

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**PRESENTATION TO
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

**SUBJECT: INTRODUCTION TO THE YMP
USE OF NATURAL ANALOGUES**

PRESENTER: DR. J. RUSSELL DYER

**PRESENTER'S TITLE
AND ORGANIZATION: CHIEF, TECHNICAL ANALYSIS BRANCH
YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT OFFICE
LAS VEGAS, NEVADA**

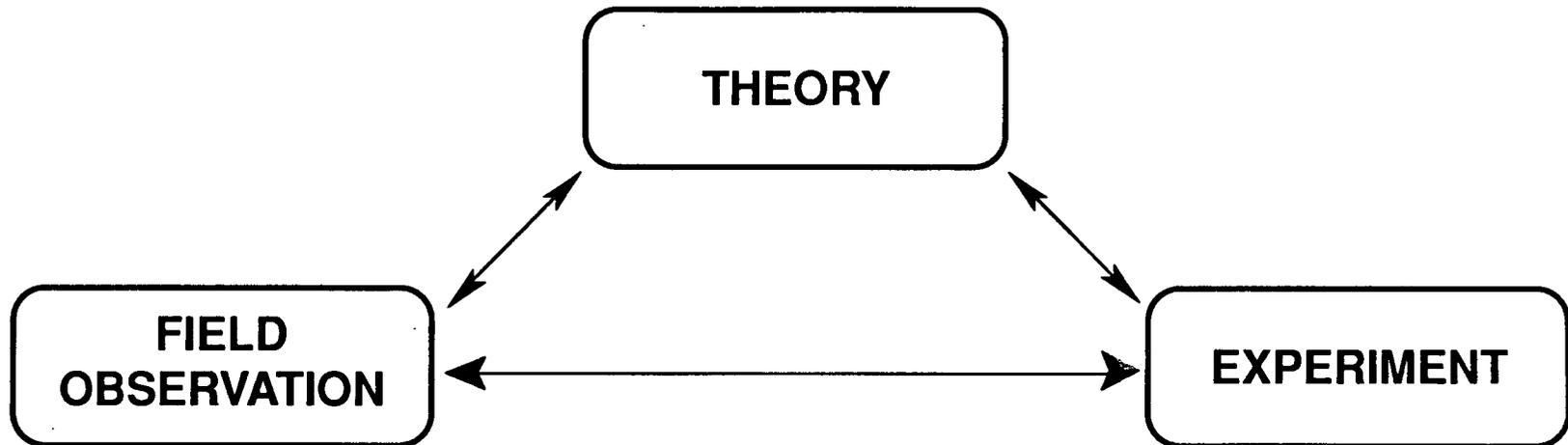
**PRESENTER'S
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**RENO, NEVADA
APRIL 16-17, 1991**

**THE YMP PHILOSOPHY FOR USE OF
NATURAL ANALOGUES:**

**NATURAL ANALOGUES ARE
AN INTEGRAL PART OF
EARTH SCIENCE STUDIES**

THE TRIAD OF EARTH SCIENCE STUDIES



- **PASSIVE OBSERVATION OF NATURAL SYSTEMS**
 - IDENTIFY PROCESSES
 - BOUND PROCESS RATES
- **OBSERVATION OF STRESSED NATURAL SYSTEM**

NATURAL ANALOGUE

OCRWM'S WORKING DEFINITION:

A NATURAL GEOLOGIC SYSTEM IN WHICH ONE OR MORE PROCESSES ANALOGOUS TO THOSE THAT MAY EXIST AT A SITE BEING CHARACTERIZED AS A POTENTIAL REPOSITORY AND/OR INDUCED BY THE STORAGE OF RADIOACTIVE WASTES ARE THOUGHT TO BE OPERATING OVER LONG TIME PERIODS OR SPATIAL SCALES.

HOW "NATURAL" MUST A NATURAL ANALOGUE BE?

**SOME ANTHROPOGENIC ANALOGUES ALSO
PROVIDE IMPORTANT, AND POSSIBLY UNIQUE,
INFORMATION ON PROCESSES THAT MIGHT
OPERATE AT A POTENTIAL REPOSITORY**

USE OF NATURAL ANALOGUES

- **THERE IS NO SINGLE, EXACT NATURAL ANALOGUE FOR A SITE BEING CHARACTERIZED FOR ITS SUITABILITY FOR GEOLOGIC DISPOSAL OF RADIOACTIVE WASTE**
- **BECAUSE THERE IS NO UNIQUE NATURAL ANALOGUE SITE FOR YUCCA MOUNTAIN, WE ARE CONCENTRATING ON IDENTIFYING PROCESSES AND PROCESS RATES WHICH MAY BE OPERATIVE AT YUCCA MOUNTAIN - NOW AND IN THE FUTURE. THESE STUDIES ARE BEING CONDUCTED AT NUMEROUS SITES, INCLUDING YUCCA MOUNTAIN**

USE OF NATURAL ANALOGUES

(CONTINUED)

- **PROCESS-ORIENTED ANALOGUE STUDIES CARRIED OUT BY THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT INCLUDE**
 - CLIMATE CHANGE
 - GEOCHEMISTRY AND TRANSPORT
 - HYDROLOGY AND FLOW
 - TECTONICS
 - MATERIAL BEHAVIOR
 - ETC.

THESE ARE COMPONENTS OF STUDIES OUTLINED IN THE SITE CHARACTERIZATION PLAN

WHAT IS THE ROLE OF NATURAL ANALOGUES WITHIN OCRWM PROGRAMS?

QUANTITATIVE

- **VALIDATION OF APPLICABILITY OF PROCESS MODELS FOR PERFORMANCE ASSESSMENTS**

QUALITATIVE

- **RECOGNITION OF OPERATIVE PROCESSES**
- **COMMUNICATING TECHNICAL INFORMATION TO THOSE NOT TECHNICALLY TRAINED**

MAINTAINING SCIENTIFIC COMMUNICATION AND CREDIBILITY

NWTRB FULL BOARD MEETING ON NATURAL ANALOGUES

TOPICS TO BE DISCUSSED

- **ROLE OF ANALOGUES IN THE RADIONUCLIDE TRANSPORT PROGRAM** J. CANEPA, LANL
- **STUDIES INVOLVING NATURAL ANALOGUES**
 - **HYDROTHERMAL ANALOGUES** C. BRUTON, LLNL
 - **PALEOCLIMATE AND HYDROLOGY ANALOGUES** D. HOXIE, USGS
 - **ANCIENT MATERIALS: ANALOGUES FOR REPOSITORY MATERIALS** A. B. JOHNSON, PNL
 - **NATURAL ANALOGUES FOR NUCLEAR WASTE GLASS** W. BOURCIER, LLNL
 - **ANTHROPOGENIC ANALOGUES – RADIONUCLIDE TRANSPORT AT DOE SITES** E. SPRINGER, LANL
 - **YUCCA MOUNTAIN AS A NATURAL ANALOGUE TO REPOSITORY-INDUCED ALTERATION** D. BISH, LANL