



# **ENVIRONMENT**

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Factors surrounding the man is called the

**“ENVIRONMENT”**

The factors can be

- ❖ Living and Non-living
- ❖ Material and Non-material

## Environment can be divided into three components:

❑ **Physical:** Water, Air, Soil, Housing, Radiation etc...

❑ **Biological:** Plant life, Animal life including Micro-organisms

❑ **Social:** Customs, Cultures, Habits, Income, Occupation etc....

## ❖ METEOROLOGY

Science concerned with the phenomenon occurring in the atmosphere.

## ❖ WEATHER

Conditions of single portion of the air lying next to the earth's surface at any stated period / time and place.

## ❖ CLIMATE

Sum-total of all the meteorological conditions in relation to animal and vegetable life Like: HOT and COLD.

# AIR

- Supplies Oxygen
- Cooling of human body
- Functions of Hearing and smell
- Conveys the disease agents

**Requirement : 10-20 m<sup>3</sup> per day**

# AIR

## Composition:

Oxygen : 20.9%

Nitrogen : 78%

Carbon Dioxide : 0.03%

Water Vapor, Ammonia, Ozone,.....

Other Gases like: Argon, Neon, Krypton..... In traces

# IMPURITIES CAN BE ADDED BY

Respiration



Decomposition of  
Organic matter



Combustion of coal, gas etc...

Trade, traffic, industries



## CLEANSING AGENTS

**Wind** : Dispersion  
Dilution

**Sunlight** : oxidation, bacteria killing

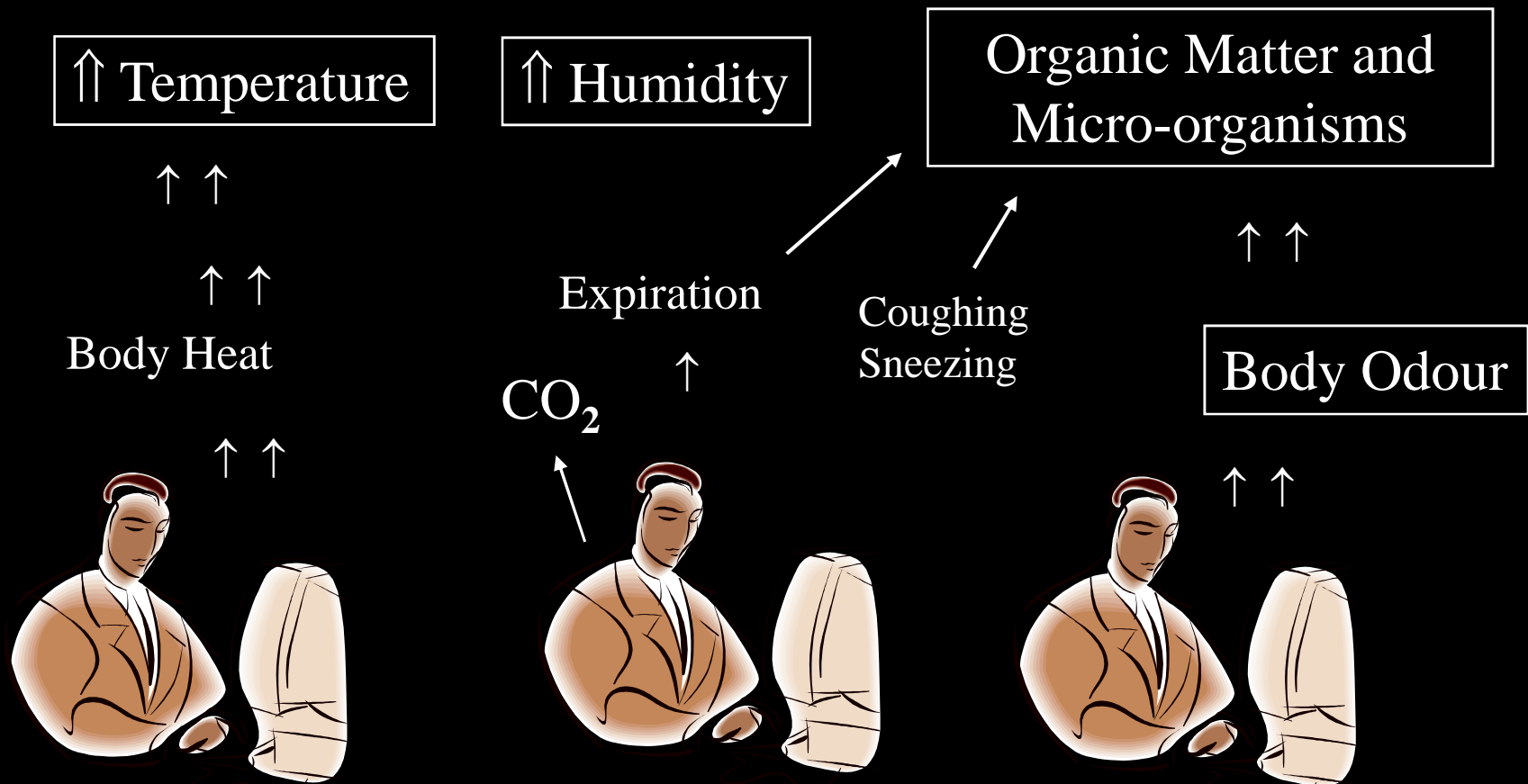
**Rain** : removes suspended and gaseous  
impurities

**Plant life** : decreases the  $\text{CO}_2$





# AIR OF OCCUPIED ROOM



**PHYSICAL AND CHEMICAL CHANGES**

# Change in O<sub>2</sub> and CO<sub>2</sub> level and Health Effects

O<sub>2</sub>:

- \* 12-15% no effects apparently
- \* < 7 % : altered consciousness

CO<sub>2</sub>:

- \* Not much health effects
- \* Can be an indicator of stagnation

## EFFECTS OF VITIATED AIR

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graph TD; A[EFFECTS OF VITIATED AIR] --> B[ACUTE]; A --> C[CHRONIC (In Miners)];
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### ACUTE

- Lassitude
- Headache
- Vertigo
- Nausea
- Vomiting
- Collapse

### CHRONIC (In Miners)

- Anemia
- Digestive Disturbance
- Nutritional and Metabolic Disorders

## ***Btu* : British Thermal Unit**

Quantity of Heat required to increase  
temperature of 1 lbs. water to 1° F

# DISCOMFORT

Discomfort is a subjective sensation which people experience in ill-ventilated and crowded rooms.

## **“Black Hole Of Calcutta”:**

146 prisoners were imprisoned in a room of 18 x 14 x 10 with two small windows which were inadequate for ventilation. Only 23 survived out of 146.

It was suggested that death was due to “Heat retention”

# DISCOMFORT

The discomfort occurs due to physical changes rather than chemical changes

**The factors affected are:**

- Temperature
- Humidity
- Air movement
- Heat radiation

# INDICES OF THERMAL COMFORT

Several indices have been put forward from time to time to express thermal comfort and heat stress.

**These are:**

- 1. Air Temperature**
- 2. Humidity**
- 3. Cooling Power : temperature, humidity, air movement**

Measured by KATA thermometer:

dry KATA : > 6

wet KATA: > 20

# INDICES OF THERMAL COMFORT

## 4. Effective Temperature :

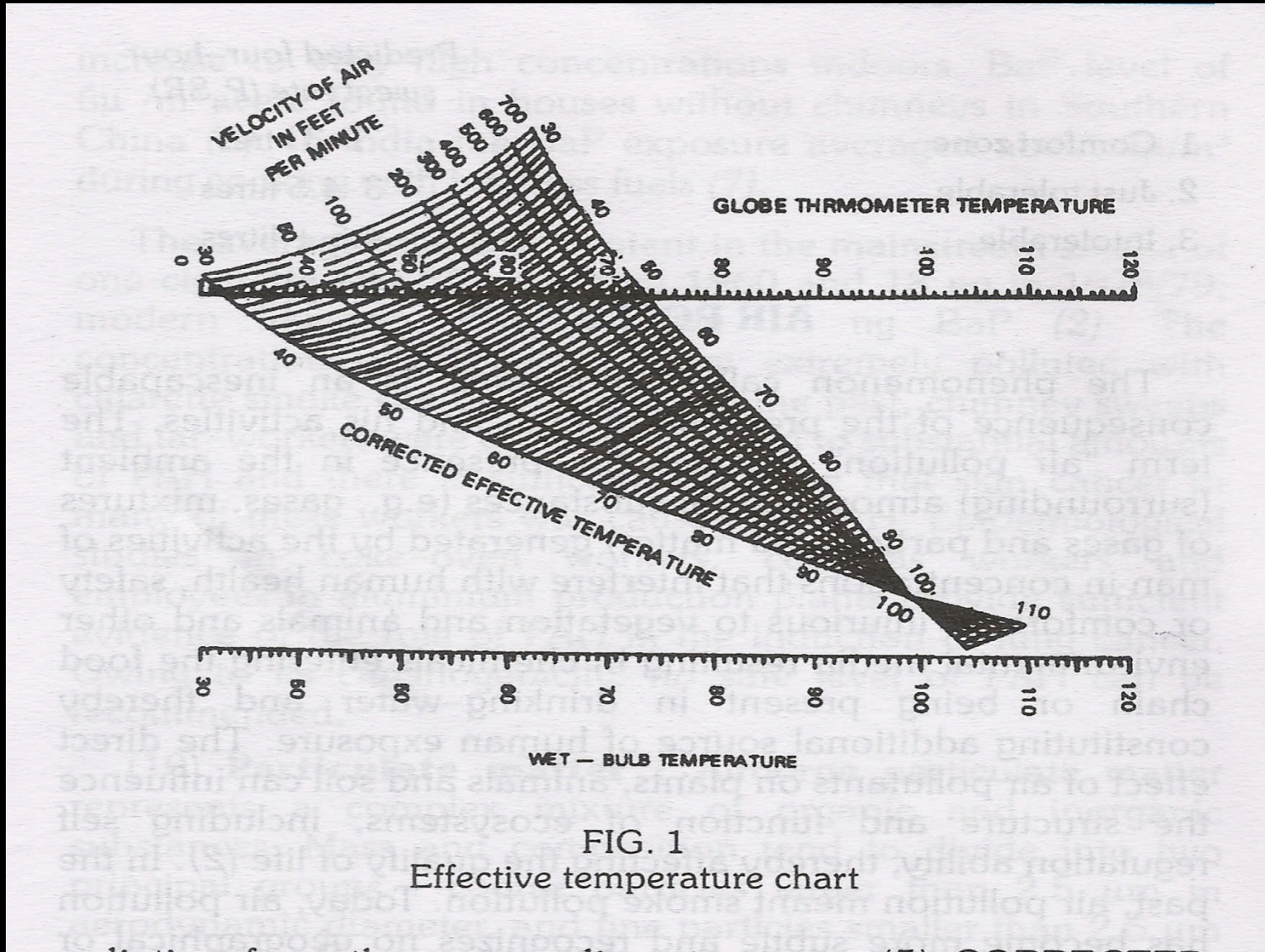
- ❑ Index showing Humidity, Movement of Air (Air Velocity) and Temperature (H.M.T.)
- ❑ Its numeric value is the temperature of still, saturated air which would induce the same sensation of warmth or cold as that can be experienced in the given conditions.
- ❑ It ignores the effect of radiation from the surrounding structure



# INDICES OF THERMAL COMFORT

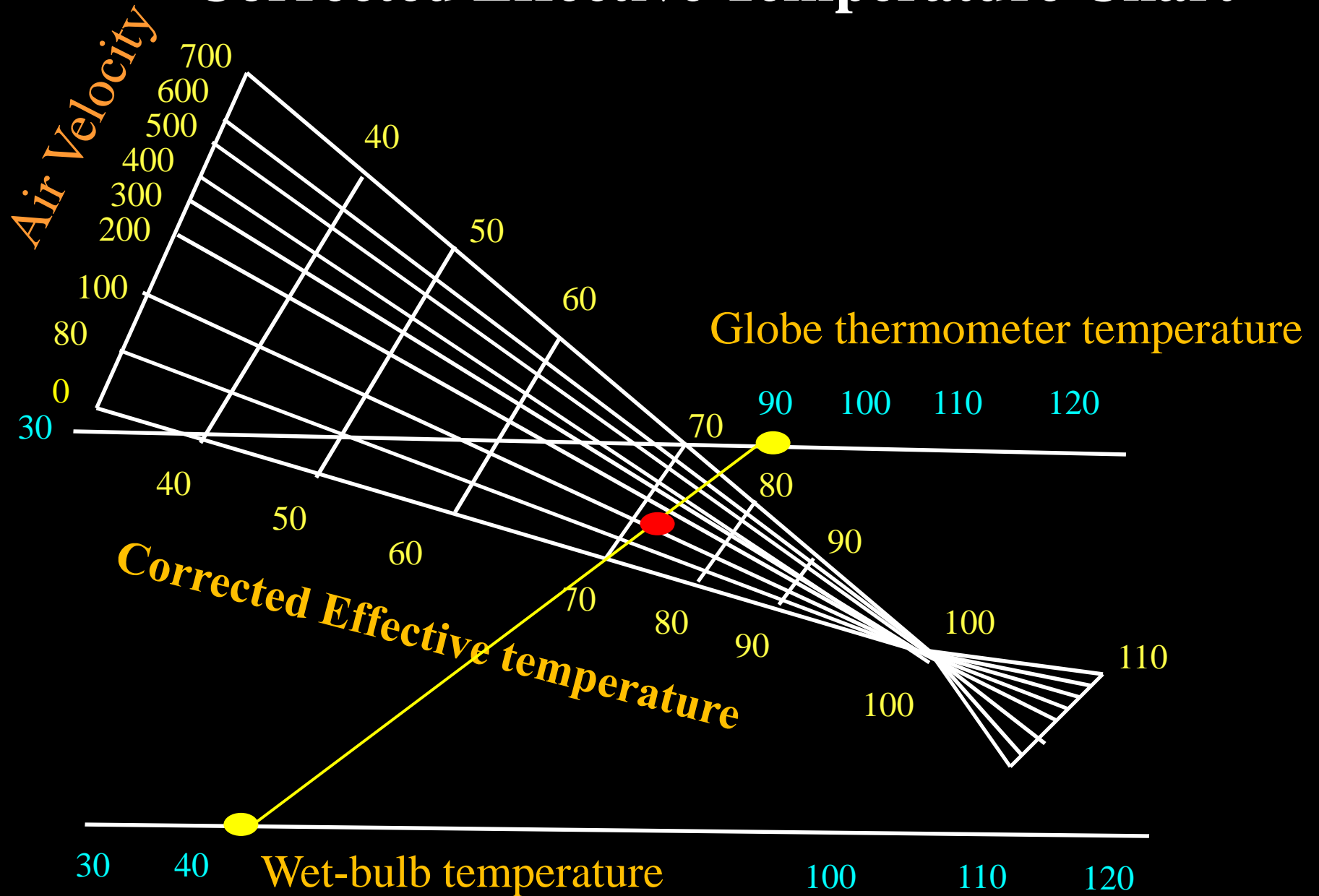
## 5. Corrected Effective Temperature (C.E.T.) :

- Index showing Humidity, Movement of Air (Air Velocity), Temperature and the radiant heat.



- Park's Textbook of Preventive and Social Medicine – K. Park

# Corrected Effective Temperature Chart



## McARDLE'S Maximum allowable Sweat rate

McARDLE and associates prepared a chart form which “*Predicted Four-hour Sweat rate ( $P_4SR$ )*” can be obtained from the combination of the dry and wet bulb temperature of the air, mean radiant air temp. and air velocity under different work intensity.

### *$P_4SR$*

Comfort Zone :	1 - 3 lit.
Just Tolerable :	3 - 4.5 lit.
Intolerable :	> 4.5 lit.

# COMFORT ZONES

Range Of Effective Temperature over which the majority of adults feel comfortable

## **Comfortable Thermal Conditions:**

These are the conditions under which a person can maintain normal balance between production and loss of heat at normal body temperature and without sweating.

# COMFORT ZONES

Comfort zones evaluated in India are:

	<b>Corrected Effective Temperature (CET) ° F</b>
1. Pleasant and Cool	69
2. Comfortable and Cool	69 - 76
3. Comfortable	77 - 80
4. Hot and Uncomfortable	81 - 82
5. Extremely Hot	83 - 86
6. Intolerably Hot	86 +

# Heat Stress

- The burden or load of heat that must be dissipated if the body is to remain in thermal equilibrium
- Metabolic rate, air temperature, humidity, air movement and radiant temperature
- Amount of heat gained by the body must be equaled by the amount of heat lost from it

# Effects of Heat Stress

- *Heat Stroke:*

- Failure of heat regulating mechanism in hypothalamus
- Very high temp; up to 110°F
- Delirium, convulsions, partial or complete loss of consciousness
- Dry and hot skin
- Sweating may be absent or diminished
- Acidotic breathing, chyne stroke type
- CFR high (40) even if brought quickly to medical attention



- *Heat Stroke:*

- *Treatment:*

- Rapid cooling, ice water bath till rectal temp falls below 102<sup>0</sup>F
    - Continuous monitoring of rectal temp for efficacy of hypothermia treatment and also to guard against clinically significant hypothermia if cooling is continued too long.
    - Correction of hypovolemia, hyperkalaemia, hypocalcaemia, bleeding diathesis, other complications of hyperthermia
    - Other supportive including CBR for several days

- **Heat hyperpyrexia:**

- Temp above 106<sup>0</sup>F
- May proceed to heat stroke

- **Heat exhaustion:**

- Inadequate replacement of water and salts lost in perspiration
- Typically occurs after several days of high temperature
- Body temp normal or slightly elevated; but not more than 102<sup>0</sup>F
- Dizziness, weakness, fatigue
- Tachycardia, weak pulse, BP and Urine Output decrease

- **Heat exhaustion:**

- Treatment:

- Removal to cool place
    - Drinking fluids containing salt
    - ORS
    - Some may need hospitalization and i. v. fluids
    - Recovery is fast

- **Heat cramps:**

- Intracellular over hydration and diminished chlorides in the tissues
- Heavy muscular work in high temp and humidity
- Painful and spasmodic contractions of the skeletal muscles esp. legs and arms
- Shift to cool place; plenty of fluids

- **Heat syncope:**

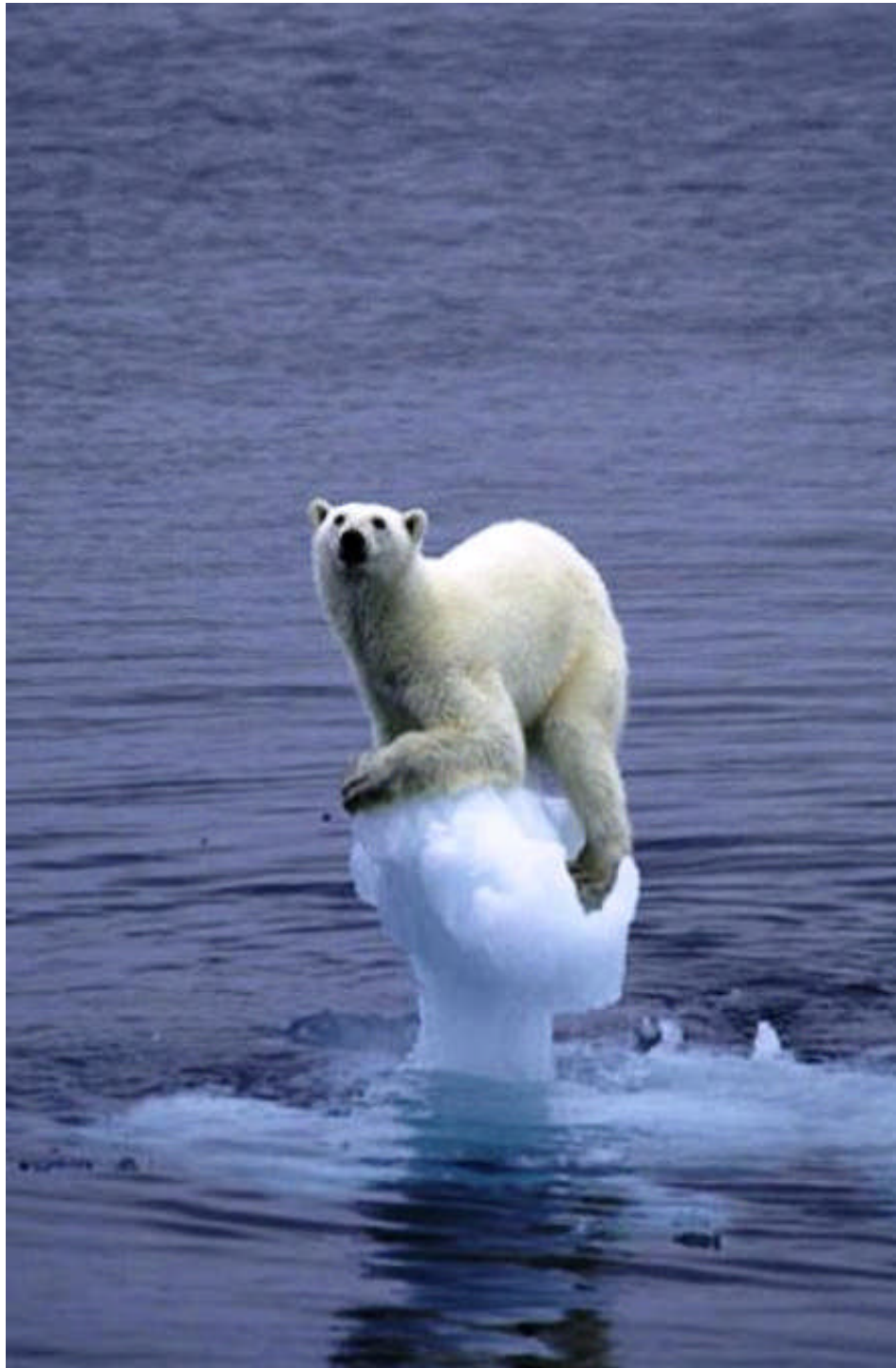
- Milder form: person standing in the sun becomes pale, his blood pressure falls and he collapses suddenly
- Pooling of blood in dilated vessels
- Make patient to lie down, with head slightly down

# Preventive measures

- **Replacement of the water content lost by body**
  - Heavy work under direct sunlight: as much as 1 litre per hour; others involved in sedentary work require half the amount
  - No need for extra salt except unacclimatized persons
- **Regulation of work:** intervals, regular periods of rest, treatment as soon as signs and symptoms start appearing

# Preventive measures

- Clothing
- Protective devices
- Work environment: proper ventilation and air conditioning



**TAKE CARE OF NATURE**

**THANK YOU**