



## **Norimitsu Ichikawa**

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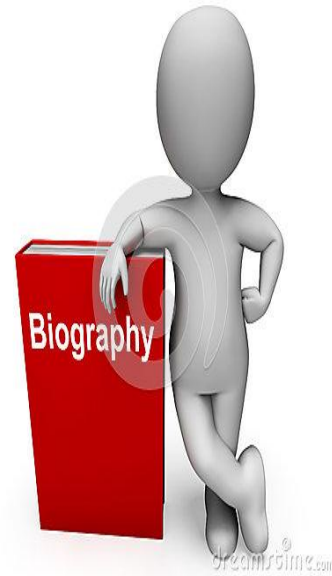
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Automatic Control of Physiological State and Function

# BIOGRAPHY



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# RESEARCH INTEREST

Induced voltage generated in a partly opened metal box when a human body moves, Study of technique for detecting electromagnetic pulse generated by discharge, The case study and statistical analysis of the accident with electrocution, Study of technique for detecting electromagnetic pulse generated by discharge.



# ELECTROCUTION



## Definition:

*"Death brought about by electricity"*

Death, murder or a sudden accident caused by an electric shock.

Deliberate execution by means of an electric shock, such as an electric chair; "electrocution" is a portmanteau for "electrical execution". It has never been proven as cause of death

# The nature of electrocution

- An electrical current through the body can cause breathing or heart to stop and can also cause burns.
- The current which causes electrocution usually comes from low or high voltage electricity and lightning.
- Electrocution may be due to
  - Low Voltage (<1000 Volts)
  - High Voltage (>1000 Volts)
  - Lightning (up to 100,000,000 Volts)
- Sources of low and high voltage electricity which may cause injuries can be found in appliances and cables found in the home, office, shops or workplace, however, these are often insulated by non conducting materials such as plastic or rubber to prevent injuries from occurring.

Water conducts electricity so using wet hands or standing on a wet floor when handling an electrical appliance may increase the risk of an electrical injury.



# Factors affecting

- ✓ Type of current (alternating or direct)
- ✓ Amount of current (Amperage)
- ✓ Potential difference (Voltage)
- ✓ Resistance (Ohms)
- ✓ Duration of event
- ✓ Route of current



# LIGHTNING

Lightening is a natural source of electricity which travels through a tall feature in the landscape in order to reach the ground. If struck by lightening the casualty may suffer shock, burns or even death.

Lightning is caused by atmospheric electricity

Temperatures of up to 30,000o C

Current of up to 20,000 A

Potential difference of up to 100,000,000 V

Direct or Indirect Strike

Side flash Strike

Step Potential

Streamer

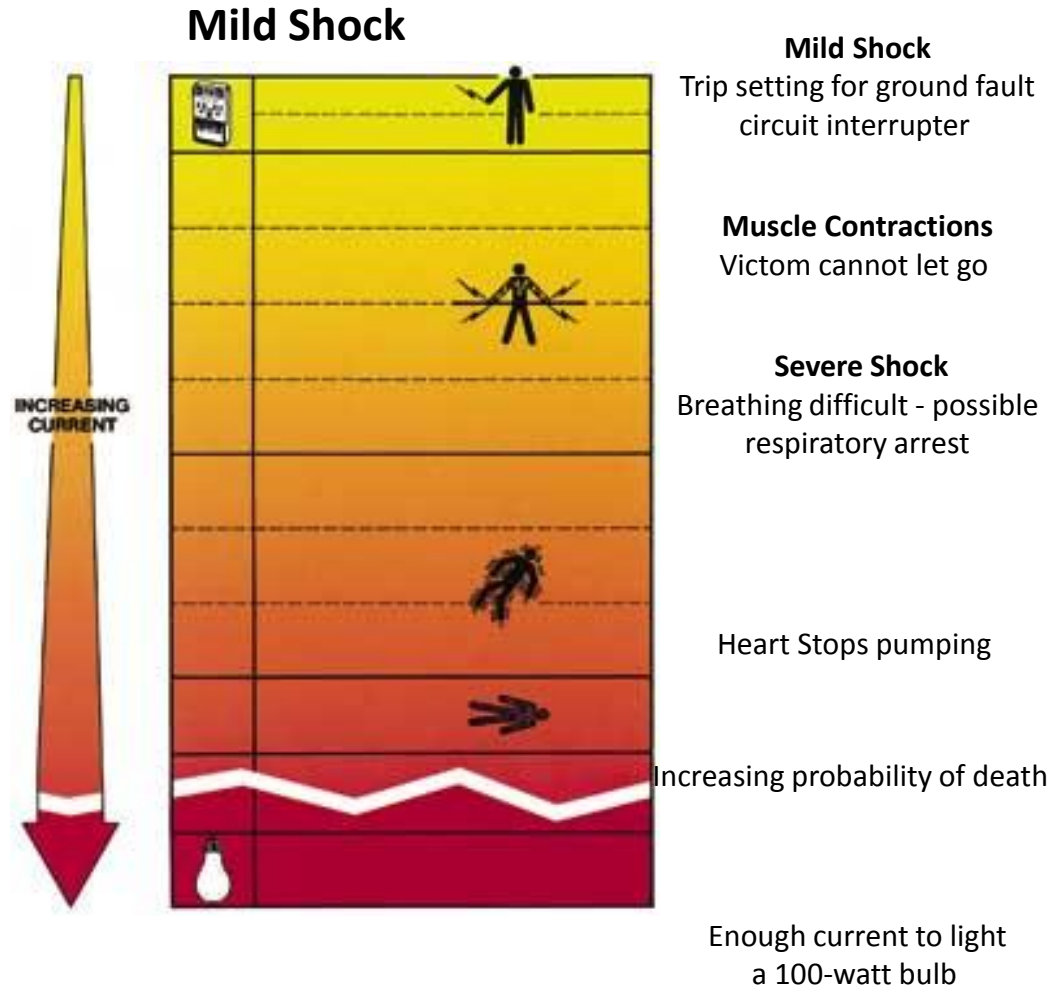


- Electrical burns are often a consequence of faulty or misuse of electrical appliances. Downed power lines can be, in some cases, a potential source of severe electrical burns.



# Electric shock

- The effect of electric shock can depend on three main factors:
- 1) how much current is flowing through the body
- 2) the path of current through the body
- 3) how long the body is in the circuit.



# Mechanism of Death

- ***Ventricular fibrillation***
  - Commonest mechanism of death
  - Associated with passage of current through the heart
  - Current acts on cardiac myocytes, nodal tissue and conduction tracts
- ***Respiratory Paralysis***
  - Less common than ventricular fibrillation
  - severe contraction of respiratory muscles such as diaphragm and intercostal muscles
  - More commonly seen in high voltage deaths
- ***Blunt Force Trauma***
  - Contact with electricity may fling or throw the victim causing potentially lethal injuries or complications thereof leading to death

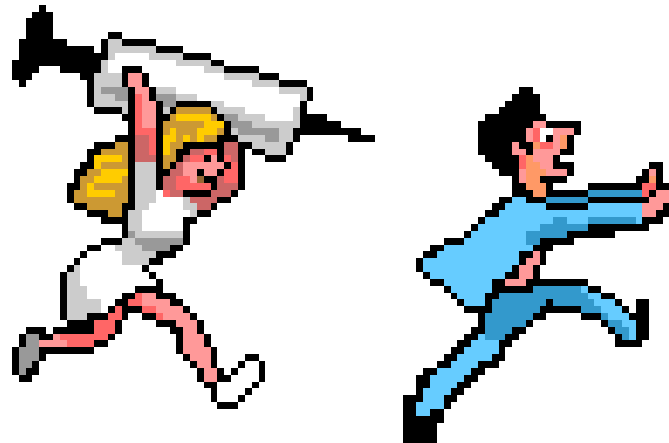
# Signs and symptoms

- Burns on the skin surface where the energy has entered and exited the body
- Dazed and confused condition
- Problems with sight
- Paralysis (from disrupted nerve pathways)
- Irritable or restless, whether conscious or unconscious
- Weak, irregular, or absent pulse
- Damage to internal muscles and tissues

- Irregular heartbeat or cardiac arrest
- Blood pressure elevated or low with signs of shock
- Shallow, irregular or absent breathing (tongue may swell and block the airway)
- Multiple fractured bones and dislocations from intense muscular contractions or from falling
- Seizures



- It necessary to remove the victim from the source or to break the current if conditions allow and then immediately arrange for transport to a hospital to be treated properly.



- When treating Electrical and lightning burns it is important to:
  - Avoid or neutralise electrical and other dangers
  - Conduct a primary survey
  - Arrange medical aid as required
  - Remove victim to a safe environment
  - Remove all jewellery from the affected area
  - Provide oxygen to victims if necessary
  - Apply a dry sterile dressing to the wound



## If the victim suffers a fracture:

- Prevent any movement at the site of the fracture
- Immobilise the joint above and below the fracture site, if possible
- If ambulance transport is not available, splint the fractured area in a position that is comfortable for the victim
- Do not attempt to realign the body



## If the victim suffers shock:

- Lay the victim down and elevate their legs
- If possible, treat the cause
- Monitor and record the victims vital signs
- Comfort and reassure
- Provide supplementary oxygen if able to
- Maintain body temperature
- Seek medical assistance



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