

# Managing Inert Gas Narcosis

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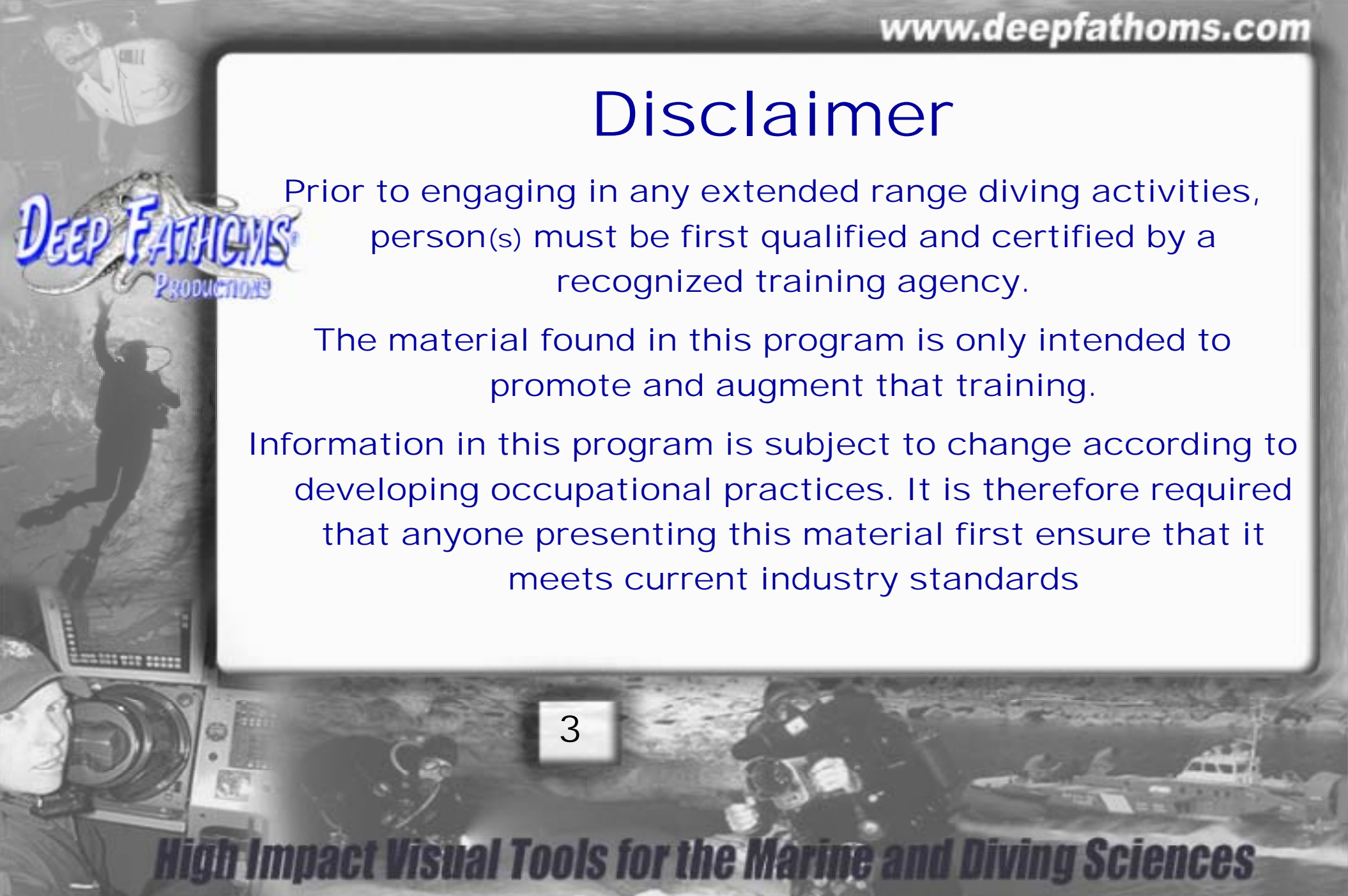


# Disclaimer

Prior to engaging in any extended range diving activities, person(s) must be first qualified and certified by a recognized training agency.

The material found in this program is only intended to promote and augment that training.

Information in this program is subject to change according to developing occupational practices. It is therefore required that anyone presenting this material first ensure that it meets current industry standards

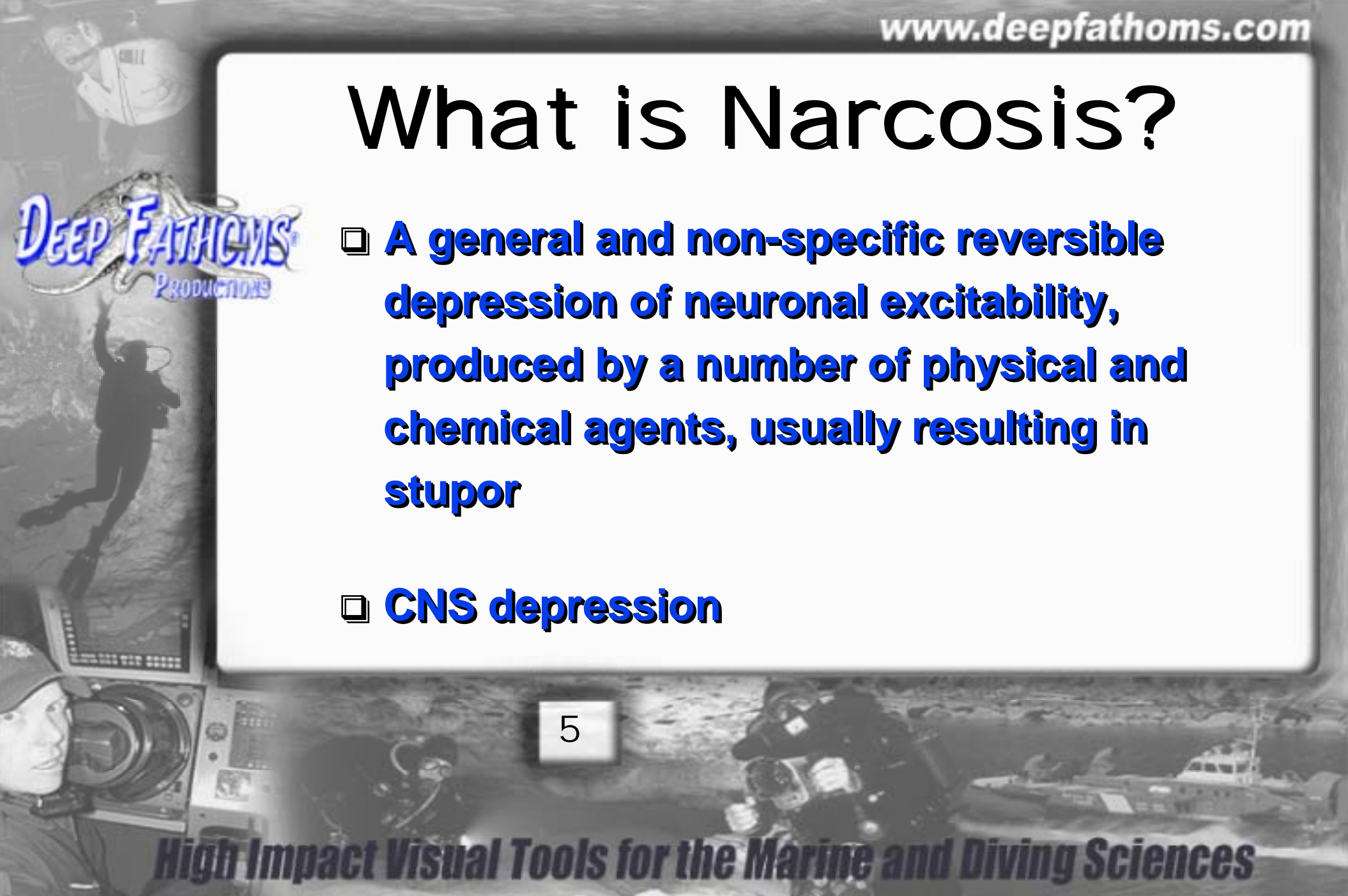


# Before we begin...

- ✓ As a courtesy please turn off all cell phones and pagers
- ✓ Location of washrooms, amenities, parking, and emergency exit protocol
- ✓ Breaks, meals and general class rules
- ✓ Your participation is expected, questions and group discussion are encouraged

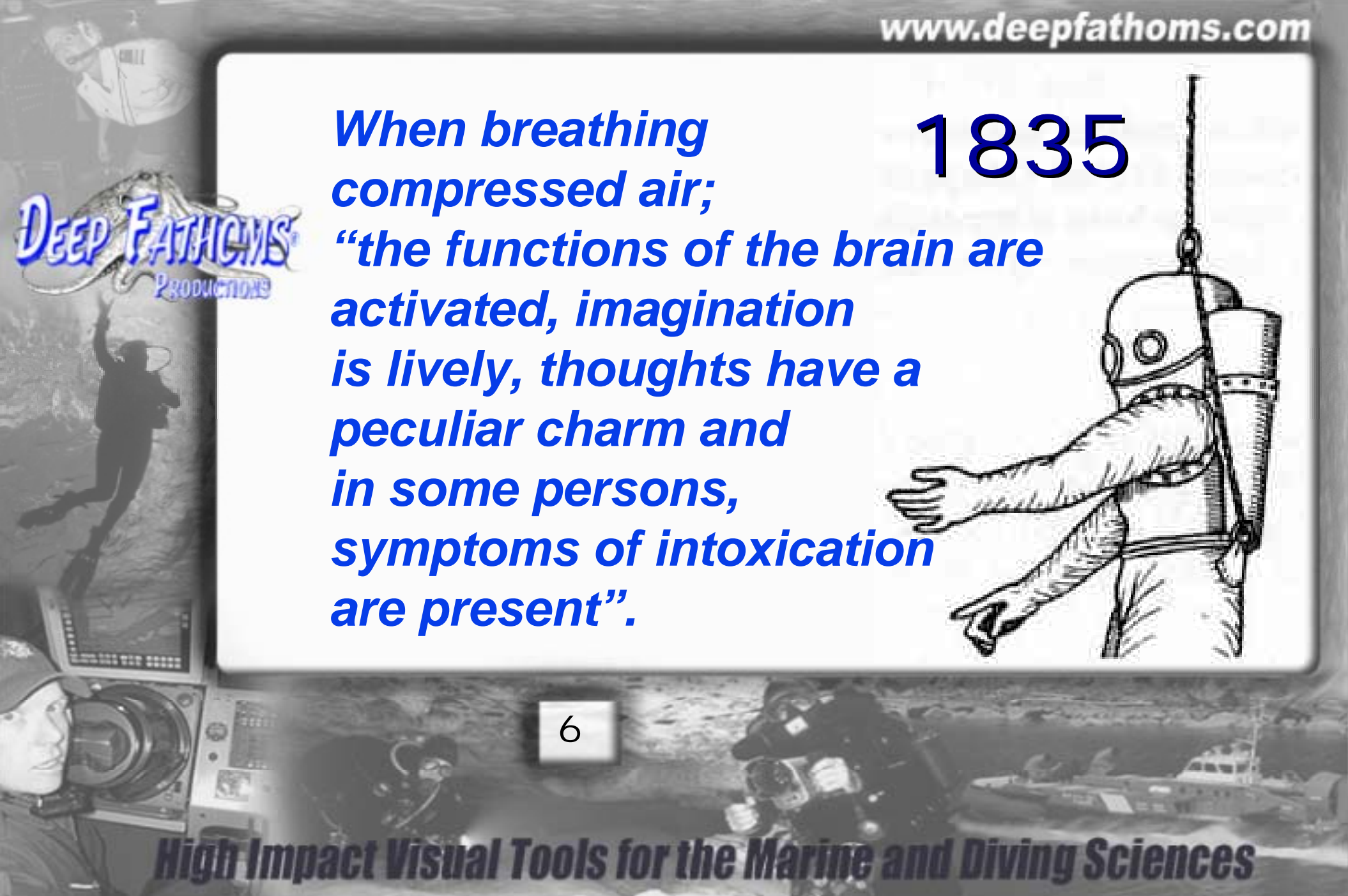
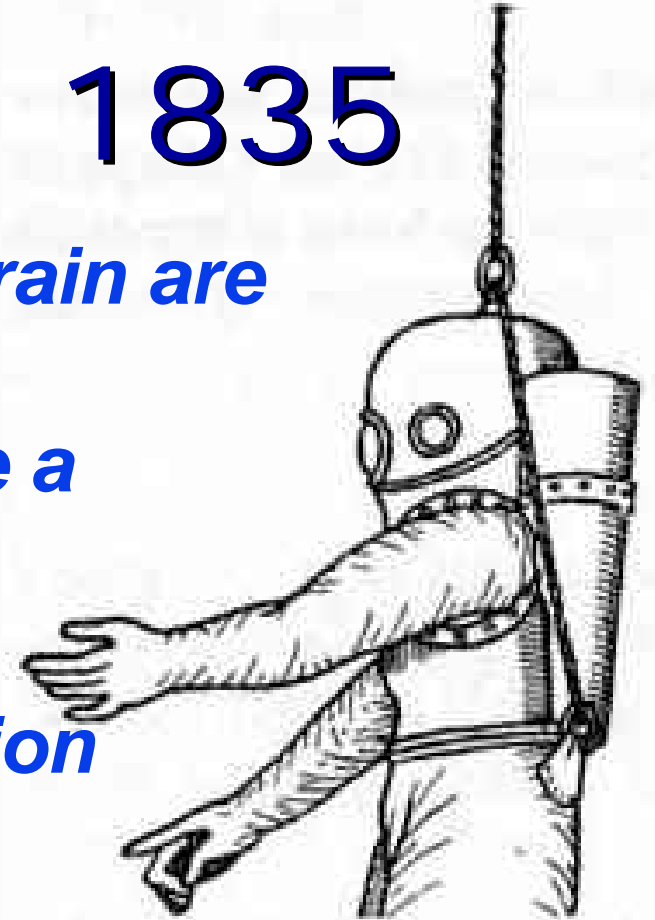
# What is Narcosis?

- ❑ **A general and non-specific reversible depression of neuronal excitability, produced by a number of physical and chemical agents, usually resulting in stupor**
- ❑ **CNS depression**



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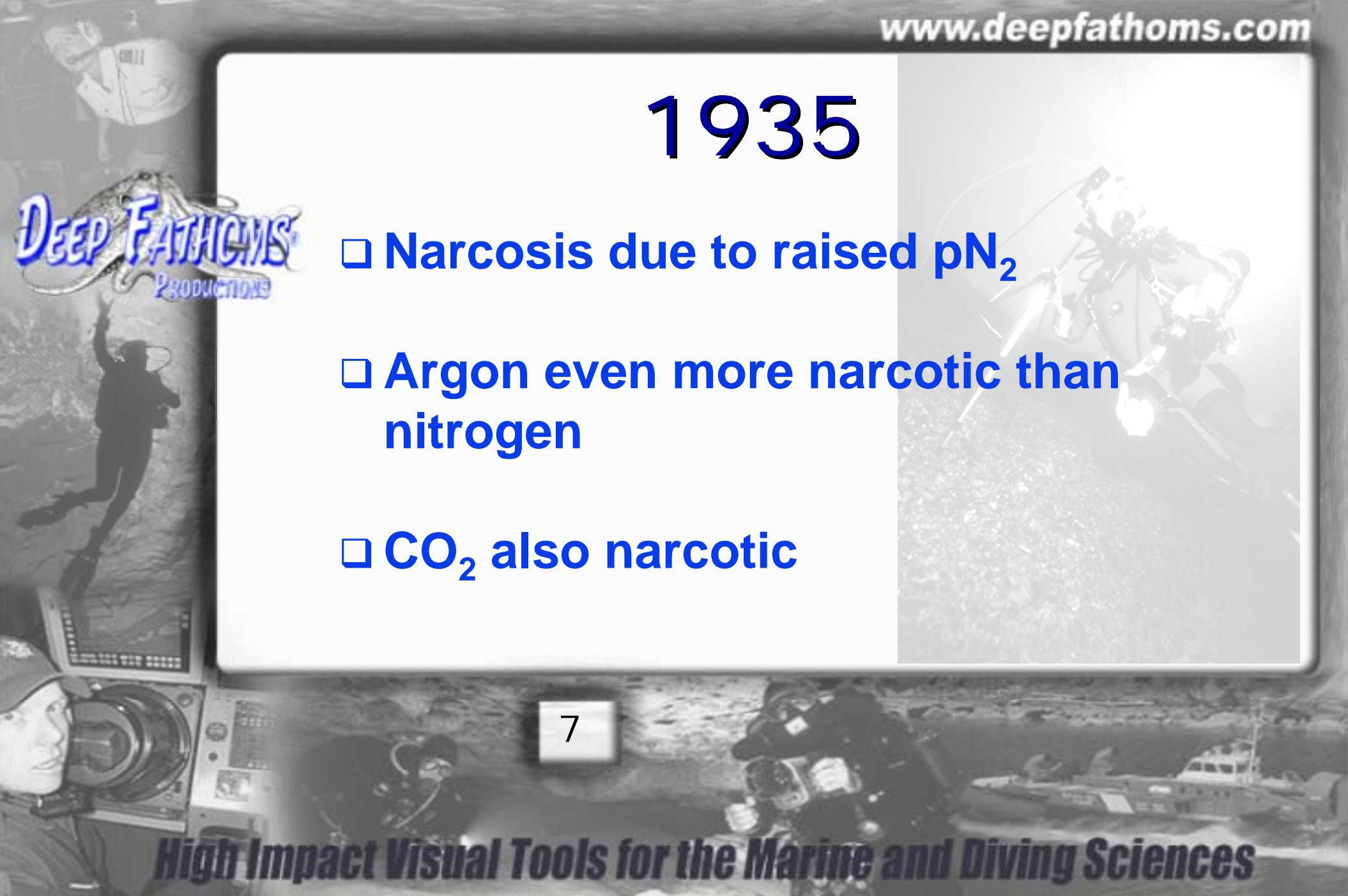
*When breathing compressed air; “the functions of the brain are activated, imagination is lively, thoughts have a peculiar charm and in some persons, symptoms of intoxication are present”.*



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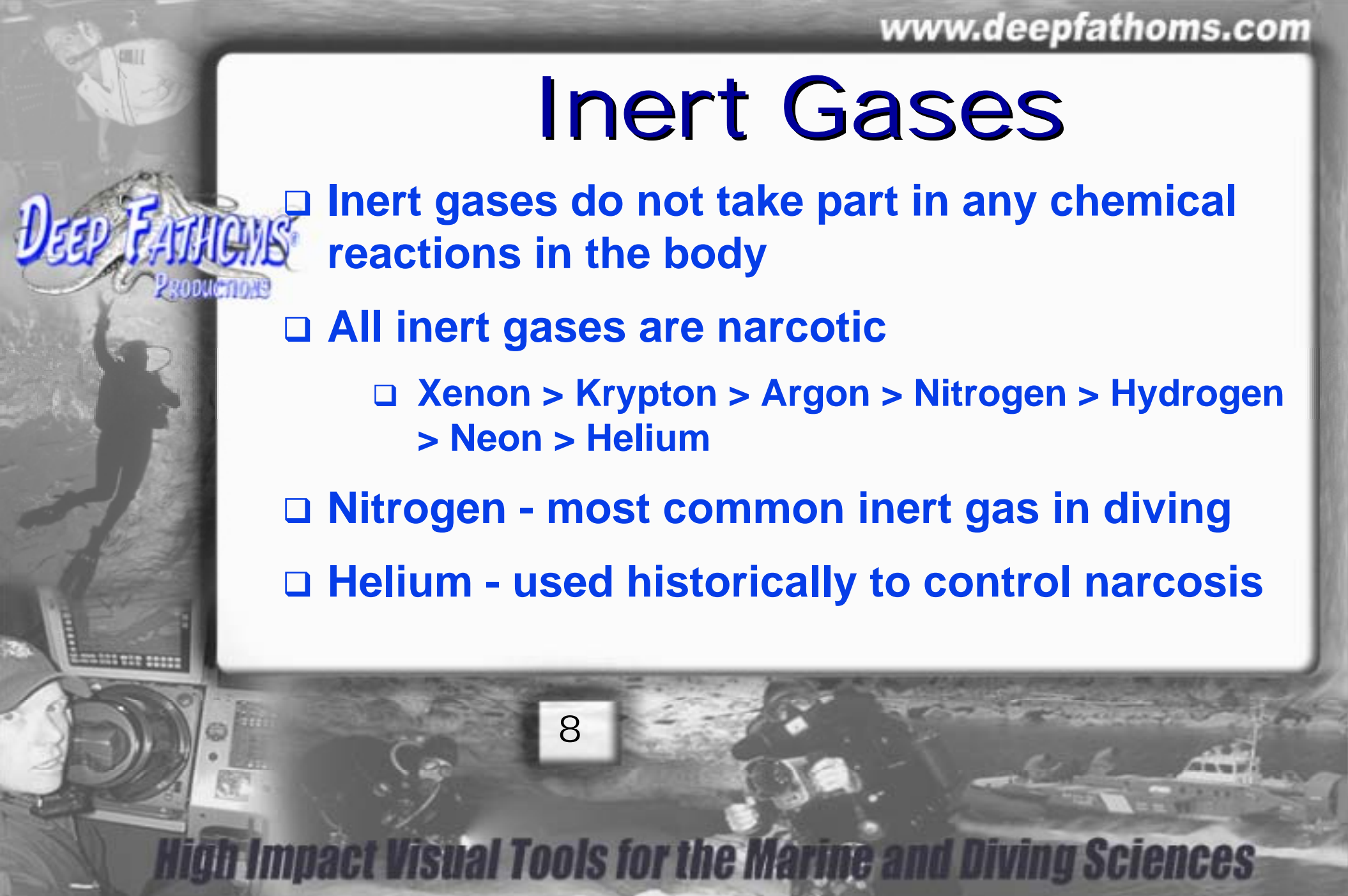
# 1935

- Narcosis due to raised  $pN_2$
- Argon even more narcotic than nitrogen
- $CO_2$  also narcotic



# Inert Gases

- ❑ Inert gases do not take part in any chemical reactions in the body
- ❑ All inert gases are narcotic
  - ❑ Xenon > Krypton > Argon > Nitrogen > Hydrogen > Neon > Helium
- ❑ Nitrogen - most common inert gas in diving
- ❑ Helium - used historically to control narcosis



# High Pressure Neurological Syndrome (HPNS)

- Problem with heliox deeper than 500 fsw
- Increasing severity with increasing depth
- Increasing severity with speed of compression
- Major operational problem deeper than 1,000 fsw

# Trimix

- Helium / Nitrogen / Oxygen
- 5 - 10% nitrogen used to control HPNS
- Technical divers set helium percentage to control narcosis
- Technical trimix less expensive than heliox
- Technical trimix warmer and requires less decompression than heliox

# Other Gas Mixtures

- ❑ Hydrogen oxygen mixtures used for deep diving

## *Hydrox*

- ❑ Little narcosis, reduced breathing resistance

- ❑ Explosive if oxygen greater than 6%

## *Tetrox*

- ❑ Helium / Nitrogen / Hydrogen / Oxygen

# Signs & Symptoms of Narcosis

- Similar to alcohol, CNS depressant
- Laughter, Excitement, Euphoria or Anxiety
- Overconfidence, Terror or Panic
- Impaired Manual Dexterity
- Idea fixation, Decreased perception
- Hallucinations, Stupor or Unconsciousness

# Onset of Narcosis

- Immediate onset upon arrival at depth
- Increased initially if rapid descent
- Stable after a few minutes at depth
- Immediate relief upon ascent
- No residual effects (hangover)

# Martini's Law

- Breathing air at depth has an effect that is similar to drinking one Martini on an empty stomach for every 50 fsw of depth
- This however is a pretty vague guideline



- Narcosis starts at the surface but most divers do not notice until around 140 fsw
- Symptoms shallower than 130-140 fsw are usually as a result of poor breathing habits and CO<sub>2</sub> retention

# Exacerbating Factors

- Anxiety, Task loading
- Cold, Fatigue, Exercise
- Sedatives, Alcohol
- Increased levels of CO<sub>2</sub>

# Relieving Factors

- Task learning, Positive motivation
- Frequent or prolonged exposure
- High Intelligence
- Experience

# Narcosis Tolerance

- Most of the relieving factors reduce anxiety
- The degree of CNS depression is **NOT CHANGED**
- The diver learns to slow down and concentrate

# Why are Inert Gases Narcotic?

- Increased lipid solubility and molecular size increase narcotic effect
- Possible swelling of nerve cell membranes
- Interference with nerve cell membrane transport mechanisms

# Thoughts on Narcosis

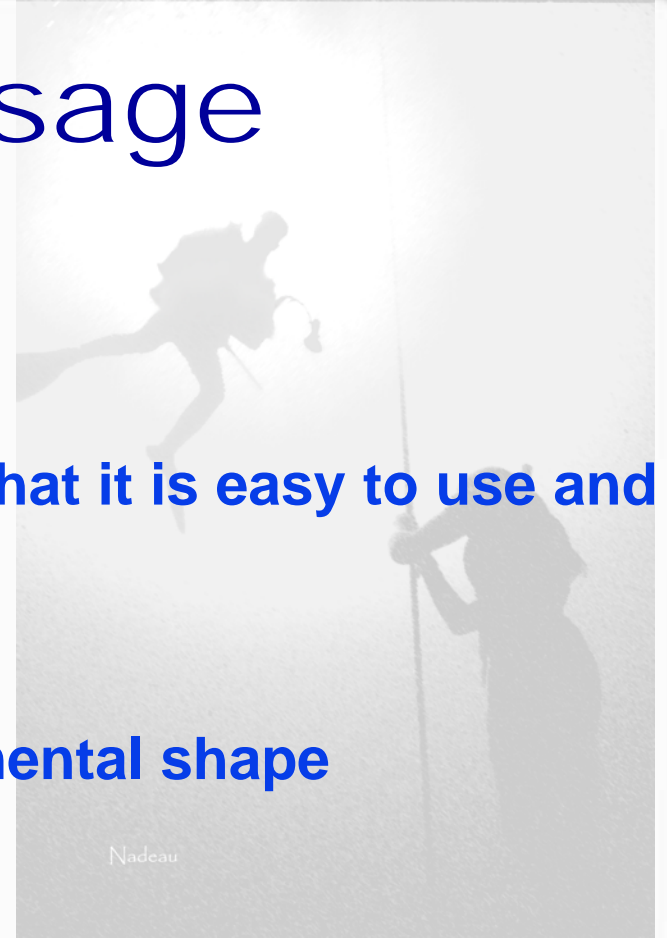
- Narcosis is a function of the  $pN_2$ 
  - Narcosis reduces the ability to think
  - The ability to handle narcosis is a function of the dive and the diver

# Dealing with Narcosis

- Reduce the  $pN_2$  (depth, helium)
- Minimize the task loading
  - Learn all tasks well in shallow water
  - Plan and organize the dive well
- Be realistic about your own CNS limits
- Always have reserve brain power to deal with emergencies

# Final Message

- Train and then overtrain
- Master the survival skills
- Prepare your equipment so that it is easy to use and function
- Know your limits
- Keep in good physical and mental shape



Nadeau

