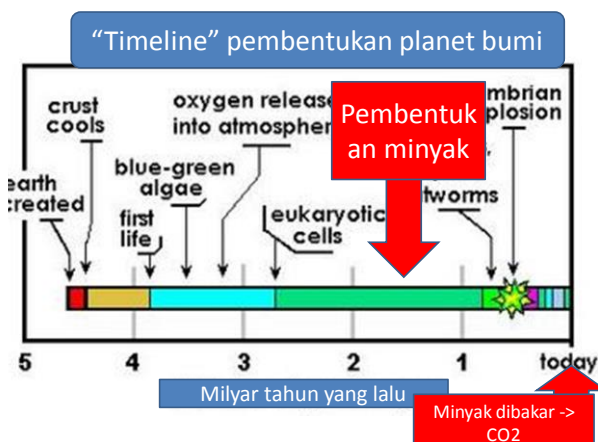
90° C, berubah jadi **cair** yg kita sebut **minyak**

Sekitar 150° C, berubah jadi **gas**

Oil/gas window	Depth (km)	Temp (°C)
Kerogen	1	30°C
	2	60°C
Oil	3	90°C
	4	120°C
Gas	5	150°C

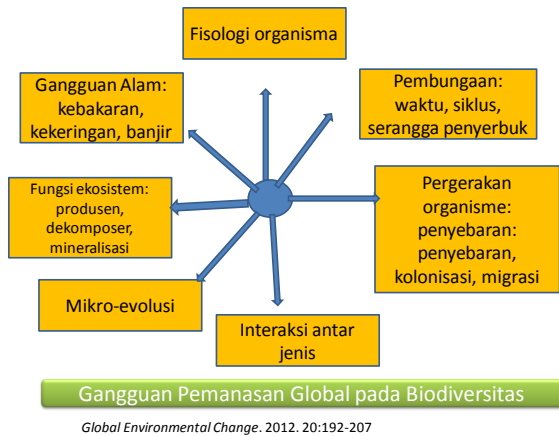
www.oilandgasgeology.com/oil\_gas\_window.jpg

YOUR PLANET EARTH



### Ada apa dengan bumi yang sedang memanas ?

Ekosistem raksasa pada bumi yang telah terkondisikan sesuai kebutuhan kehidupan yg dirintis oleh mikroba, tumbuhan, hewan, telah terganggu akibat aktivitas manusia....☹



#### Efek Perubahan Iklim terhadap ekosistem

- Merubah tempat hidup dan cara mahluk hidup berinteraksi
- Berdampak pada satu jenis dan merambat ke jenis lain melalui rantai makanan
- Pegunungan dan ekosistem arktik (kutub) sangat rentan
- Dapat mengakibatkan kepunahan jenis-jenis yang terdapat pada ekosistem yang rentan

<http://www.epa.gov/climatechange/impacts-adaptation/>

#### Efek Perubahan iklim terhadap Pertanian

- Kenaikan suhu dan penambahan karbon dioksida pada atmosfer dapat meningkatkan pertumbuhan tanaman
- Banjir atau kekeringan dapat mengakibatkan penurunan produksi
- Ternak dapat memiliki resiko yang buruk secara langsung akibat kenaikan suhu
- Secara tidak langsung, ternak dapat dipengaruhi oleh ketersediaan pakan yang cocok (kualitasnya bagus)
- Pada perikanan, kenaikan suhu akan merubah "species range"
- Air menjadi habitat yang lebih baik bagi jenis-jenis invasif
- Waktu siklus hidup ikan akan berubah

<http://www.epa.gov/climatechange/impacts-adaptation/>

#### Efek Perubahan Iklim terhadap hutan

- Perubahan frekuensi dan intensitas gangguan hutan termasuk kebakaran, peledakan populasi serangga, keberadaan jenis invasif
- Perubahan produktivitas hutan
- Memperparah kerusakan hutan yang berasal dari pengemangan lahan dan polusi udara

<http://www.epa.gov/climatechange/impacts-adaptation/>

# Take Home #1

- When faced with a change in environmental condition, a population of a species can get MAD:
  - MIGRATE to a more favorable location
  - ALREADY be adapted
  - DIE

Miller Chapter 5  
 Powerpoint Adapted from:  
<http://yhspatriot.yorktown.arlington.k12.va.us/~mzito/APES/PPTs/Evolution.ppt>

## "Ecological - Economic conflicts"



lagoonsociety.com/wp-content/uploads/.../Diane-Srivastava-UBC.ppt



Lalu, bagaimana kita bisa memperlambat terjadinya "global warming"







### Pengembangan bioenergi



biodiesel

taiwan



Bioetanol



### Kurangi konsumsi bahan bakar fosil

Because greenhouse gas emissions are tied very closely to our energy consumption, using less fossil fuel based energy puts fewer greenhouse gases into the atmosphere.

This will help slow global warming.

**Mountaintop removal for coal mining near Rawl, West Virginia.**

**50% of electricity in the United States is produced from coal.**



education.ilab.org/jsat/powerpoint/0708\_global\_warming.ppt

### Average Electricity Emission Factors

Region/State	CO2 lb/kWh	CO2 tons/MWh	CO2 Metric tons/MWh	CH4 lbs/MWh	NO2 lbs/MWh
South Atlantic	1.35	0.674	0.612	0.0127	0.0207
North Carolina	1.24	0.621	0.563	0.0105	0.0203
Virginia	1.16	0.582	0.528	0.0137	0.0192
West Virginia	1.98	0.998	0.897	0.0137	0.0316

education.ilab.org/jsat/powerpoint/0708\_global\_warming.ppt

### Kitchen Light Fixture



Three 60 Watt Bulbs

education.ilab.org/jsat/powerpoint/0708\_global\_warming.ppt

We can make some simple substitutions

Replacing just 1 incandescent light bulb with 1 compact florescent bulb saves about **150 pounds of carbon dioxide per year!**



If every American household replaced just 5 high-use incandescent bulbs with compact florescent lights we'd collectively save more than \$8 billion each year in energy costs and we would prevent the greenhouse gases equivalent to the emissions from nearly 10 million cars.

Source: <http://www.energystar.gov>

Small changes really add up



Replace your old refrigerator with a new Energy Star:  
Annual savings:  
\$90; 700 pounds CO<sub>2</sub>



Set your thermostat down a few degrees in the winter  
Annual savings:  
\$135; 1400 pounds CO<sub>2</sub>



Drive JUST 10 fewer miles per week  
Annual savings:  
\$80; 520 pounds CO<sub>2</sub>



Wash clothes in cold water only  
Annual savings:  
\$70; 500 pounds CO<sub>2</sub>



Reduce your garbage by 10% through greater recycling or reduced packaging  
Annual savings:  
1200 pounds CO<sub>2</sub>

\* These are mid-range estimates from published sources; your savings may vary.

education.ilab.org/jsat/powerpoint/0708\_global\_warming.ppt

## Blowing Up Your World

- 1. How many of you leave your bedroom light on when you are not in the room?
- *Turning off lights saves energy and money. The more energy used, the more rivers are dammed or more fossil fuel is burned, causing air pollution and increased levels of carbon dioxide in the atmosphere.*

education.ilab.org/jsat/powerpoint/0708\_global\_warming.ppt

## Blowing Up Your World

- **How many of you walked, bicycled or took public transportation to get to school today, instead of coming by private automobile?**

***Our reliance on cars that burn fossil fuels is one of the major causes of increased levels of carbon dioxide in the atmosphere and it is the primary cause of urban smog.***

## Blowing Up Your World

- How many of you, when you drink a soft drink, throw the container into the garbage?
- *Throwing away containers of any kind wastes energy and resources and adds to our waste problem. Many towns are running out of landfill space.*

## Blowing Up Your World

How many of you eat fresh vegetables instead of canned or frozen?

*Fresh vegetables cook more quickly and are usually more nutritious than frozen or canned foods. Canned and frozen vegetables are often over-processed, contain additives, contribute to air pollution (transport and packaging) and add to our waste problem.*

education.jlab.org/jsat/powerpoint/0708\_global\_warming.ppt

## Blowing Up Your World

- How many of you use a hairdryer or other energy-consuming convenience appliance, especially in the morning?
- *Hairdryers use a lot of energy. In the morning so much energy demand is put on our grids that power companies have to find other sources of energy just to meet the morning rush hour*

education.jlab.org/jsat/powerpoint/0708\_global\_warming.ppt

## Blowing Up Your World

- How many of you, when you go to a store, get a bag for your purchases, even if you have only one or two small items to carry?
- *Making paper and plastic bags uses energy and resources. The bags add to our litter and waste problems, and plastic is not biodegradable. Recycling is not the best answer because collecting and recycling materials requires energy. Instead, carry a reusable cloth bag or a knapsack with you.*

## Blowing Up Your World

How many of you carry your lunch to school in a lunch box or reusable container?

*Making paper and plastic bags uses energy and resources.*

## Blowing Up Your World

- How many of you eat take-out or cafeteria food that is served in foam or plastic containers?
- *Polystyrene and other plastic containers are made from precious petrochemicals, do not decompose in landfills, and release toxic gases when they are burned in incinerators.*

education.jlab.org/jsat/powerpoint/0708\_global\_warming.ppt

## Blowing Up Your World

- How many of you use handkerchiefs instead of tissues and use cloth towels instead of paper towels?
- *Paper comes from trees. The more of it we use, the more trees that are cut down*

education.jlab.org/jsat/powerpoint/0708\_global\_warming.ppt

## Blowing Up Your World

- How many are changing incandescent bulbs for new compact fluorescent bulbs?

**Changing one bulb could save 150 pounds of carbon dioxide per year!**



education.jlab.org/jsat/powerpoint/0708\_global\_warming.ppt

## Tingkat kepedulian terhadap lingkungan

- You're an environmentalist!
- you're starting to save the world.
- Lots of room for improvement.
- You're exiled to the town dump!



education.jlab.org/jsat/powerpoint/0708\_global\_warming.ppt



Planet bumi merupakan hasil interaksi antara faktor hayati dan nir-hayati yang panjang shg menjadi tempat yg memungkinkan bagi kehidupan manusia

Aktivitas manusia telah merubah keadaan planet bumi sehingga merugikan bagi kehidupan manusia itu sendiri

Dampak dari perubahan tersebut sangat rumit

Untuk menekan perubahan itu, manusia diharuskan untuk memenuhi kehidupannya dengan cara yang bijak

Valuasi ekosistem: membandingkan ekosistem hutan tropis dengan kelapa sawit (Kalimantan):

Kearifan lokal berbasis keanekaragaman hayati: obat herbal

Kenaikan paras air laut mengakibatkan daerah pantai tergenang air laut:  
Efek global warming terhadap pertanian/perikanan

Terganggunya siklus hidup serangga/hama tertentu sehingga terjadi peledakan populasi: contoh peledakan ulat bulu

Biomaterial

Kepedulian terhadap lingkungan