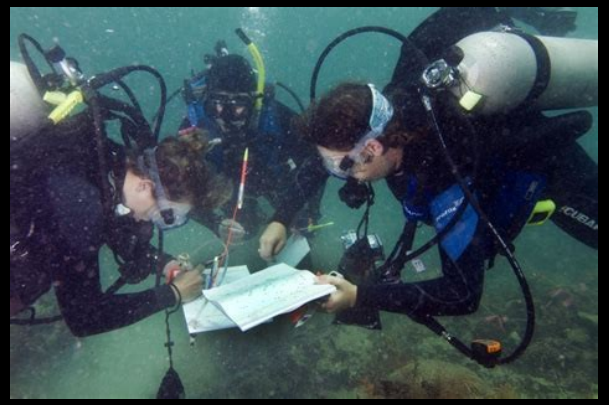
What Is Scientific Diving?

Larry "Harris" Taylor, Ph.D.
Diving Safety Coordinator, U of Michigan



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NOAA


NOAA
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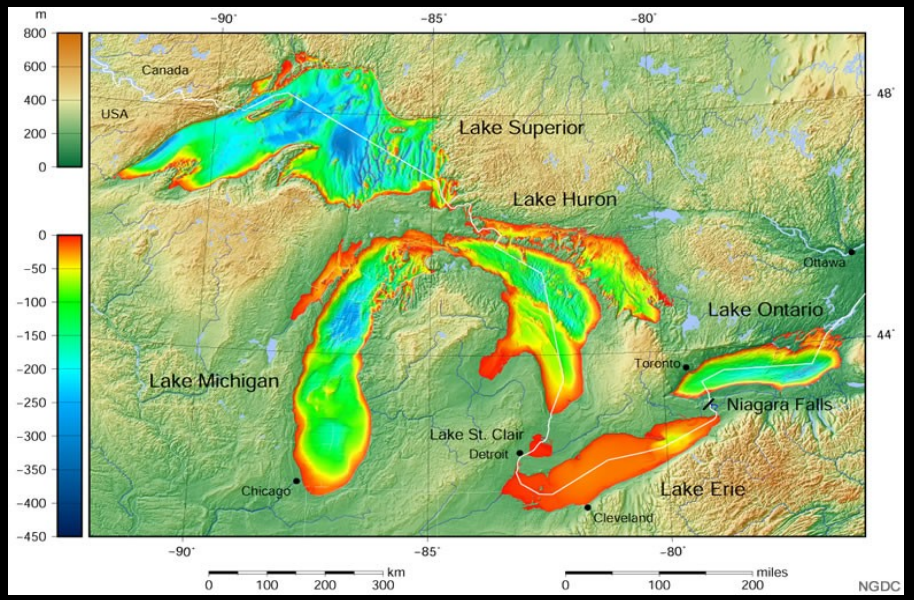
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48°
44°
Canada
USA
Lake Superior
Lake Huron
Ottawa
Lake Ontario
Toronto
Lake Michigan
Niagara Falls
Lake St. Clair
Detroit
Chicago
Lake Erie
Cleveland
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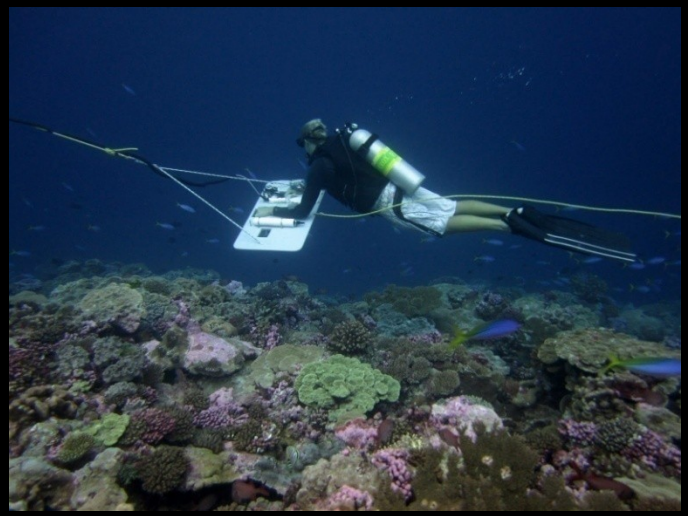

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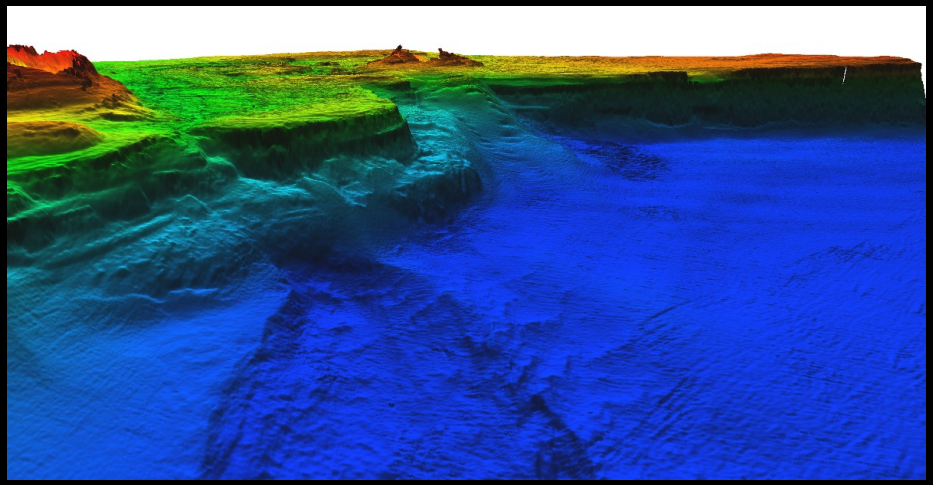
National Geographic



TV Series: Drain The Oceans

Drain The Great Lakes

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Research / Academic Institutions

Scripps

Wood's Hole

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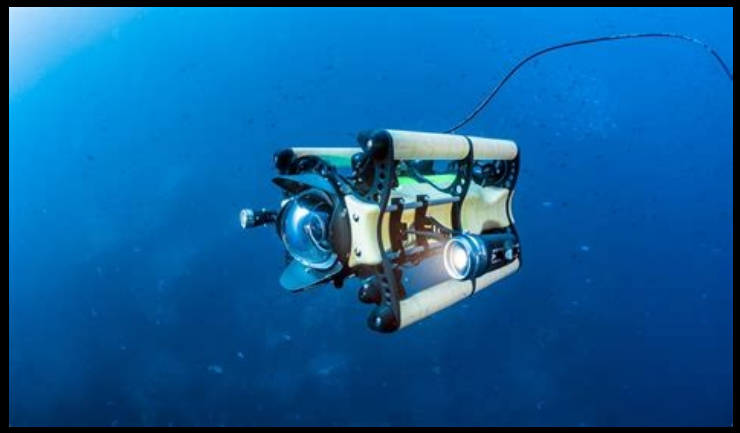
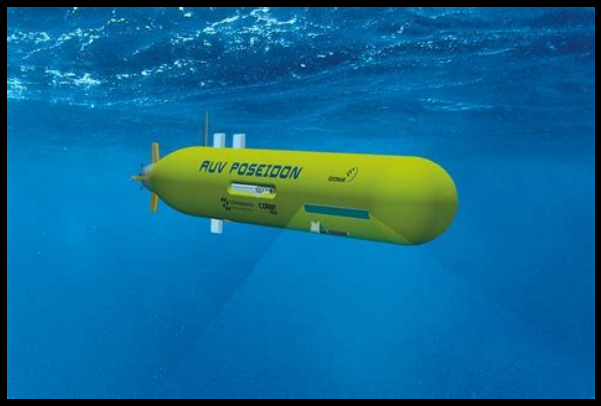
Studying The Underwater Realm



Remote Operated Vehicle (ROV)

Manned Submersible



Autonomous Underwater Vehicle (AUV)

Towed Instruments:
- Side Scan Sonar
- Magnetometer
- Cameras

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Scientific Diving Locations

Subtropical Seas
Temperate Waters
Freshwater Rivers and Lakes
Karst (Cave) Formations
Polar Environments
Blue Water (Open Ocean)
Submarine Canyons
Estuaries
Offshore Platforms

Basically, Anywhere there is water

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Aquarium Divers

Maintenance / Study of underwater resources
Public feeding displays
Lead “Discover Diving” Experiences

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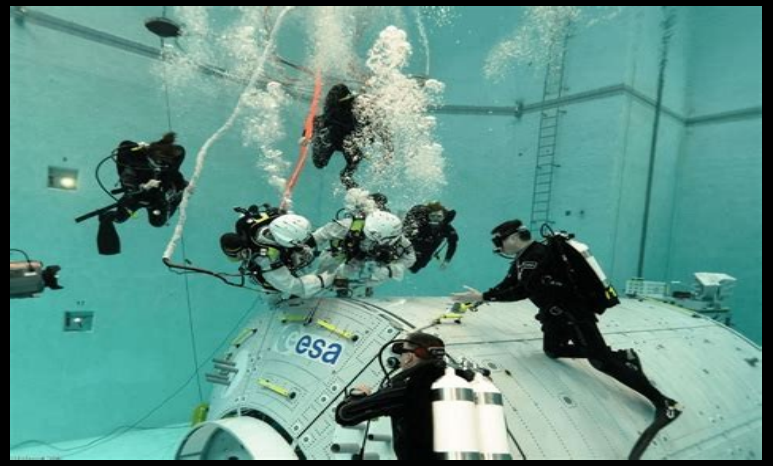
Support NASA Astronaut Training

Wet F – Houston

Neutral Buoyancy – Huntsville

Underwater weightlessness mimics space environment



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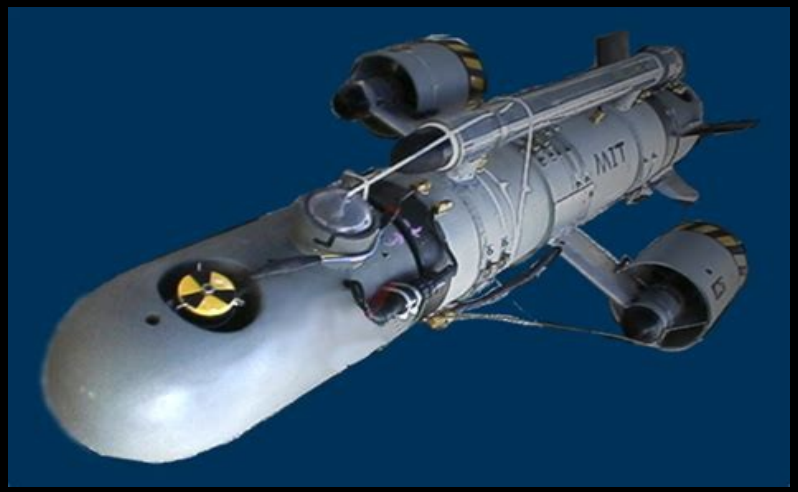
US Navy Experimental Diving Unit

Major technological advances often derived from military



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Most Scientific Research Done by Divers

Observe, Measure, Record, Analyze

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Types of Scuba Diving

Recreational
- Underwater "tourism"
- Done for pleasure
- Limited knowledge and skill 'cause of minimalistic training

"Mission-Oriented"
- Academic / Scientific / Institutional
- Commercial
- First Responder Rescue
- Military
- Public Safety

Done with "work objective"
- Diving secondary to "mission"
- Requires higher level of skill / knowledge / experience
- Often equipment intensive
- Often a team-effort

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"Scientific Diving" is NOT about Diving

"Scientific diving is diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks."

It is about:
Data Collection

"Doing Academic Stuff" Under water

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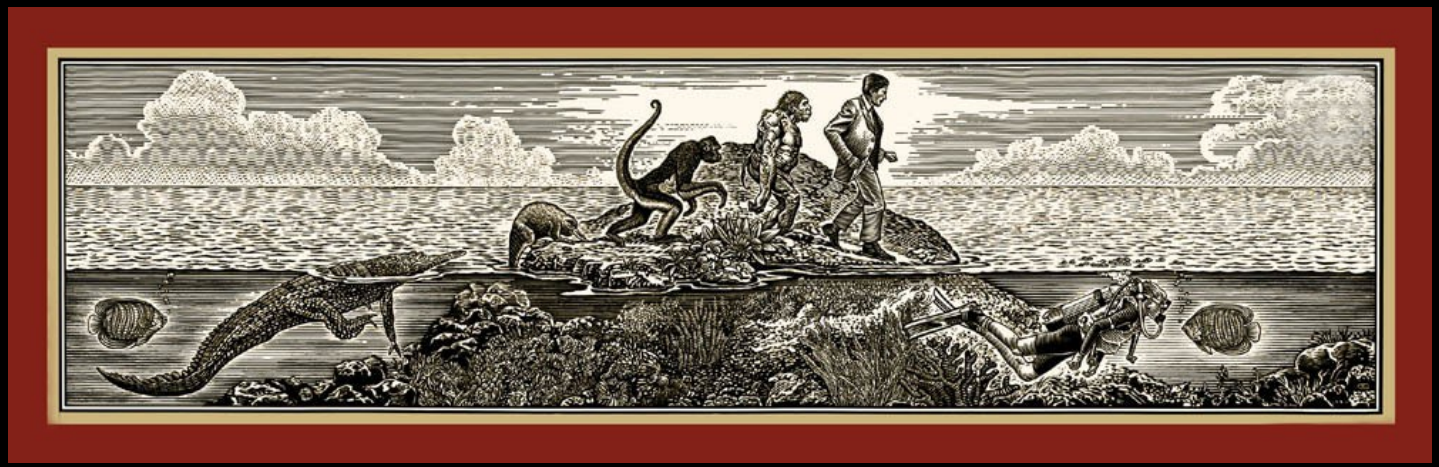
Since diving is just a mode of transportation,
Skill level must exceed recreational training

‘cause diver
needs to focus
on the mission / science

In-water skills / comfort must be a given



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Recreational Training Necessary, But Not Sufficient For "Mission-Oriented" Diving

Poorly trained diver:

Safety risk to self & others

Liability to project

Liability to P.I.

Liability to Institution

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C-Cards / Log Books Are Not Reliable Skill Indicators

Advanced Diver

C-Cards Sold

Animals Certified

Given As Rewards

"Battle Royale"

28 Days to Become Instructor

Specialty Newbie Today;
Instructor Tomorrow

Knowledge and skill must be individually assessed

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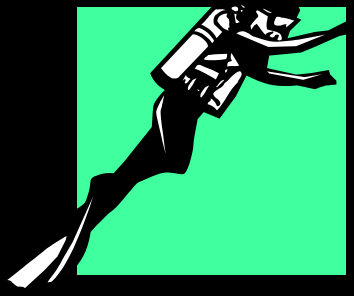
Given that C-Cards Are Not Reliable Skill Indicators:
Scientific Diver Authorization Requires:

Documentation of training (c-cards)
Documentation of experience (log book)
Documentation of knowledge (exams)

In-water evaluation for everyone by qualified DSO (regardless of c-card level /experience)



The Lesson of History:
This process has created
one of the Planet's Best Safety Records!

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AMERICAN ACADEMY of UNDERWATER SCIENCES

OSHA Set Rules For Commercial Diving
Began As Means To Define Academic Diving
Sets Standards For Academic Diving
One of World's Best Safety Records
Reference Resource
Reciprocity

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AMERICAN ACADEMY of UNDERWATER SCIENCES

Standards For Academic Diving

Historically, based on 15 weeks (semester):

30 hours lecture (basic diver)

30 hours lecture (in-water scientific techniques)

30 hours pool

Plus: First Aid, CPR, DAN O_2 & Hazmat

First Open Water Weekend: 5 dives (>250 minutes)

Additional water training:

rescue, navigation, night, deep, EANx, etc

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Michigan Diving Authorization

Purpose:

Ensure Health & Safety of Divers

Provide Liability Protection For PI's

Provide Liability Protection For University

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Michigan Diving Authorization Requirements:

1. Certified Diver (Valid C-Card)
2. Current ARC/AH / AAOS Adult CPR
3. Current ARC / AAOS Standard First Aid
4. Current DAN O_2 (EHS provides)
5. Physical Exam (umich Health Care Professional)
6. Complete Application / Legal Forms
   (Interview with DSO)
7. In-water evaluation by the University DSO

Valid as long as
- All certifications are current
- 12 dives per year

Expires: Any lapse

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Diving Opportunities In Michigan

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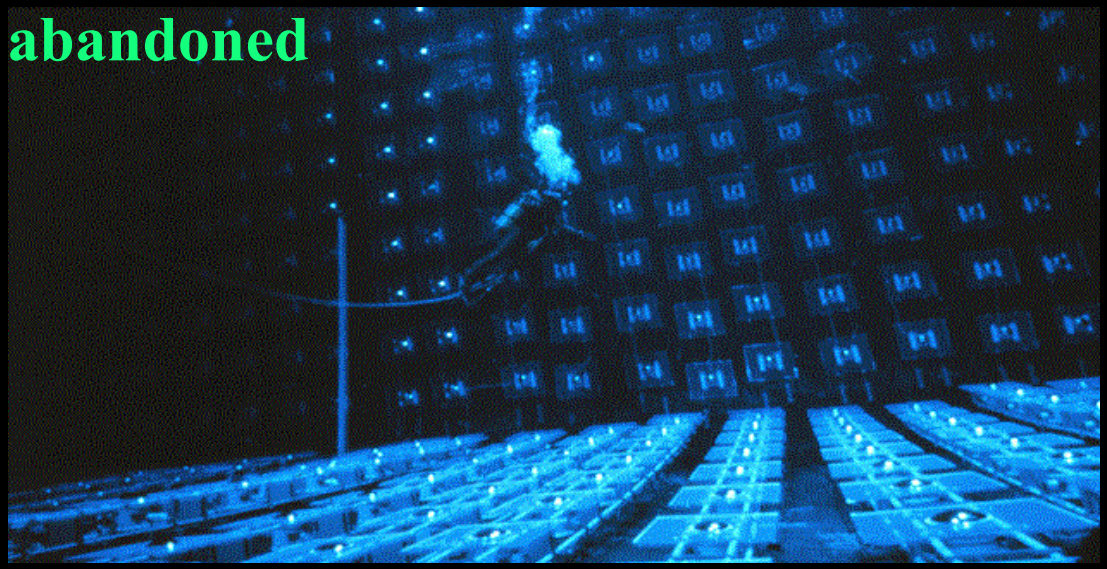
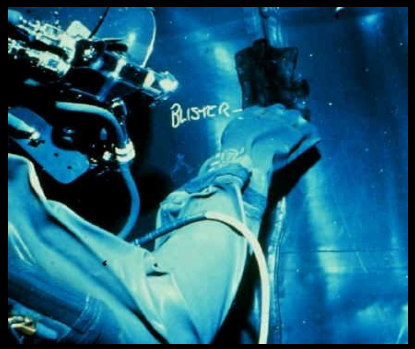
Proton Decay (Neutrino) Detector

Theory: Protons unstable with $t^{1/2} = 10^{56}$ years
Proton decay neutrino generates cone of light
2000 feet underground in working salt mine
Pool ultrapure water: 80 ft x 70 ft x 70 ft
2048 high resolution photomultiplier tubes
7 simultaneous neutrinos ➔ catastrophic event
Discovered supernova 1987a
Advanced real-time nano-second computing
Project abandoned





2000 Feet Below Lake Erie

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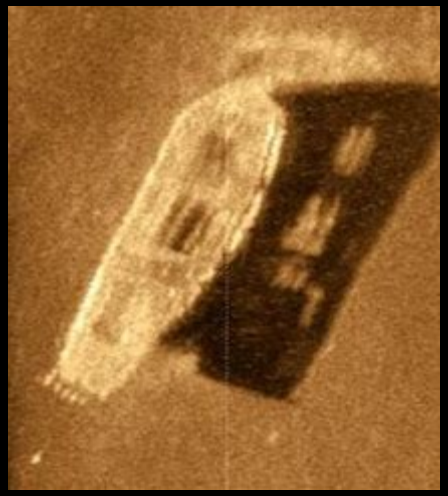
Nautical Archeology: Shipwrecks



Cultural Time Capsules

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Great Lakes Shipwrecks

No wood consuming Teredo worms
Cold slows chemical corrosion
Estimates: 4000 -18,000 shipwrecks
Causalities of war, poor navigation, storms

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Michigan Bottomland Preserves

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Great Lakes Maritime Museums

Lake Superior
Maritime Visitor Center -Duluth, MN
SS Meteor Whaleback -Superior, WI
Bayfield Maritime-Bayfield, WI
Marquette Maritime-Marquette, MI
Shipwreck Museum-Paradise, MI
SS Valley Camp-Sault Ste. Marie, MI

Lake Michigan
Wisconsin Maritime-Manitowoc, WI
Ludington Maritime-Ludington, MI
USS Silversides-Muskegon, WI
Michigan Maritime-South Haven, MI
Chicago Maritime-Chicago, IL

Lake Huron
Great Lakes Lore-Rogers City, MI
Maritime Heritage-Alpena, MI
Huron Lightship-Port Huron, MI
Maritime Center-Port Huron, MI

Lake Erie
National Museum-Toledo, OH
Maritime Museum-Sandusky, OH
Steamship W.G. Mather-Cleveland, OH
Erie Maritime-Erie, PA
Port Burwell-Port Burwell, ON, Canada

Lake Ontario
HMCS Naida-Hamilton, ON, Canada
Niagara-On-The-Lake, ON, Canada
Maritime Museum-Kingston, ON, Canada

Detroit
Dossin Museum-Belle Isle, Detroit, MI

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Maritime Archeological Survey Team (M.A.S.T.)

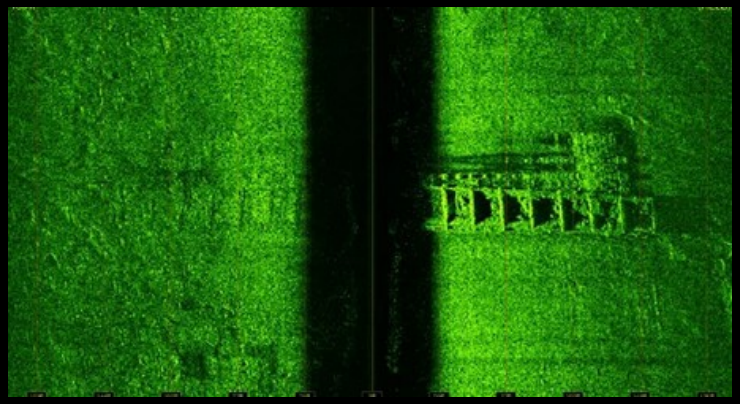
Volunteers documenting Ohio's Underwater Historic Resources

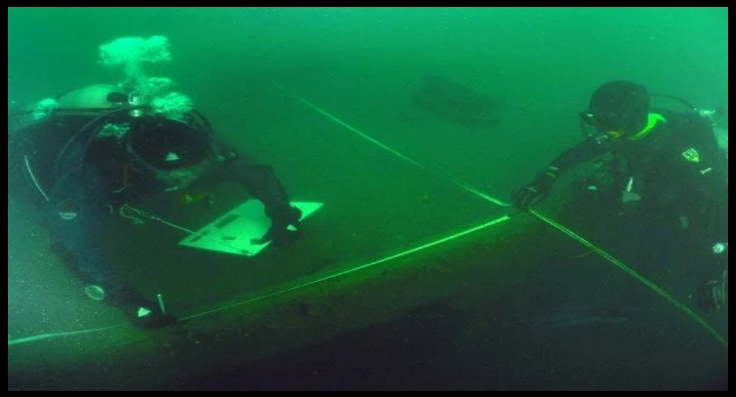
Runs Educational Programs (Toledo Museum)

First Weekend: Documentation / Mapping

Second Weekend: Document a boat wreck at White Star Quarry

Prepares diver slates of surveyed Lake Erie wrecks





Collaborates with Ohio State University

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Wreck Resources

Much information prior to digital age

Stonehouse Feltner Kohl

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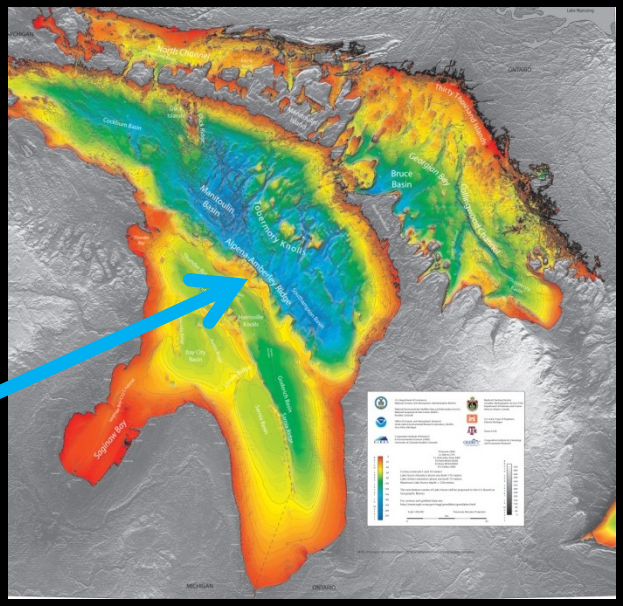
Nautical Archeology: Bottomlands



Underwater "Land Bridge "
Caribou Hunting Blinds
~10,000 years ago

Rewriting understanding of pre-history

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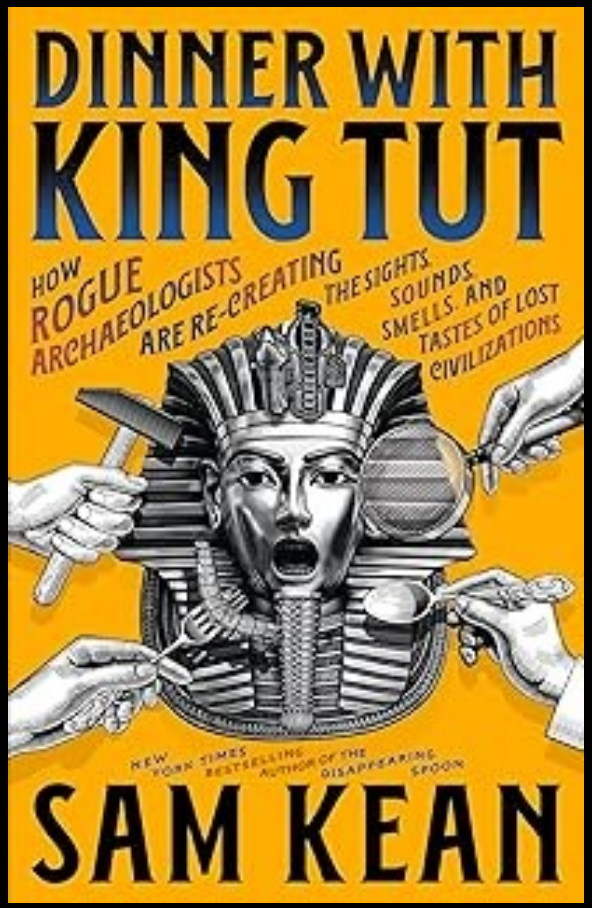
SAM Kean: Award Winning Science Writer / Journalist

7th book (July, 2025): Dinner With King Tut



Rogue Archeologists:

- Make human mummies
- Investigate the unsolved murders of ancient bog bodies
- Carve primitive spears and go hunting
- Knap their own obsidian blades to skin the game
- Build perilous boats and plunge out onto the open sea
- Build and fire medieval catapults
- Build Roman Roads

Mixes science with fiction to describe past civilizations

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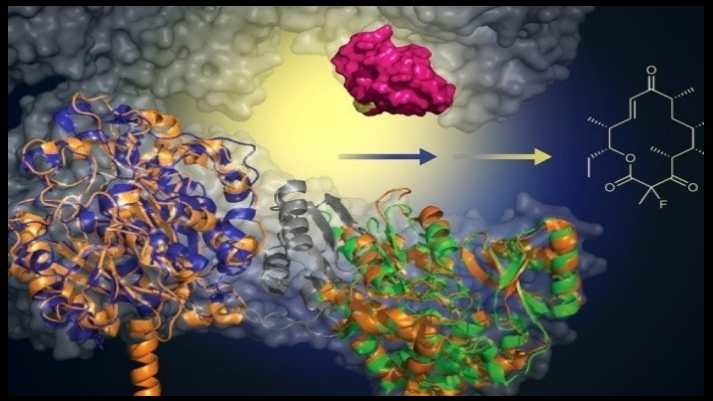
Medicinal Chemistry

Collects tropical sediment sea bacteria and fungi

Determines biological properties in extracts

Searching for antibiotics, anti cancer, and anti infectious diseases

Primary Site: Costa Rica



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Ecology and Evolutionary Biology

Impact of Caribbean shallow water sea grass on ecology
Using surface supplied air or snorkeling
Primary Site: The Bahamas

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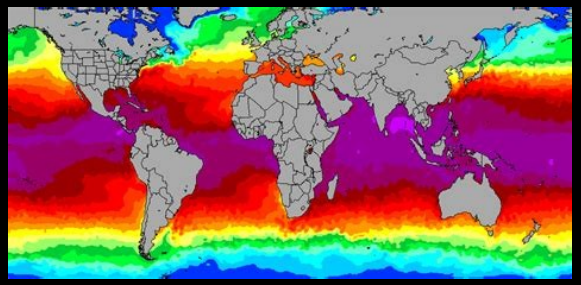
Earth and Environmental Sciences

Collects coral / cave core samples

Uses radioisotope ratios to determine age and temperature

Focus on studying climate change thru geologic time

Primary Site: Galapagos Islands



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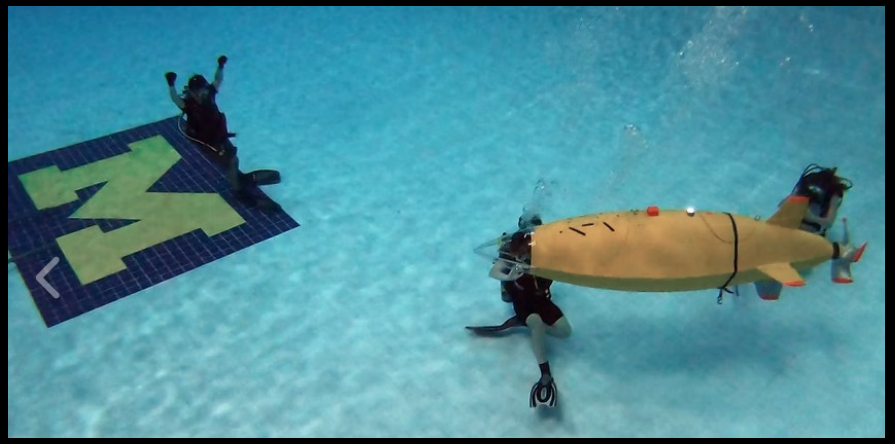
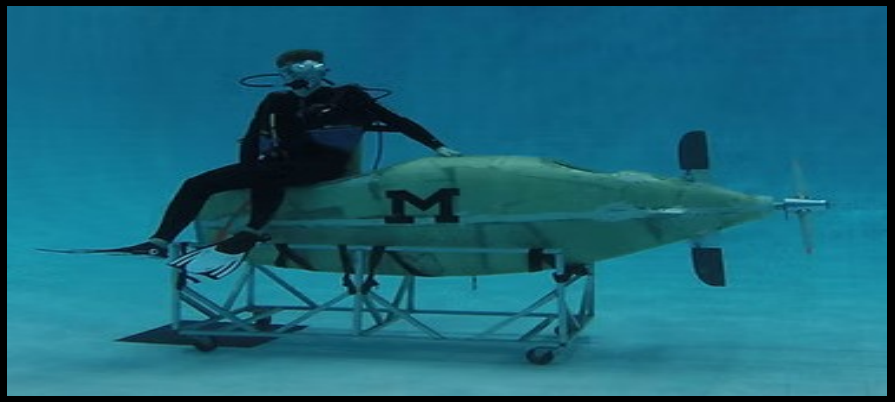
Human-Powered Submarine Team

College of Engineering

Undergrad students design, build, test, and race their submarine

International Competition: California, Washington, D.C. England





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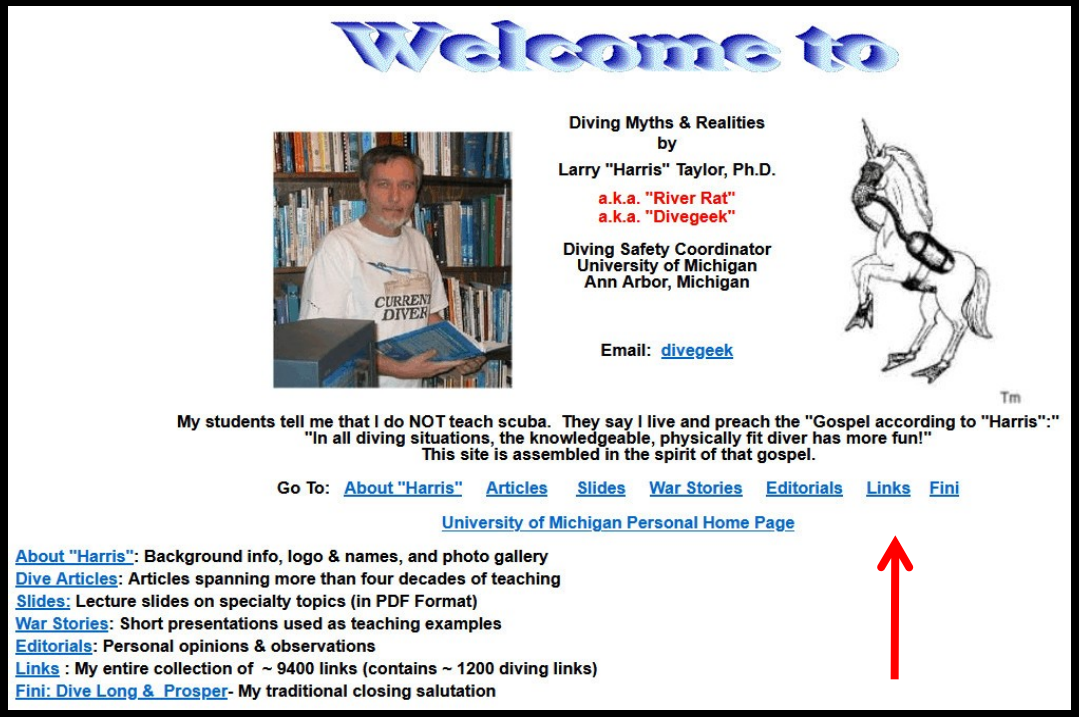
Your Diving Resource



https://websites.umich.edu/~lpt/Divegeek/home.htm
divegeek@earthlink.net

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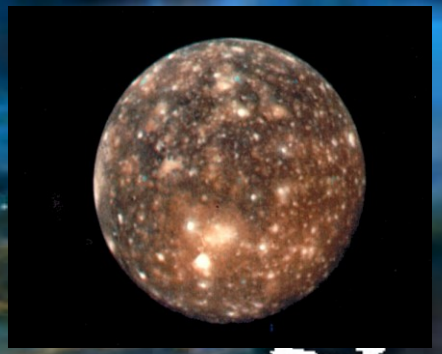
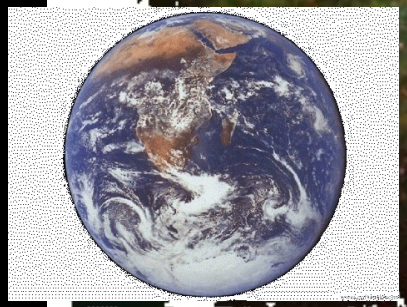
Dive long & Prosper!





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