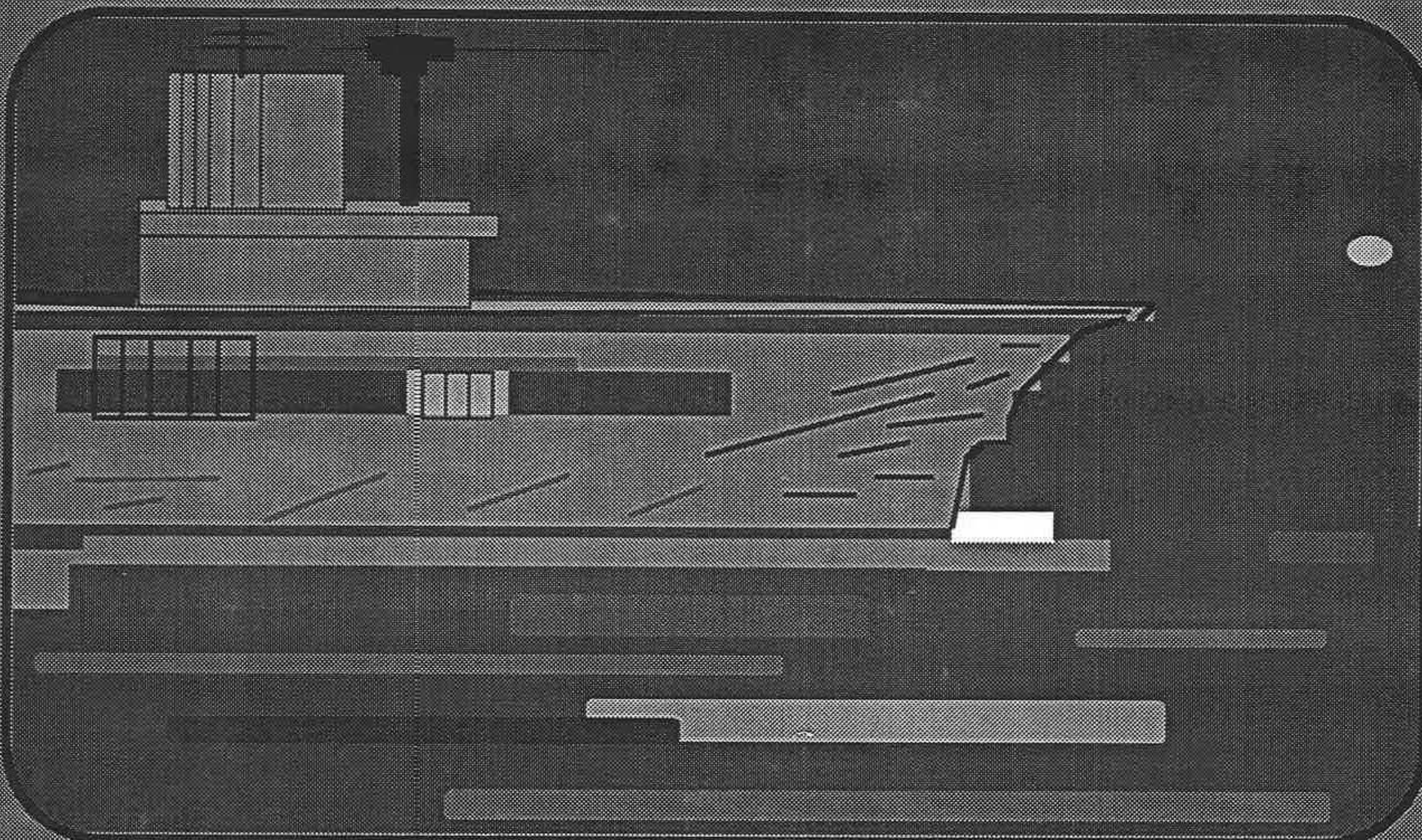
Entrando al Siglo XXI:
la busqueda de hidrocarburos.

H. Roice Nelson, Jr.
Landmark Graphics Corporation

01 October 1991

MEXIL

One Captain's "Viewpoint:"



MEXIR

What are 3 R's of E & P ?

In 19th century U.S. culture there were the 3 R's of education:

Reading
wRiting
aRithmetic

As captains of the E & P battleship, do we believe the earth science disciplines are another battleship?

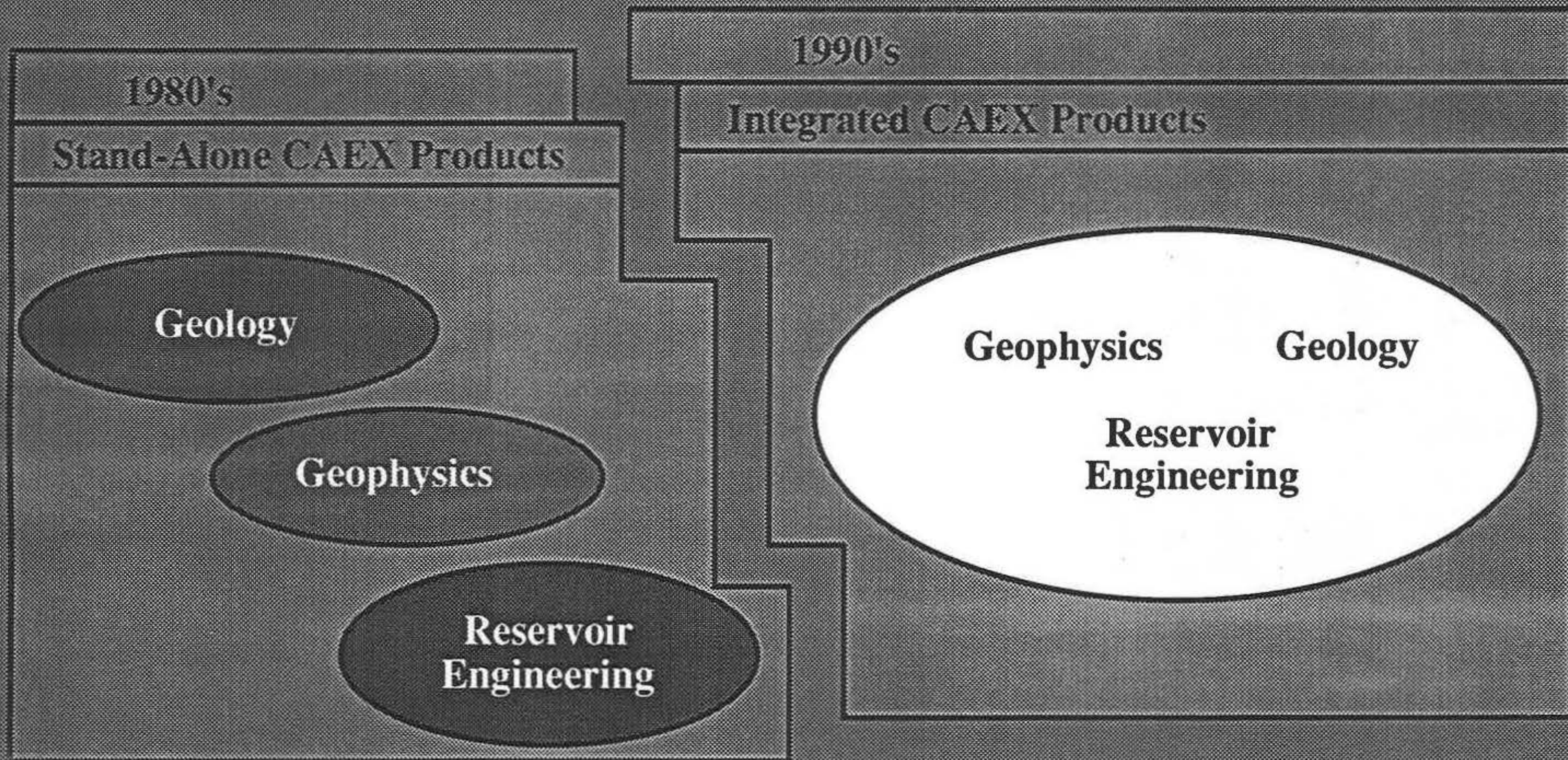
Geology
Geophysics
Engineering

MEX2L

Are There Misperceived Lighthouses in E & P ?

MEX2R

CAEX in the 1990's:



Earth science professionals have (in the past) and will continue (as we reach for the 21st century) to "push the envelope" in each of the major E & P disciplines.

CAEX = Computer Aided Exploration & Production

MEX3L

The Next Wave of Exploration:

"Petroleum exploration has evolved into a pattern molded on . . . the assembly line. Specialists in data acquisition record field data, which is then handed off to data processing specialists, who in turn deliver the processed sections to a seismic interpreter, and passes that to geologists and engineers for integration with regional geology and evaluation of the economics of the area. This bucket brigade approach has worked well and has been able to strip most of the major structural traps . . . .

With most of the structures found, attention in the last few years has turned increasingly to stratigraphic traps . . . instead of the assembly line approach to exploration, such activities require a more circular feedback system."

Roy O. Lindseth
The Next Wave of Exploration
Geophysics: The Leading Edge
December, 1990

MEX3R

This Presentation Will:

- Review identified E & P needs.
- Illustrate where our industry has come from.
- Describe some new technologies available to assist E & P.
- Show examples of reaching towards the 21st century in our search for hydrocarbons.

Identified E & P Needs:

- Replace declining reserves.
- Increase exploration to refill the "field pipeline."
- Provide wide access to modern computer tools.
- Locate new types of traps, for notwithstanding recent discoveries in the Bay of Campeche, the major structures have been found.
- Implement stratigraphy interpretation principles.
- Develop access to available massive digital databases.

MEX5L

Where have we come from?

In 1959 Lewis Weeks:

- Evaluated Australian oil potential as a consultant to BHP.
- Discounted existing plays, but implied knowledge of a new play.
- After a handshake agreement with Sir Ian McLennan, the chief executive of BHP, he:
  - Pointed out a new potential play in the Bass Straits.
  - Laid out an exploration program:
    - Aeromagnetic survey to locate basement highs.
    - Regional seismic data collection.
    - Detail seismic data across structures.

The results:

- Production in 1989 was 382 KB/day, with 950 MB in place.
- Production in 1990 was 308 KB/day, with 925 MB in place.
- Australian total consumption for 1990 was 635 KB/day.

- Still providing 50-60% of Australian hydrocarbon usage.
- Up to 80% of BHP Petroleum's annual income.
- Up to 1986, 85% of total income went to pay an excise tax.

MEX6L

Latency: an example of the impact of new technology:

From 1982 to 1989:

- Memory access speed remained about 0.1 micro-second per byte.
- Disk latency/element was at 0.1 second/sample or 100,000 seconds (27 hours) per MB.
- The relative price performance of compute power increased by a factor of 100.

In 1990 Landmark Graphics:

- Increased automatic picking of seismic data by a factor of 100, going from ZAP (the Zoned-Auto-Picker) to Turbo-ZAP.
- This was largely due to moving more data into memory rather than extra compute power.

In 1995 we anticipate:

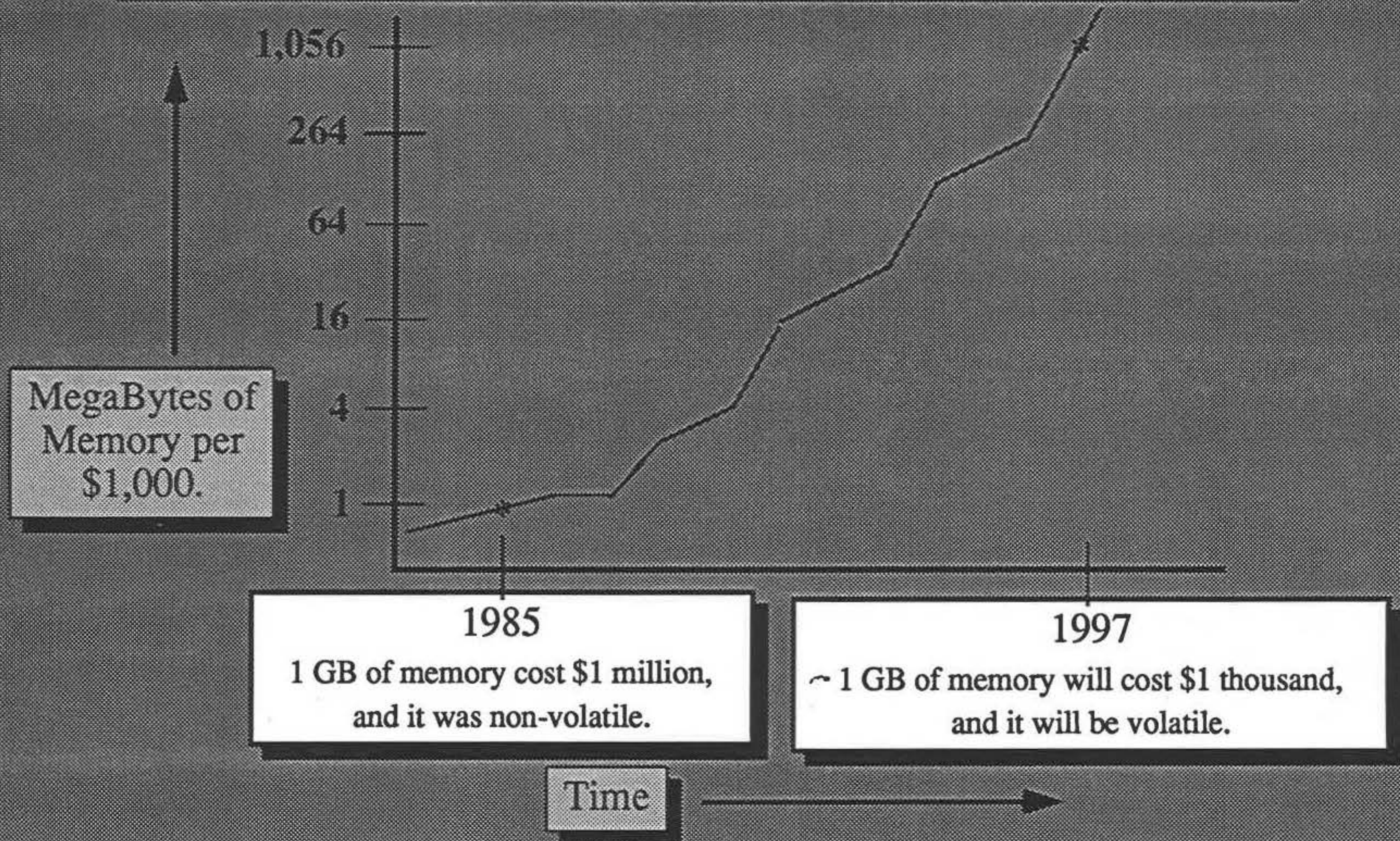
- High-definition television (HDTV) will be introduced.
- Each HDTV will require 1 GB of memory (15 seconds of television).
- This will being an economic revolution that will drive down computer memory prices.

HDTV is a serial application, vs. working with a volume, like with 3-D seismic surveys.

MEX17L

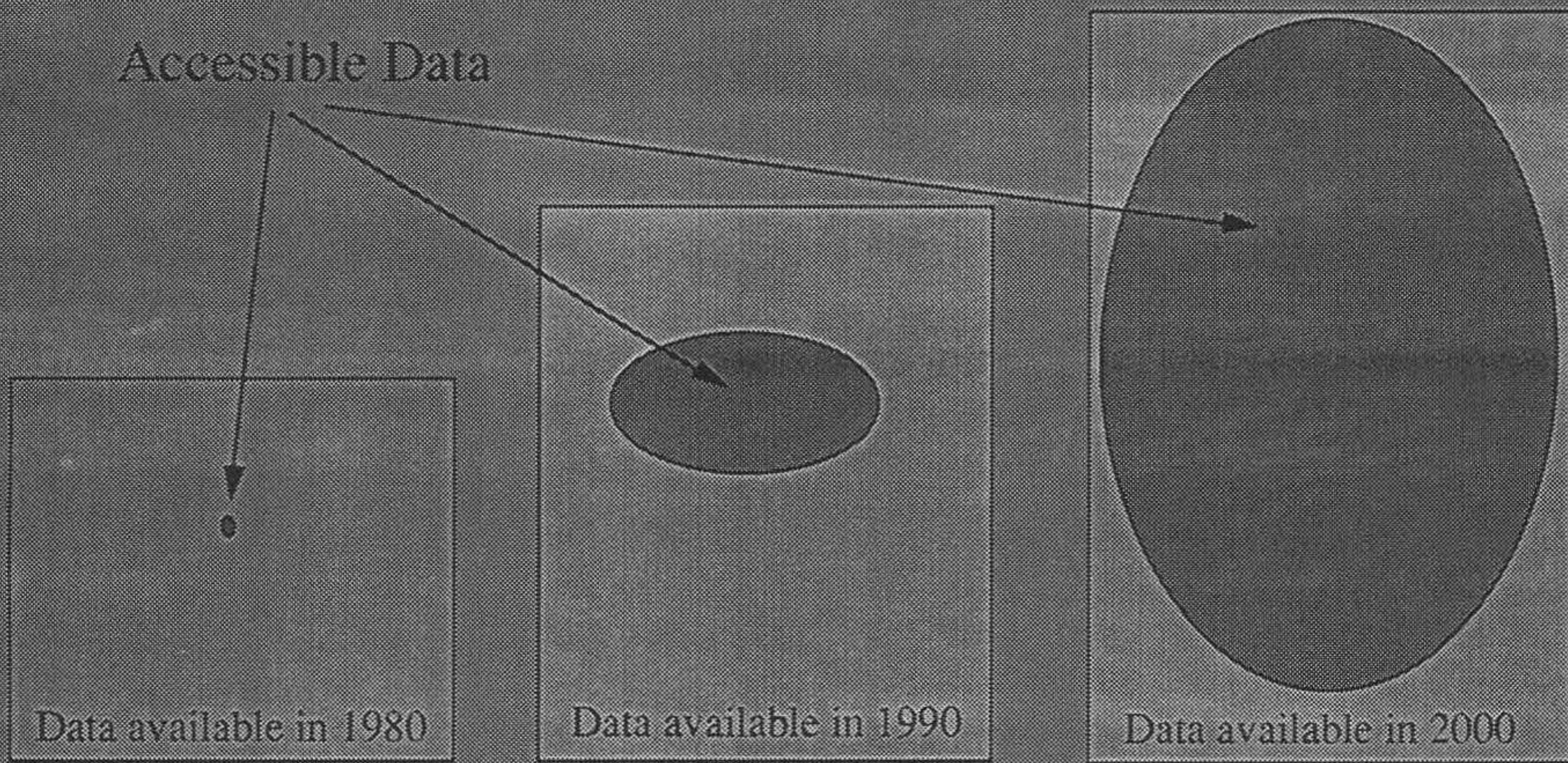
An Economic Revolution:

Computer memory increases by a factor of 4 every 18 months.



MEX17R

Data, more valuable than computer tools!



People and computers can now see more of the data at one time.

MEX18L

Types of Available Data:

- Location.
- Geologic Age.
- Pressure.
- Temperature.
- Fluid Mass Flux.
- Sedimentation Rate.
- Rate of Sea-Level Change.
- Pore Fluid Salinity.
- Rate of Fluid Flow.
- Permeability.
- Heat Flow.
- Long-Term Compressibility.

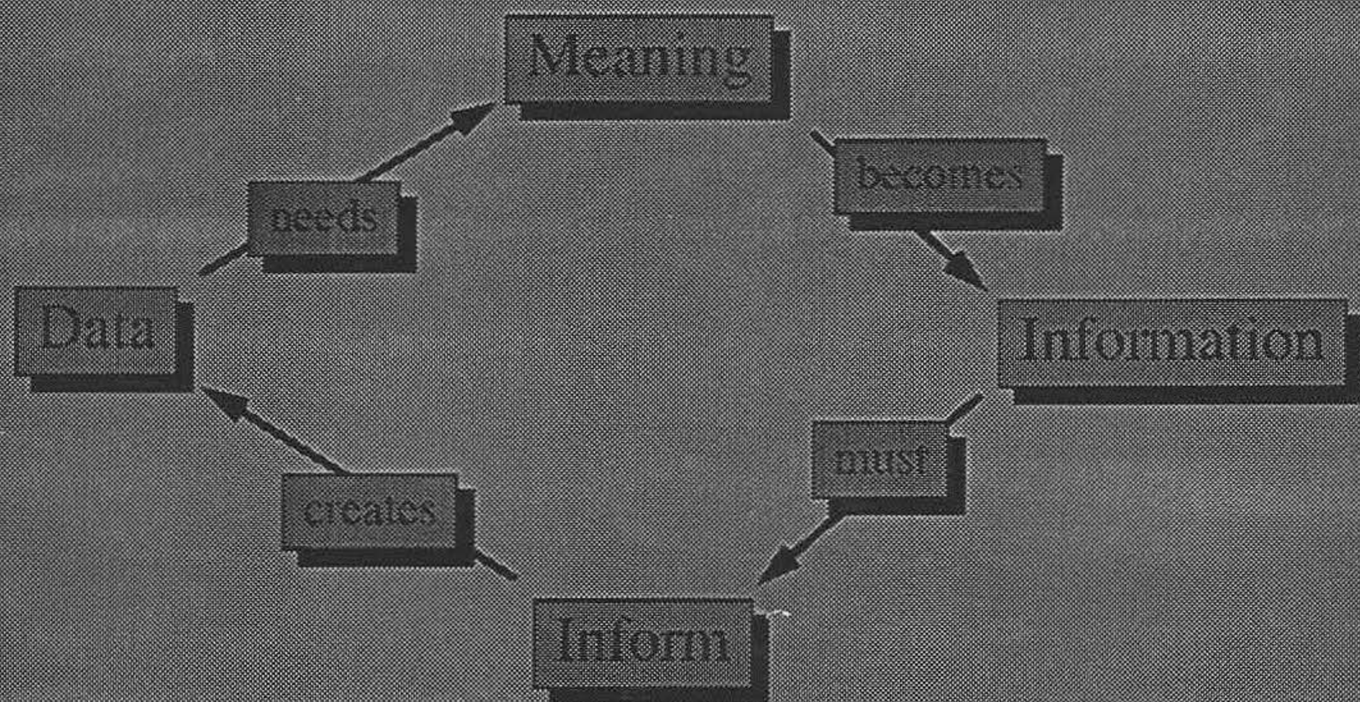
- Yield Strength of Sediment Matrix.
- Porosity.
- Thermal Conductivity of Media.
- Total Pore Fluid Expansion.
- Thermal Sources.
- Cold Water Hydrostatic Pressure.
- Dynamic Viscosity.
- Fluid Density.
- Reference Fluid Density.
- Initial Sediment Density.
- Full Thermochemical Data for all minerals involved in diagenetic and metasomatic alteration.

How do we keep track of and optimally use all of these data in E & P?

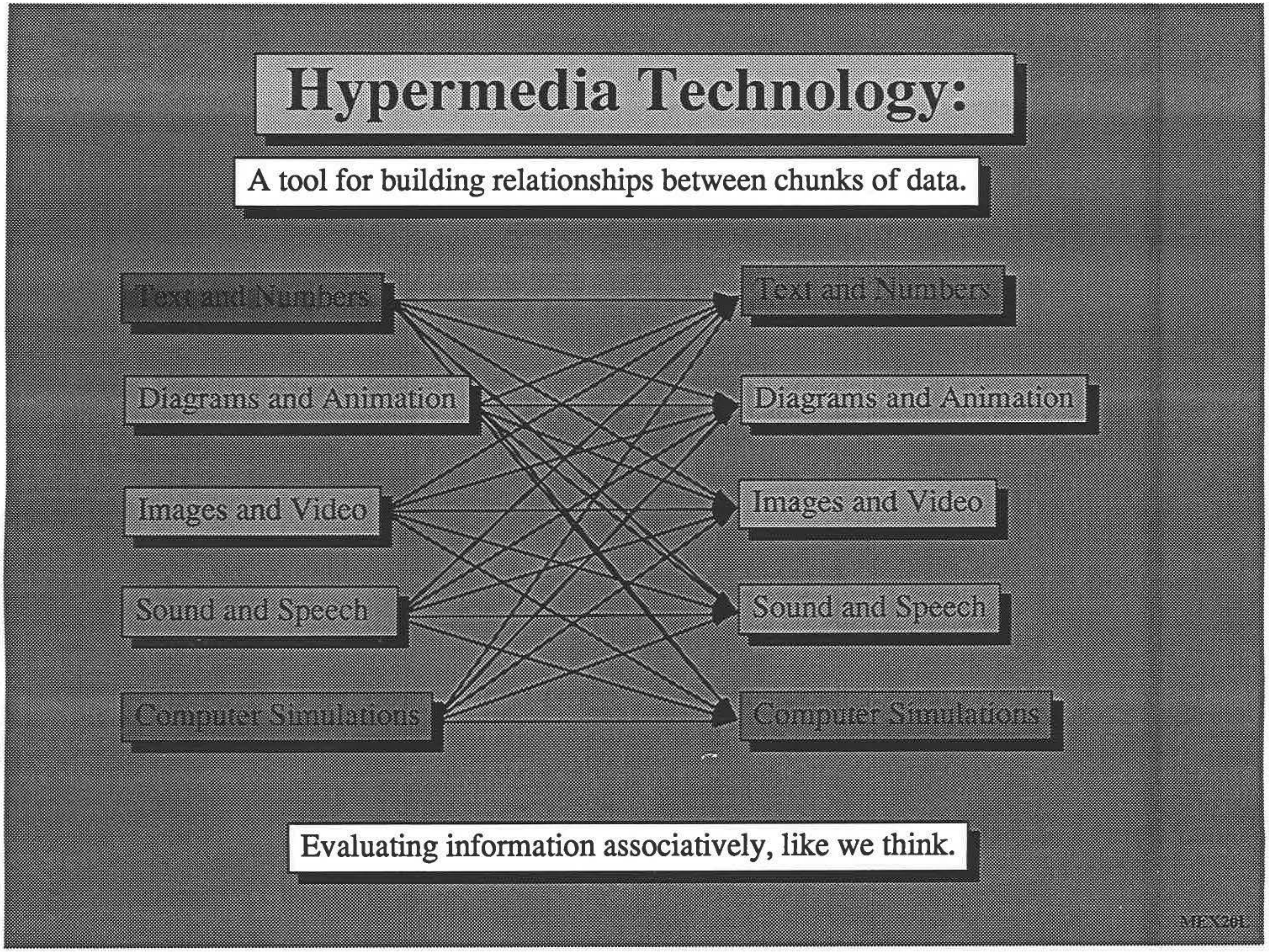
MEX18R

The Information Age is Just Opening:

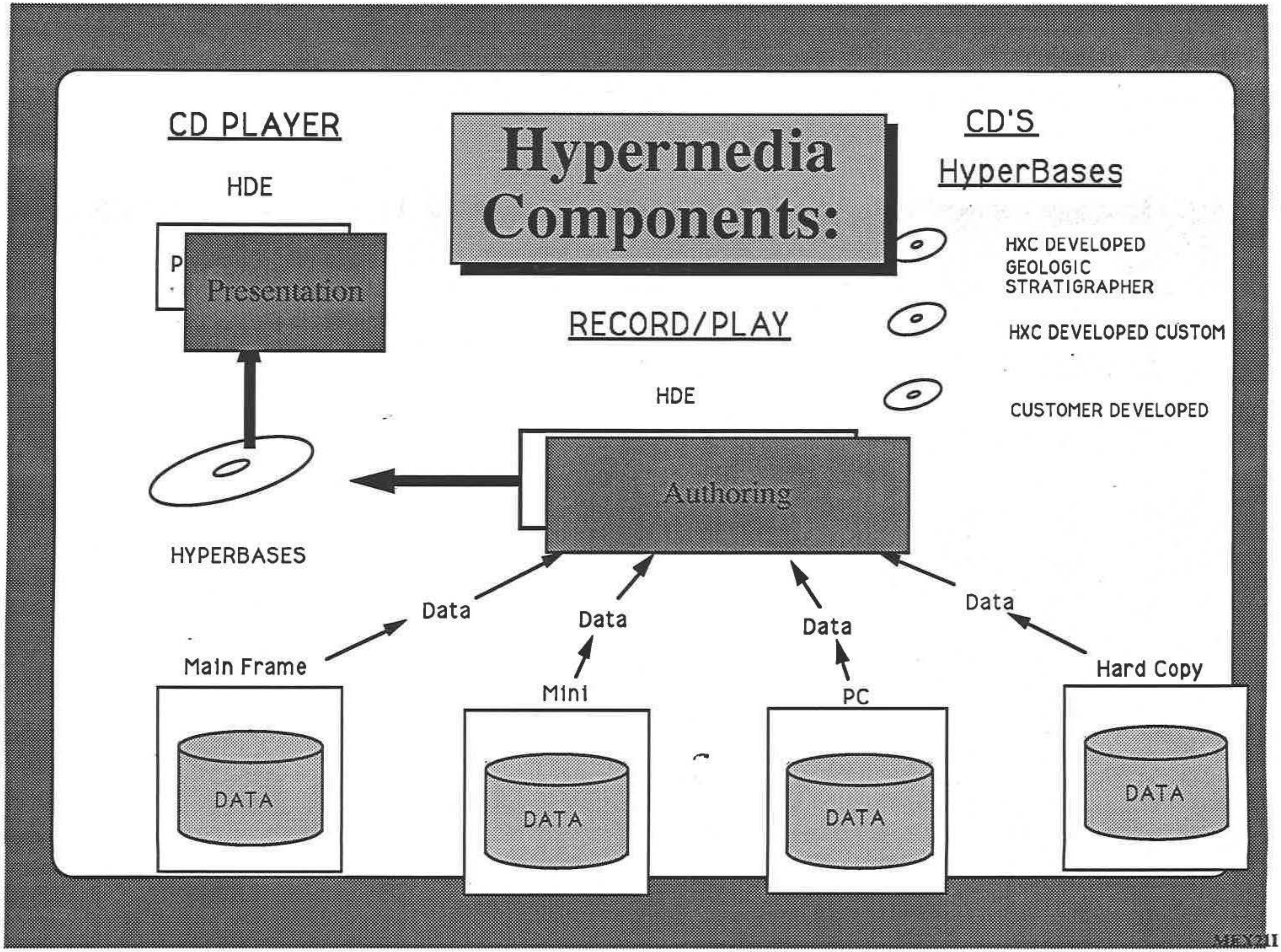
- Up to now we have simply collected and produced data.
- We need to allow users to provide meaning to data, thus creating information that can be used to inform and create new data.



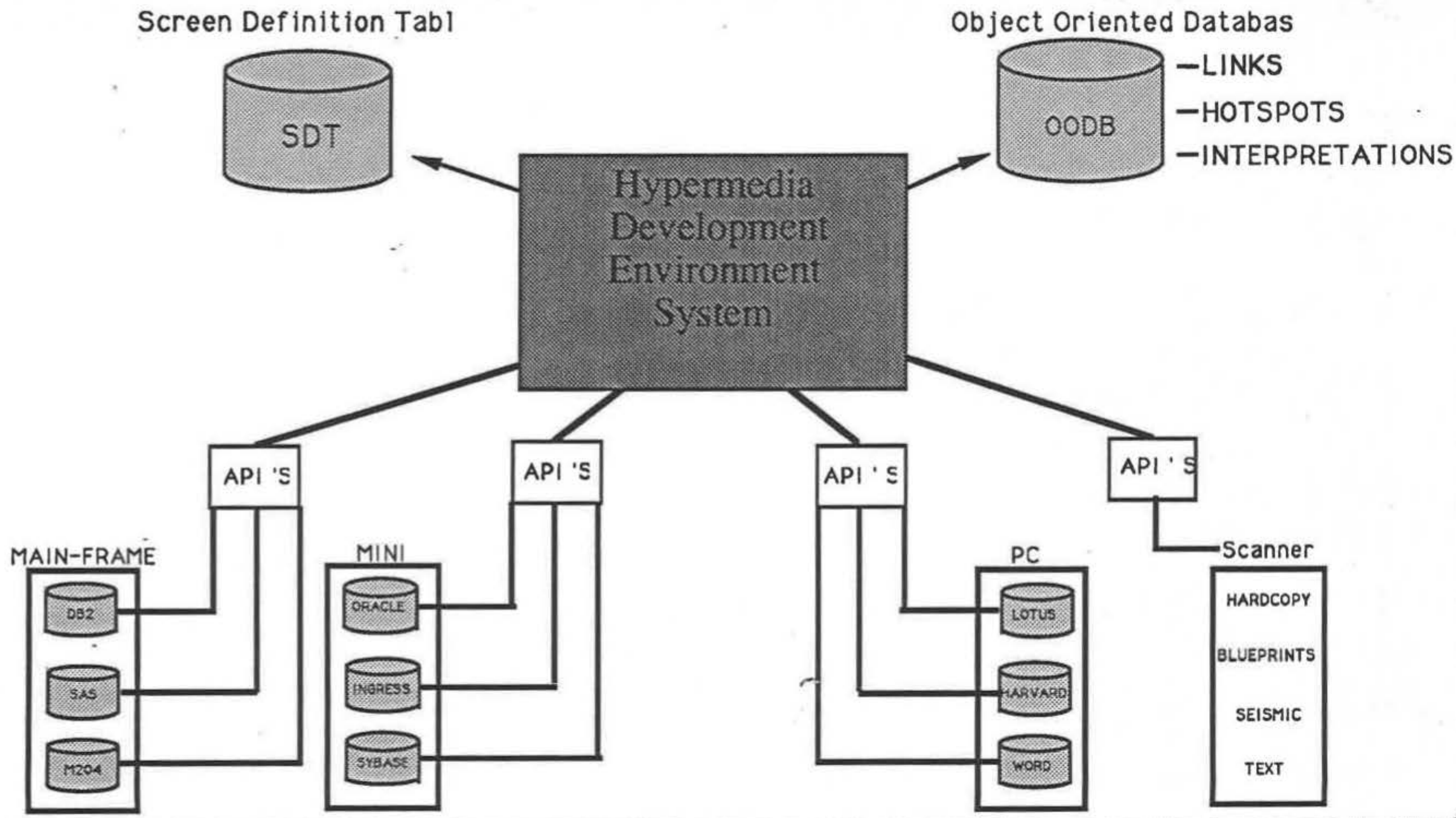
MEX19L



Hypermedia Technology:
A tool for building relationships between chunks of data.
Text and Numbers
Diagrams and Animation
Images and Video
Sound and Speech
Computer Simulations
Text and Numbers
Diagrams and Animation
Images and Video
Sound and Speech
Computer Simulations
Evaluating information associatively, like we think.


Hypermedia Components:
CD PLAYER
HDE
Presentation
HYPERBASES
RECORD/PLAY
HDE
Authoring
CD'S
HyperBases
HXC DEVELOPED
GEOLOGIC
STRATIGRAPHER
HXC DEVELOPED CUSTOM
CUSTOMER DEVELOPED
Data
Data
Data
Data
Main Frame
Mini
PC
Hard Copy
DATA
DATA
DATA
DATA

The Promise of Hypermedia:



Standards:

- Operating system (UNIX™), languages (C, C++), graphics systems (X-Windows), and user interface (OSF/Motif™) become transparent.
- Removes the user from worrying about hardware components.
- Applications are no longer tied to particular piece of hardware.
- Allows new generations of hardware to be added to the system every six weeks.
- Provides extensive window management capabilities:
    - Move.
    - Re-size.
    - Expand to full screen.
    - Iconize.
    - Pop-up windows.
    - Scroll.
    - Selection.
    - Pointers.
- Instantaneous, automatic update of data types between applications.
- The basis of a new visual language for interacting with computers.
- Potential of pointers that will retrieve data from large data bases without requiring reformatting of data.

New E & P Technologies,
closely tied to advances in computer science:

Acquisition:
volumes of data because of data storage improvements.

+

Interactive Processing:
because of RISC technologies, more memory, and parallel processing.

+

Computer-Aided Interpretation:
from paper to auto-tracking to ZAP (Zoned Auto-Picking).

+

Optimized Production:
real-time simulation and automated production processes.

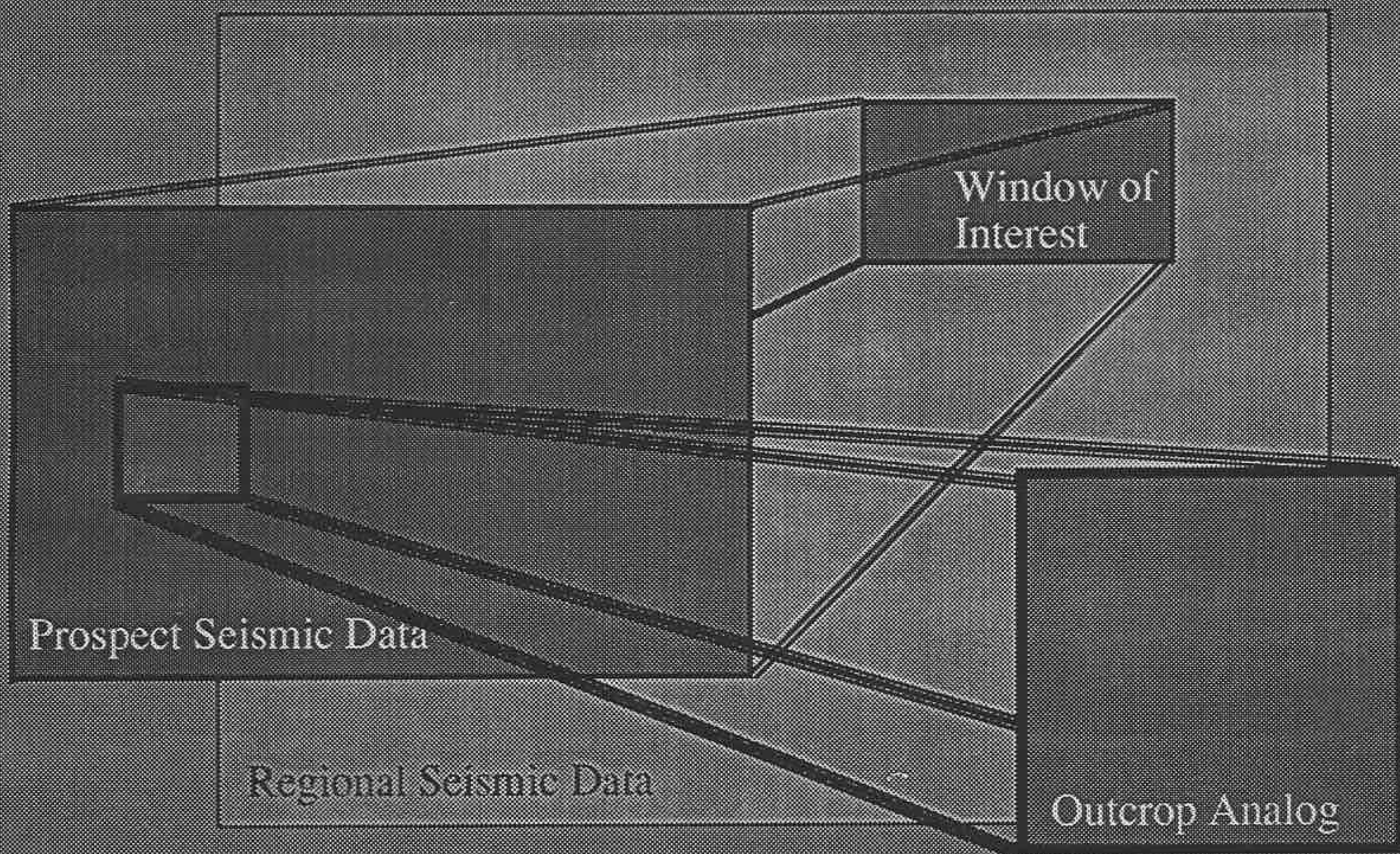
=

- Integration of data and disciplines.
- Productivity improvements.
- Higher quality interpretations.
- Better results at the drilling site.

MEX28L

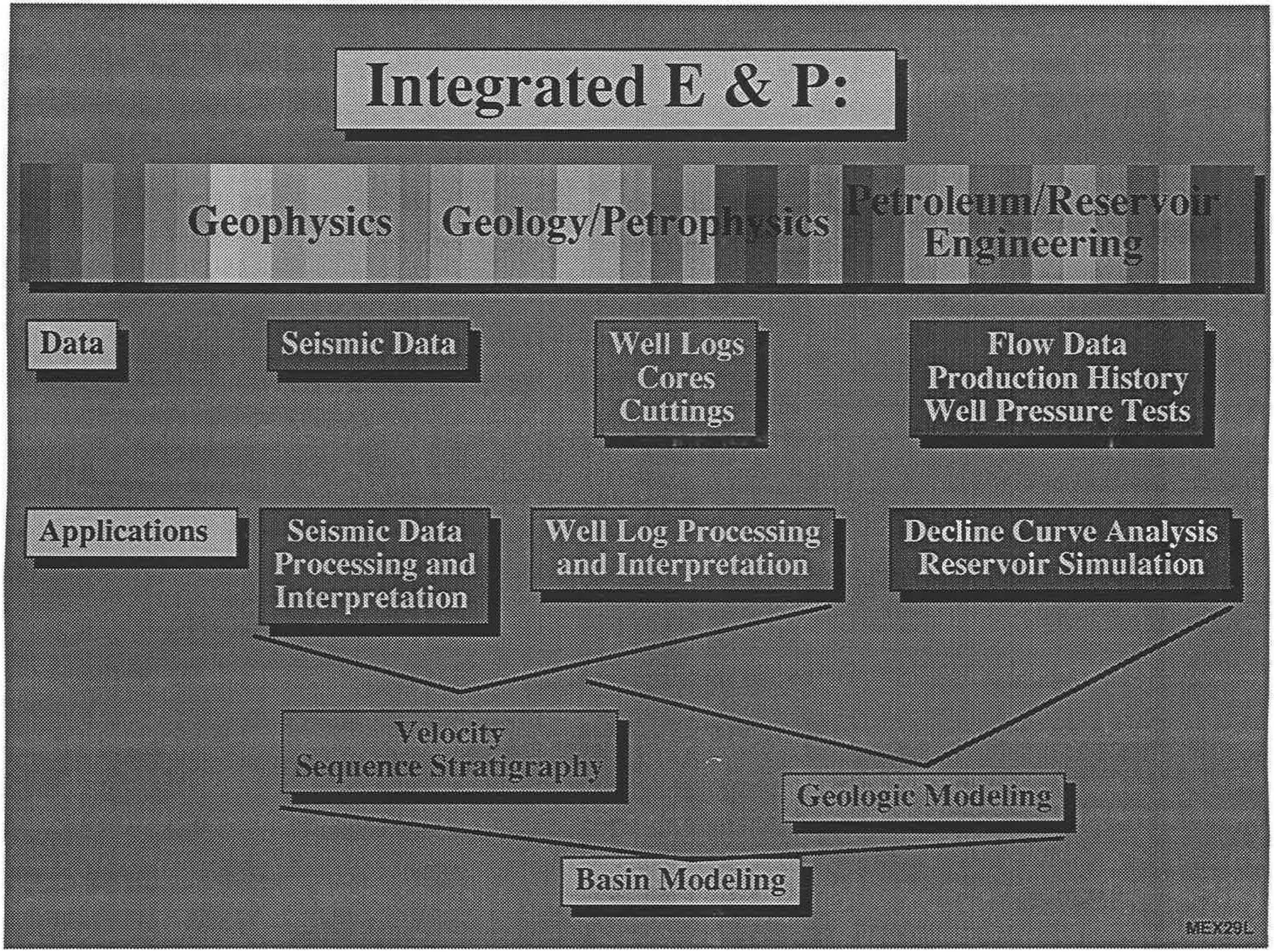
New Computer Technologies:

Shrinking the distance between Exploration & Production



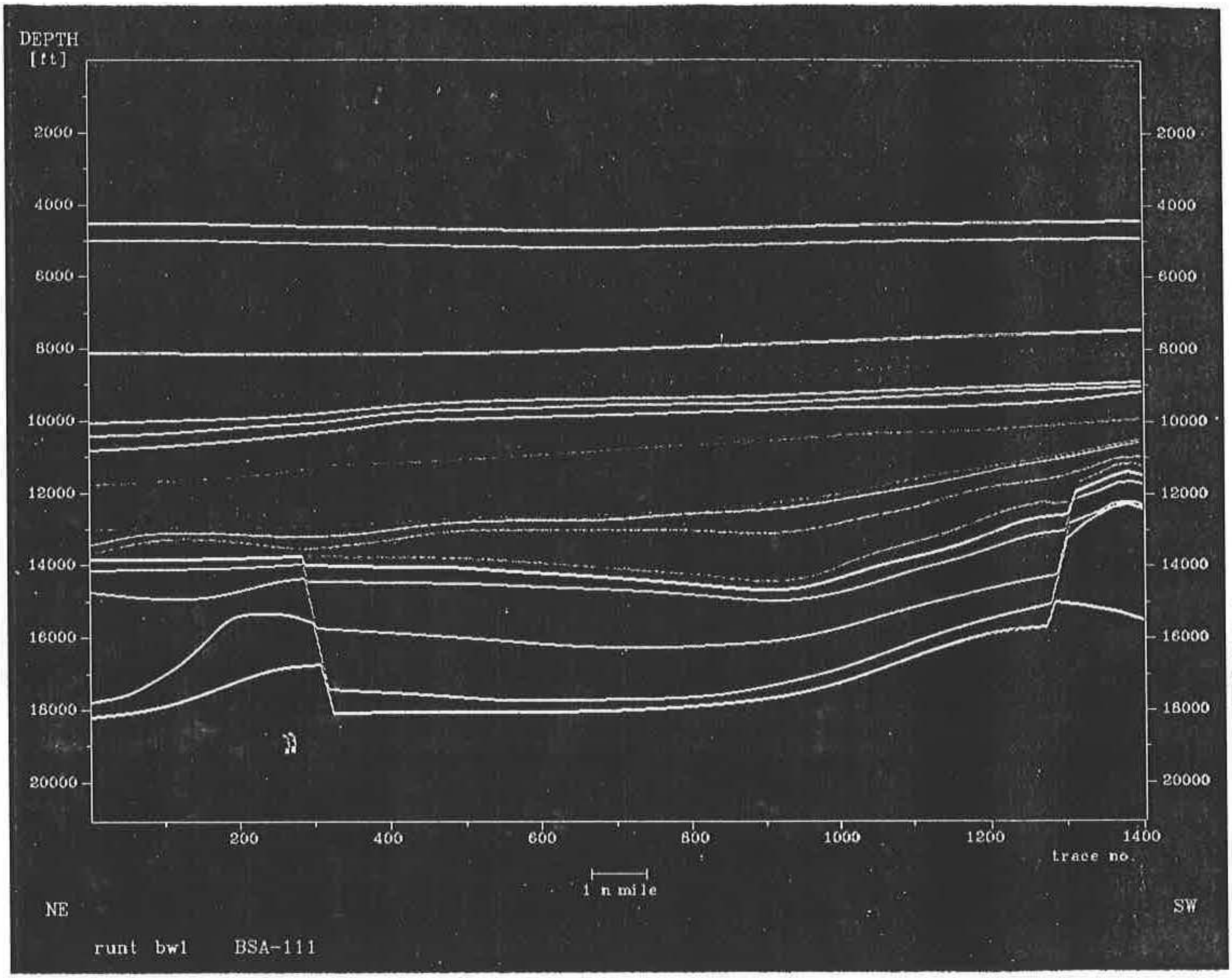
Opening Windows into the Earth.

MEX28R

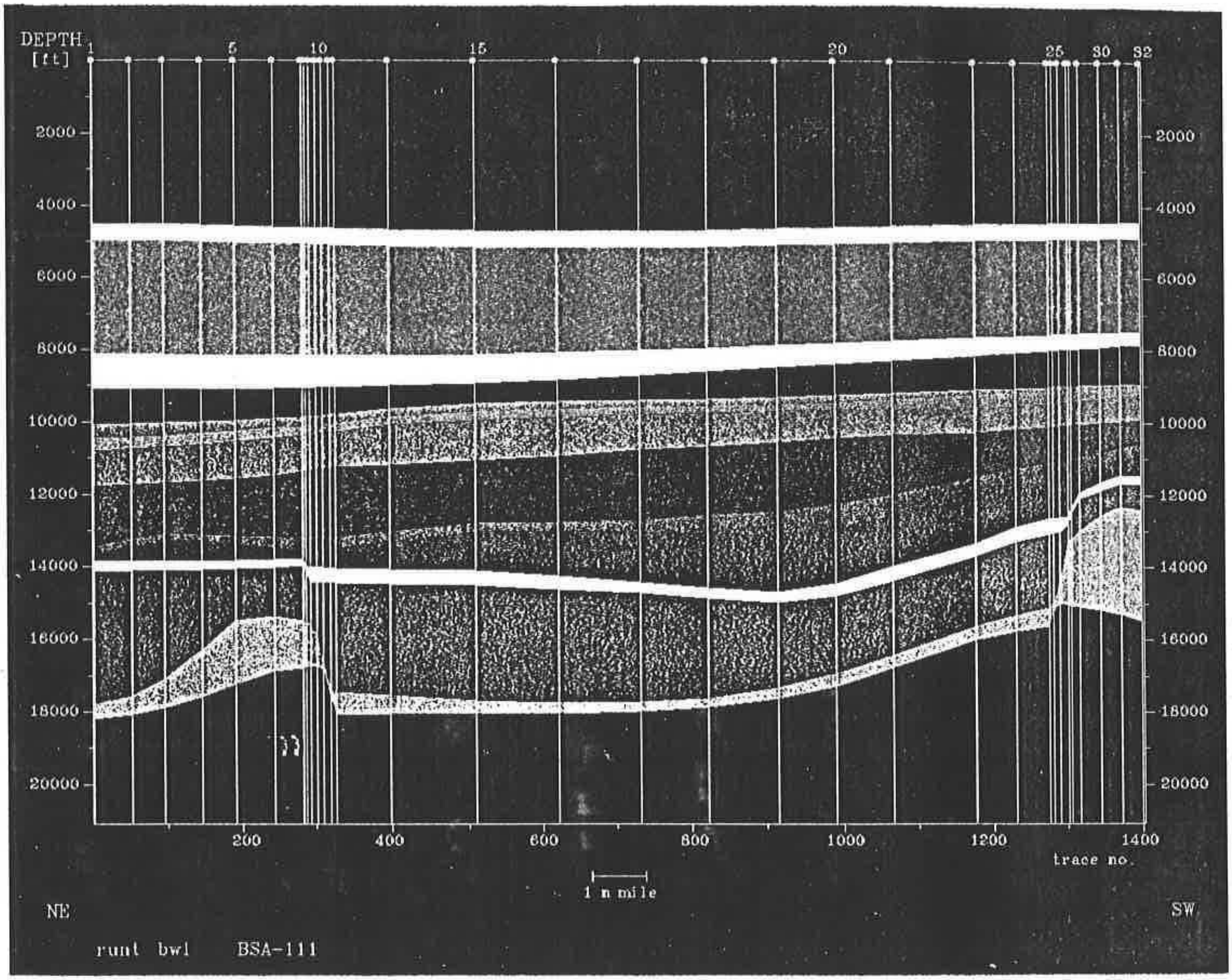

Integrated E & P:
Geophysics
Geology/Petrophysics
Petroleum/Reservoir Engineering
Data
Seismic Data
Well Logs
Cores
Cuttings
Flow Data
Production History
Well Pressure Tests
Applications
Seismic Data Processing and Interpretation
Well Log Processing and Interpretation
Decline Curve Analysis
Reservoir Simulation
Velocity
Sequence Stratigraphy
Geologic Modeling
Basin Modeling
MEX29L

Examples reaching for al Siglo XXI:

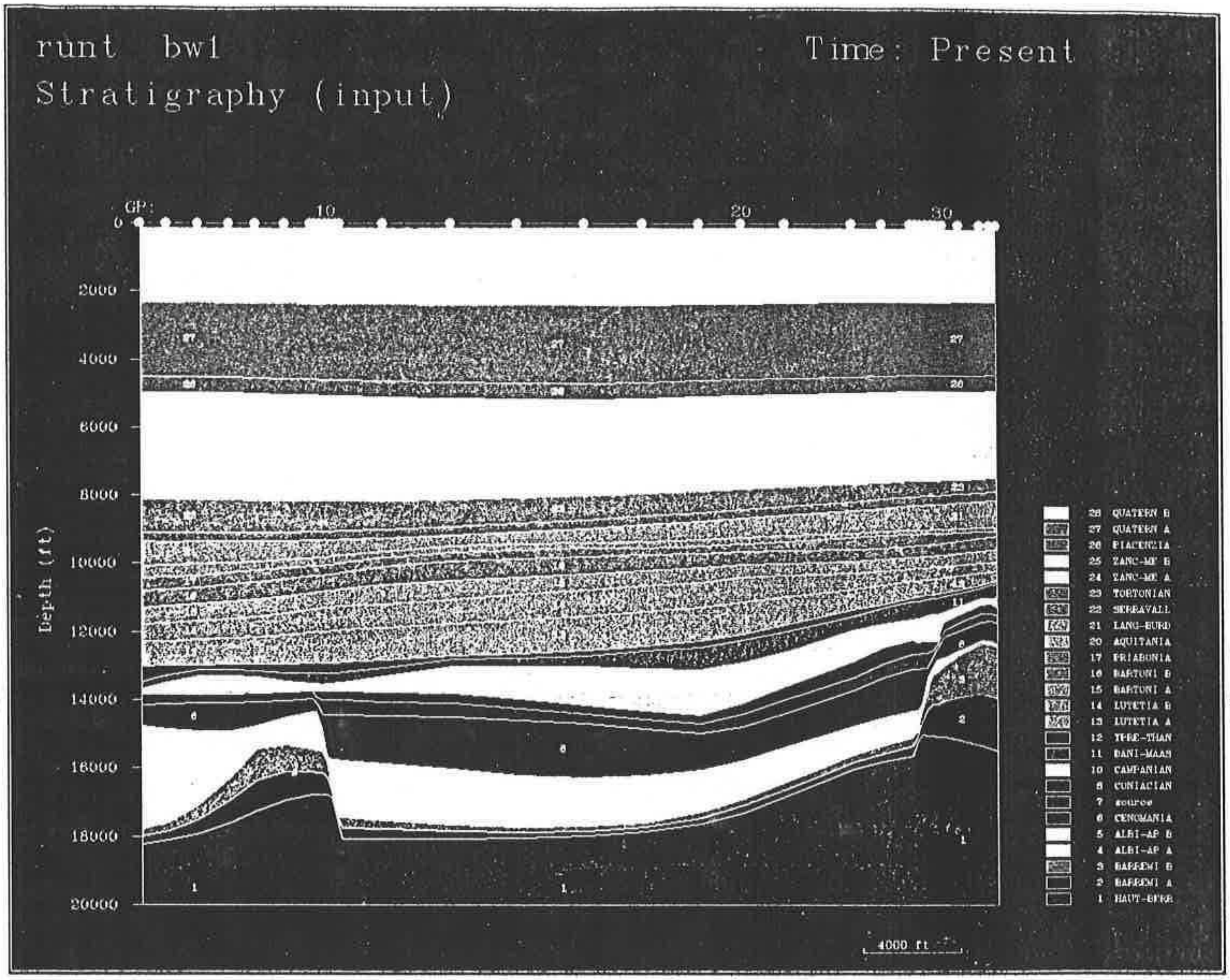
- **Basin Analysis:**
  - IES example.
- **Sedimentary Fill Simulation:**
  - Marco Polo example.
- **Well Log Interpretation:**
  - Canadian Tableland example.
- **Petrophysical Interpretation:**
  - Stanford University example.
- **Interactive Processing:**
  - University of Calgary example.
- **Seismic Interpretation:**
  - 3-D Gulf of Mexico examples.
  - 2-D BP sparker survey.
- **Reservoir Engineering:**
  - GBRN example.

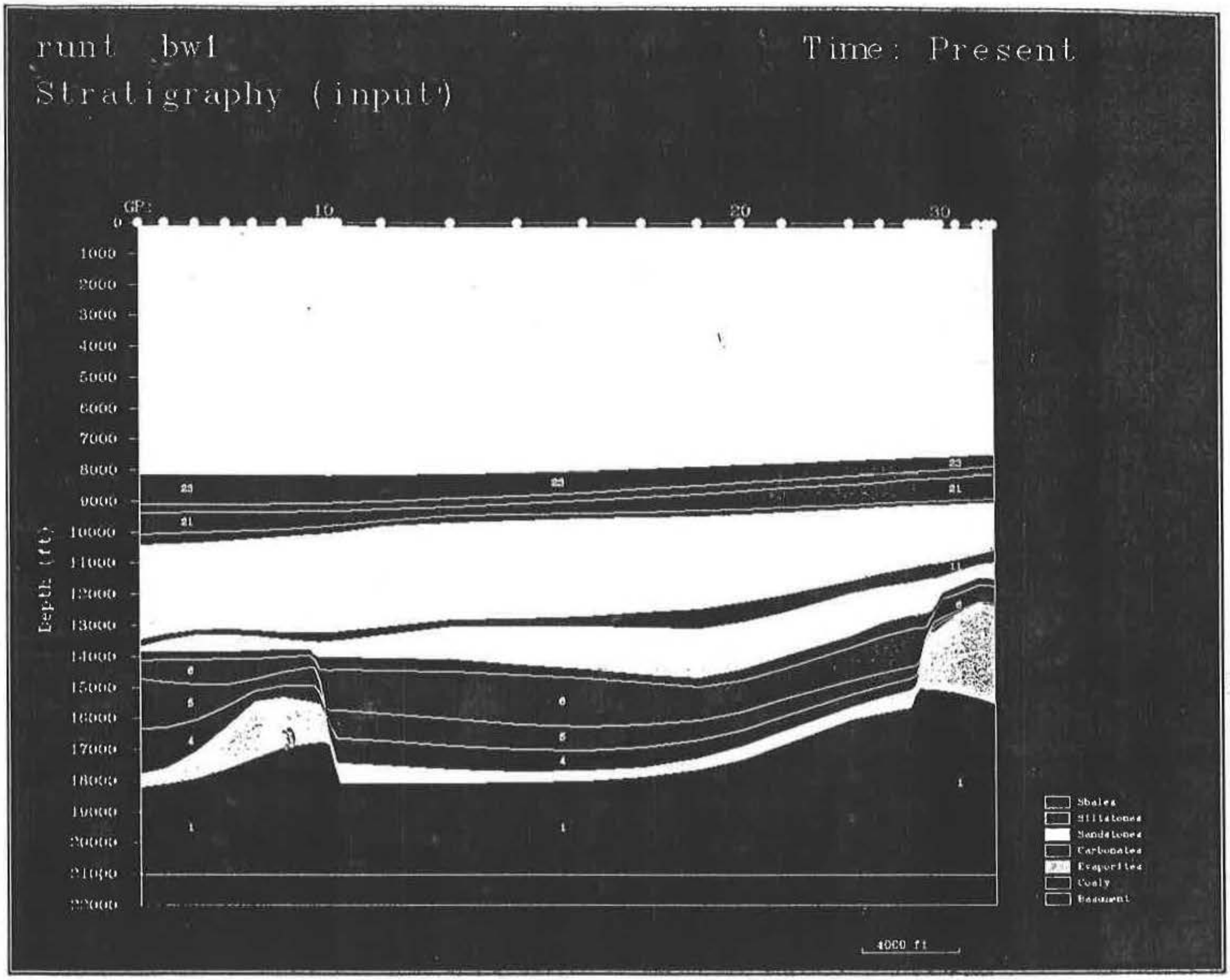


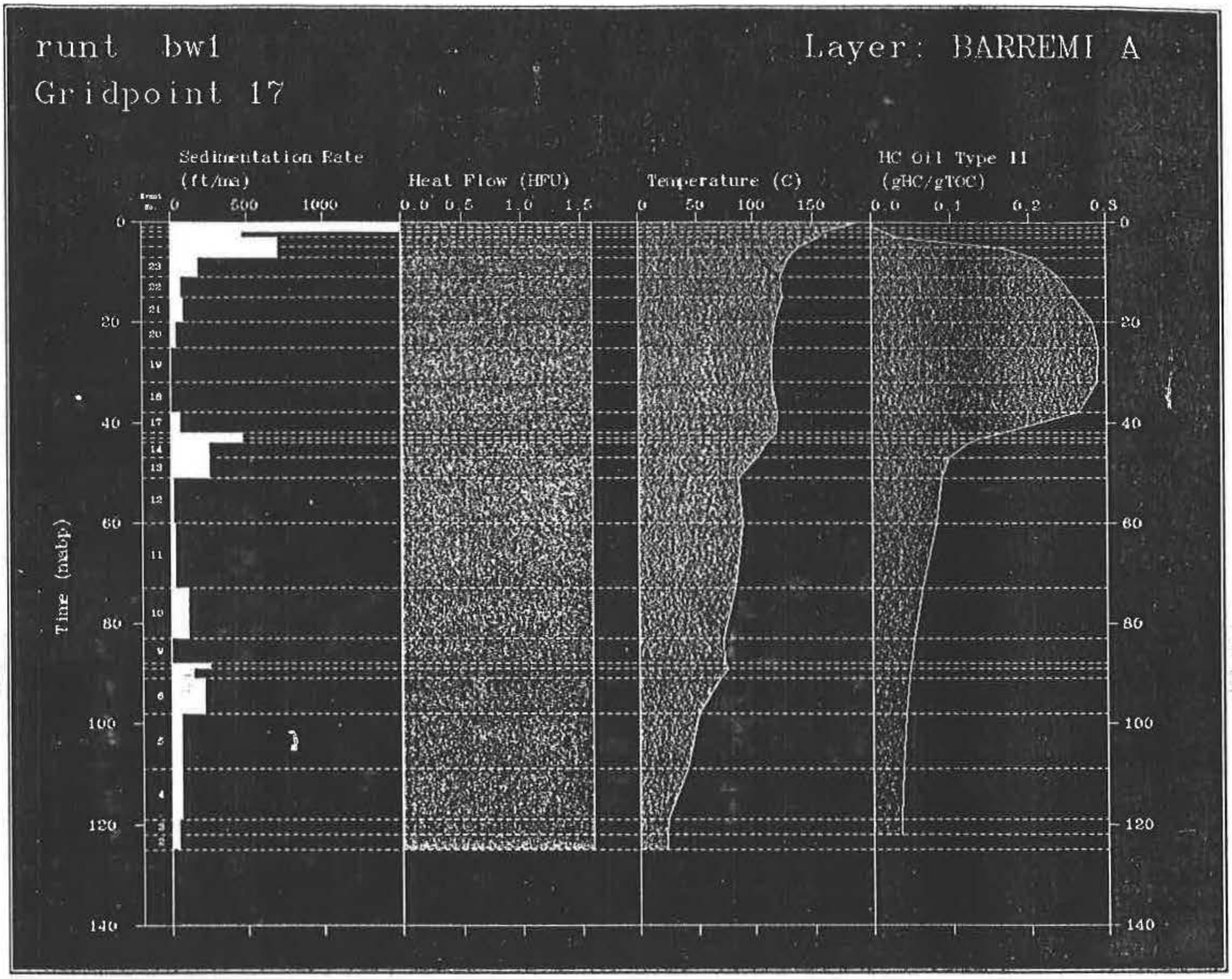
DEPTH
[ft]
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
200
400
600
800
1000
1200
1400
trace no.
1 n mile
NE
SW
runt bw1 BSA-111



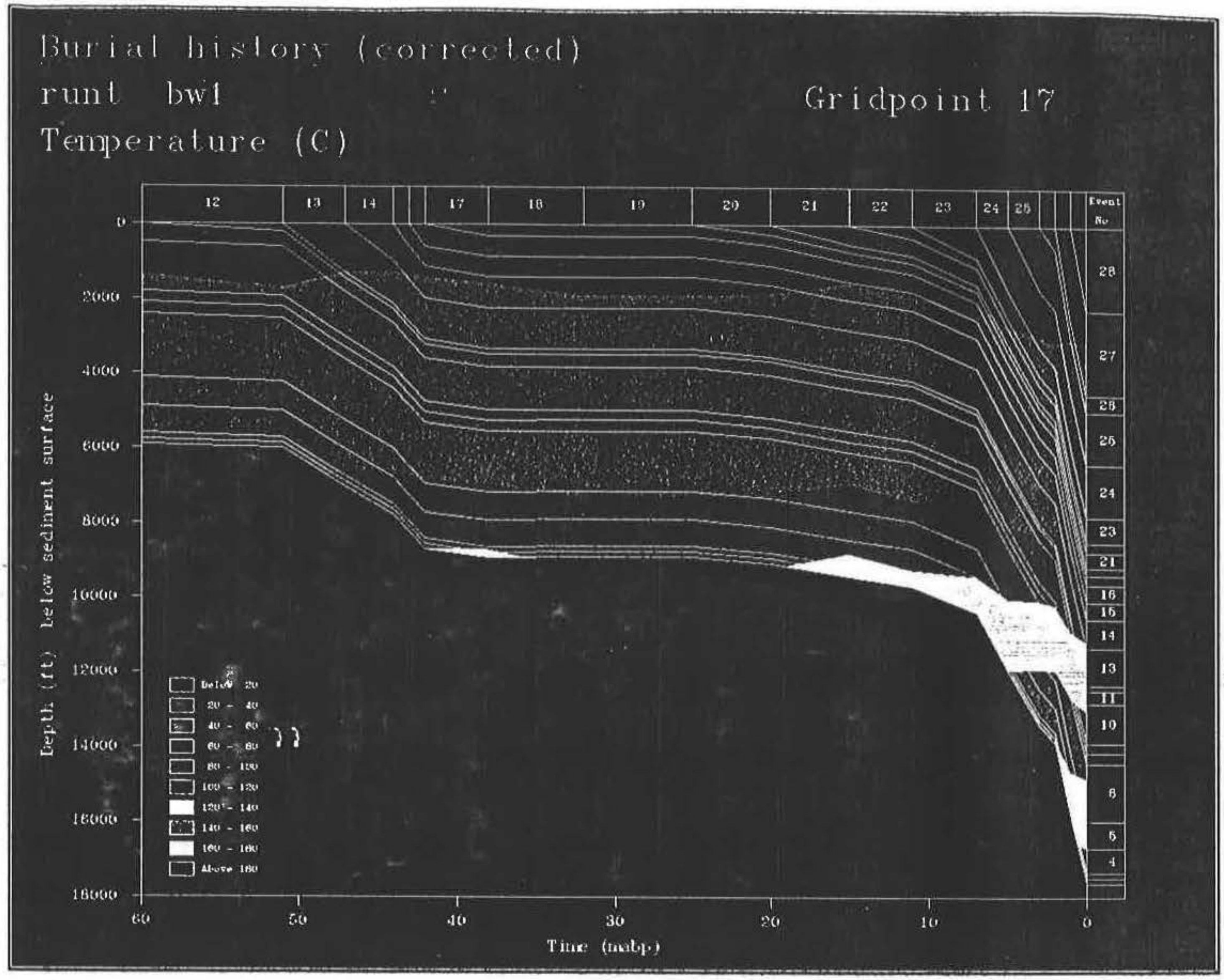
DEPTH [ft]
1
5
10
15
20
25
30
32
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
200
400
600
800
1000
1200
1400
trace no.
1 n mile
NE
SW
runt bwl BSA-111

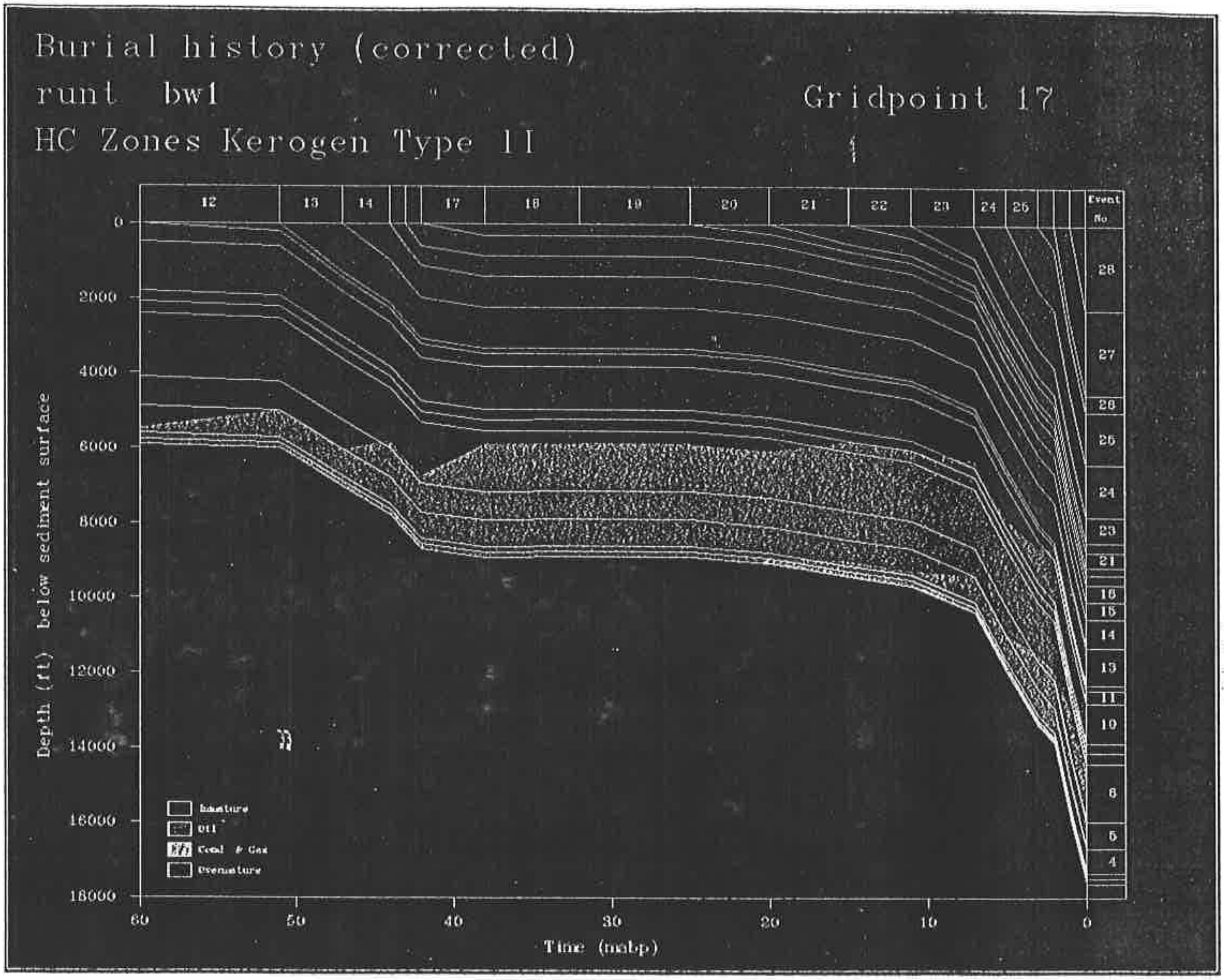

runt bwl
Time: Present
Stratigraphy (input)
GP:
10
20
30
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Depth (ft)
4000 ft
28 QUATERN B
27 QUATERN A
26 PIACENZIA
25 ZANC-ME B
24 ZANC-ME A
23 TORTONIAN
22 SERRAVALL
21 LANG-BURD
20 AQUITANIA
17 PRIABONIA
16 BARTONI B
15 BARTONI A
14 LUTETIA B
13 LUTETIA A
12 YPRE-THAN
11 DANI-MAAS
10 CAMPANIAN
8 CONIACIAN
7 source
6 CENOMANIA
5 ALBI-AP B
4 ALBI-AP A
3 BARREMI B
2 BARREMI A
1 HAUT-BERR


runt bw1
Time: Present
Stratigraphy (input)
GP:
10
20
30
Depth (ft)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
21000
22000
Shales
Siltstones
Sandstones
Carbonates
Evaporites
Coaly
Basement
4000 ft

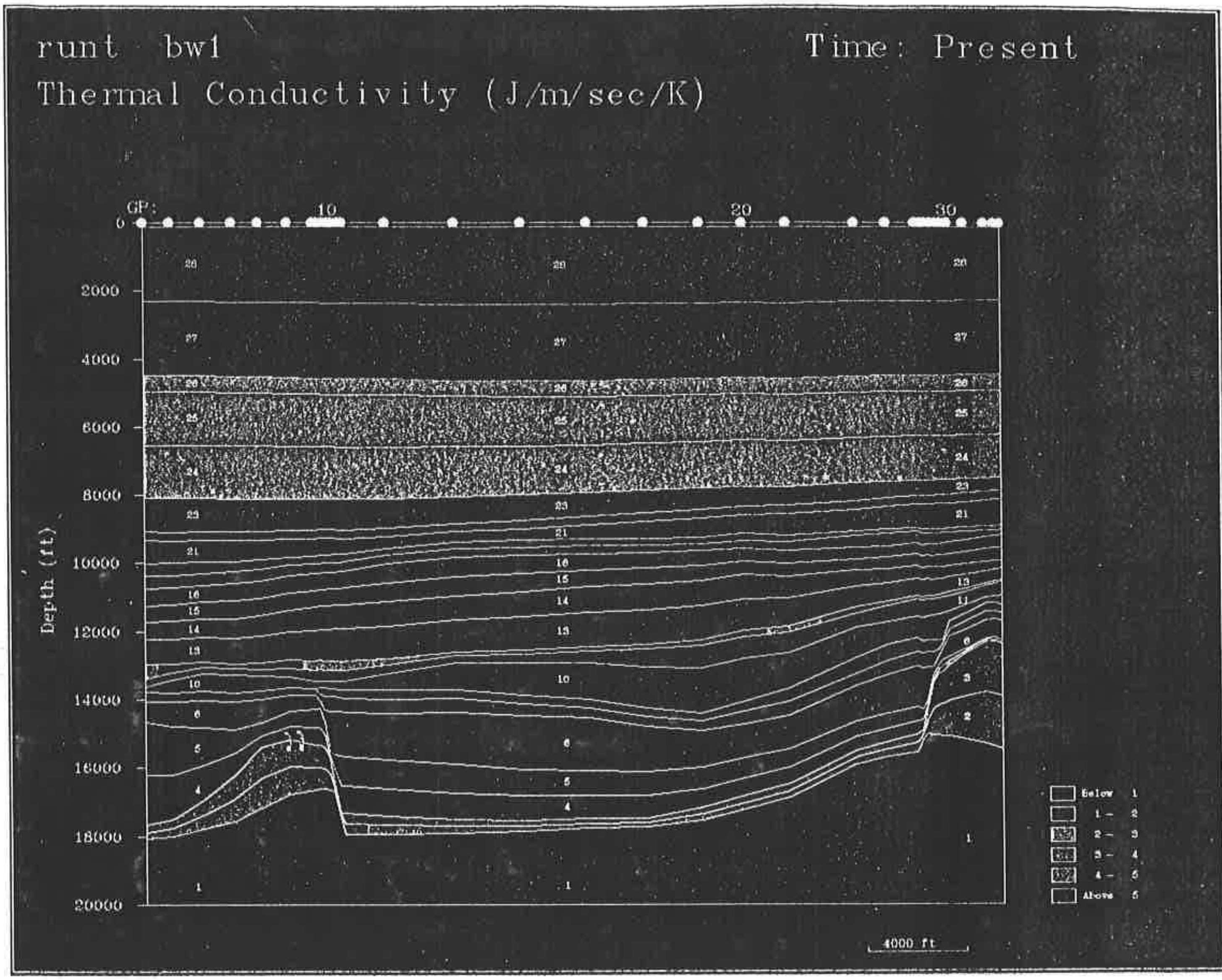


runt bw1
Gridpoint 17
Layer: BARREMI A
Sedimentation Rate (ft/ma)
Heat Flow (HFU)
Temperature (C)
HC Oil Type II (gHC/gTOC)
Time (mabp)
0 500 1000
0.0 0.5 1.0 1.5
0 50 100 150
0.0 0.1 0.2 0.3
0 20 40 60 80 100 120 140

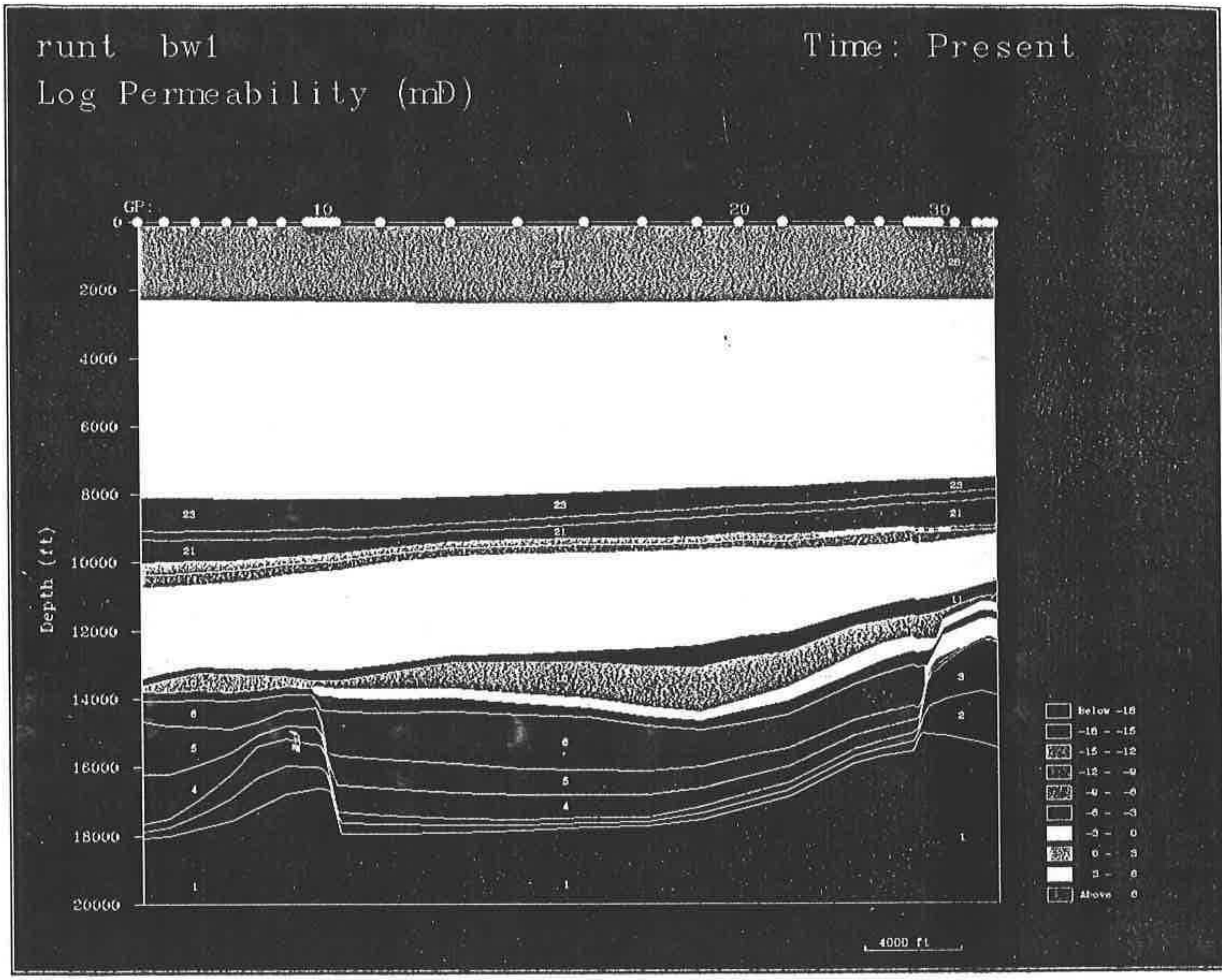

Burial history (corrected)
runt bw1
Gridpoint 17
Temperature (C)
12
13
14
17
18
19
20
21
22
23
24
25
Event No
28
27
26
25
24
23
21
16
15
14
13
11
10
8
5
4
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Depth (ft) below sediment surface
Below 20
20 - 40
40 - 60
60 - 80
80 - 100
100 - 120
120 - 140
140 - 160
160 - 180
Above 180
60
50
40
30
20
10
0
Time (mabp)



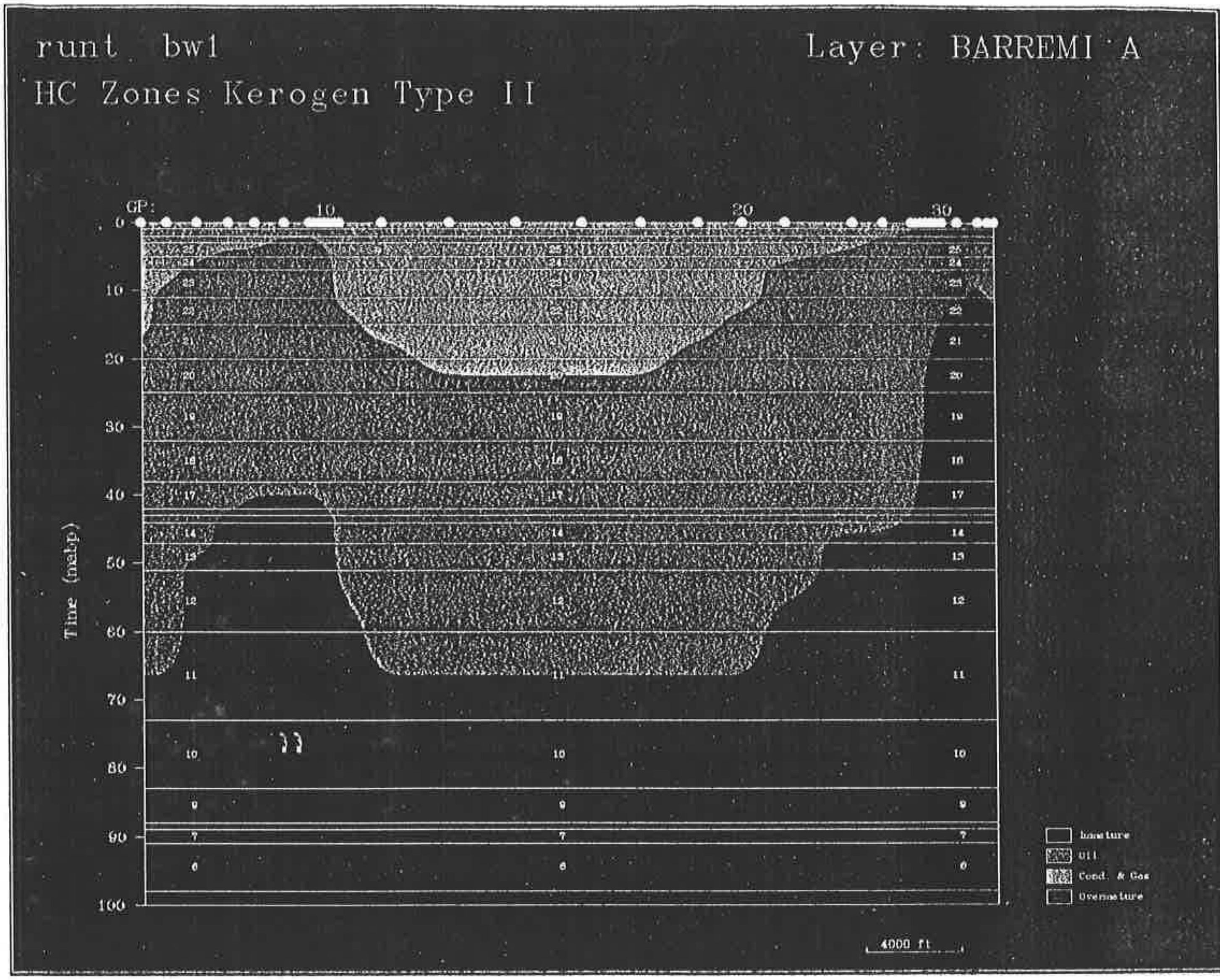
Burial history (corrected)
runt bw1
Gridpoint 17
HC Zones Kerogen Type II
Event No
Depth (ft) below sediment surface
Time (mabp)
Oil



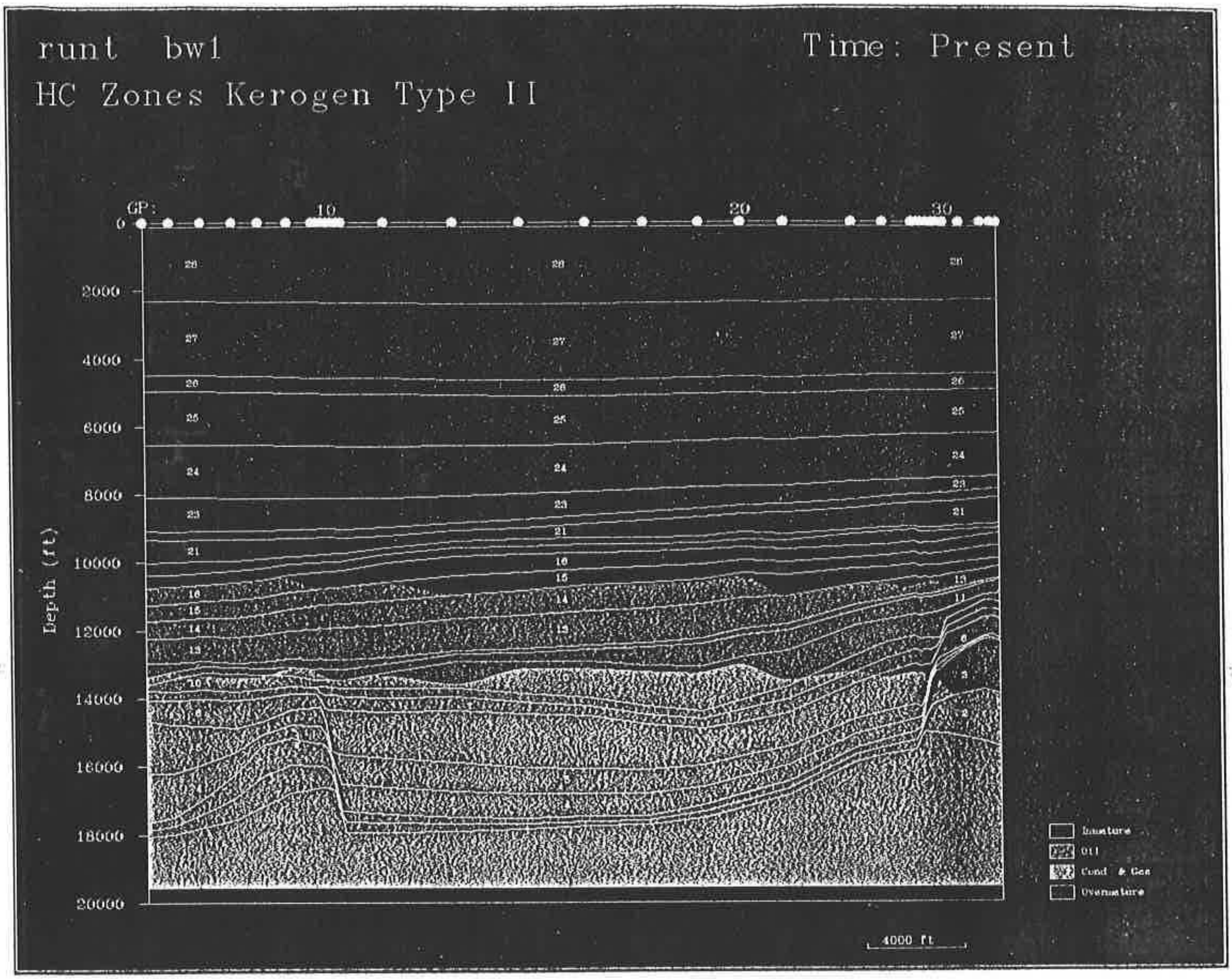
runt bw1
Time: Present
Thermal Conductivity (J/m/sec/K)
GP:
10
20
30
Depth (ft)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Below 1
1 - 2
2 - 3
3 - 4
4 - 5
Above 5
4000 ft



runt bw1
Time: Present
Log Permeability (mD)
GP:
10
20
30
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Depth (ft)
Below -18
-18 - -15
-15 - -12
-12 - -9
-9 - -6
-6 - -3
-3 - 0
0 - 3
3 - 6
Above 6
4000 ft



runt bw1
Layer: BARREMI A
HC Zones Kerogen Type II
GP:
Time (mabp)
Oil
Cond. & Gas
4000 ft


runt bw1
Time: Present
HC Zones Kerogen Type II
GP:
Depth (ft)
4000 ft

Simulation of Geological Processes:

Provides verification of interpretations and improved E & P information.

Basin Scale Modeling maximizes wildcat success.

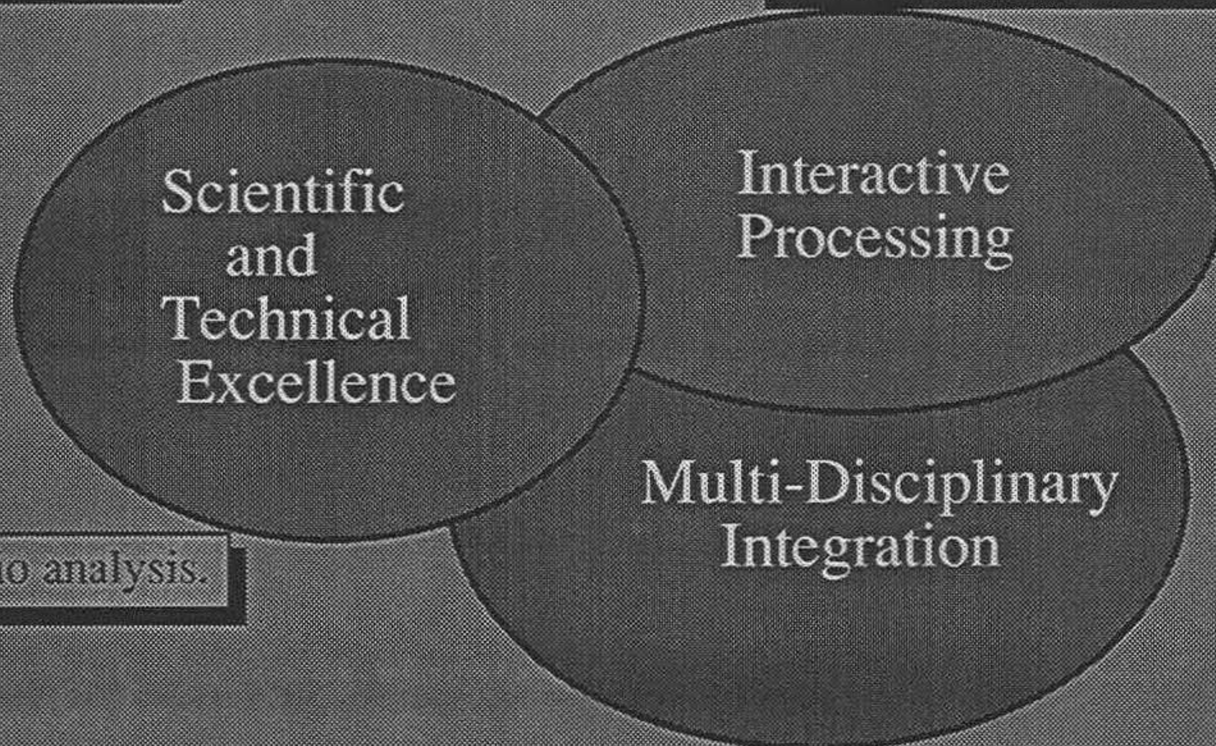
Reservoir Scale Modeling optimizes production.

MEX35R

Highest Value Seismic Data Processing:

The Components:

Interact with the data.



"What-if" scenario analysis.

Automatically input parameters from other disciplines.

The Sum = Interpretive Processing.

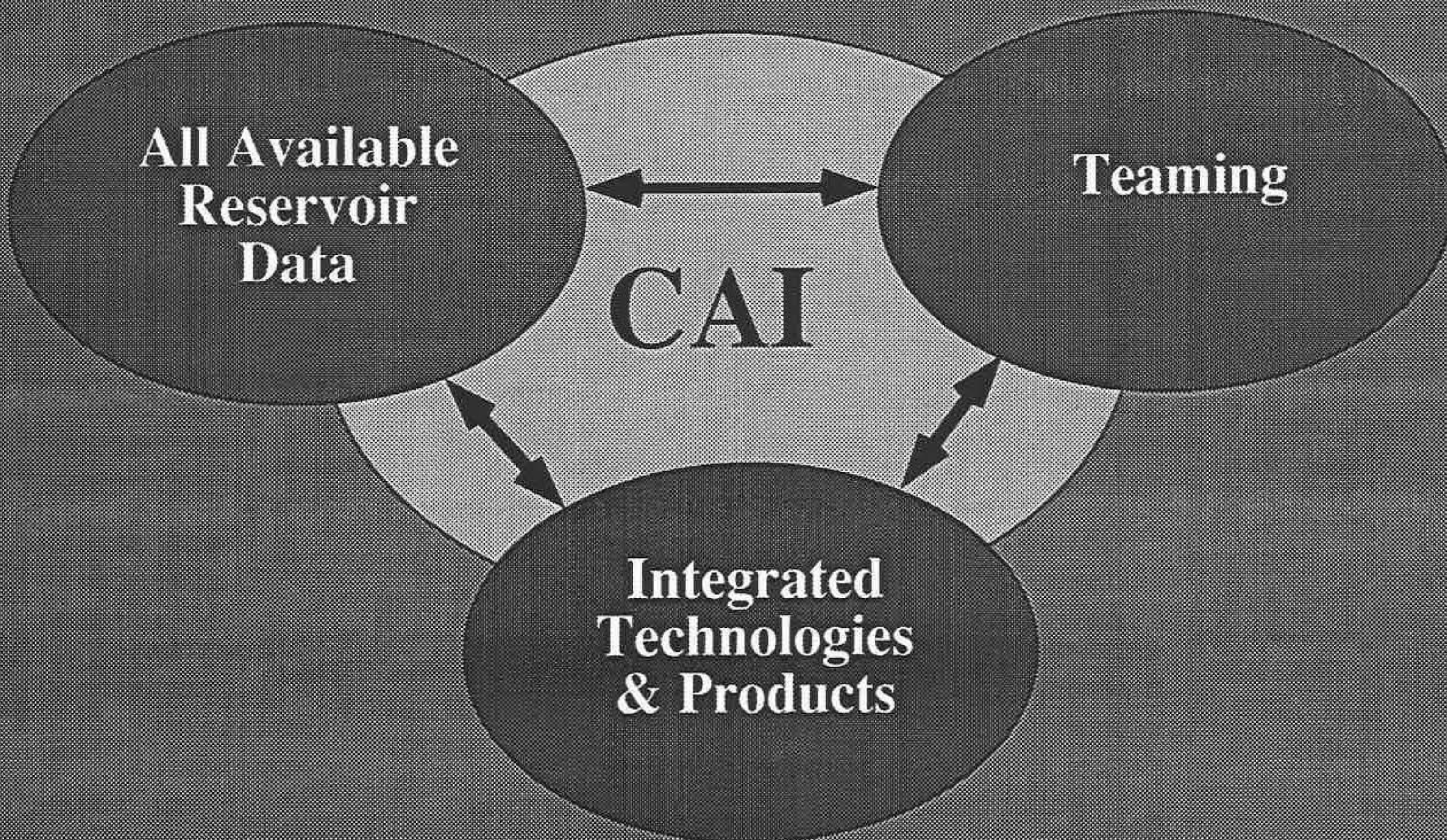
MEX45L

Integrated Interpretation:

	Geophysics	Geology/Petrophysics	Petroleum/Reservoir Engineering
Professionals	Geophysicists	Geologists Petrophysicists	Petroleum Engineers Drilling Engineers Reservoir Engineers
Data	Regional Seismic 3-D Seismic Site Surveys	Well Logs Cores Cuttings	Cores Flow Data Production History Well Pressure Tests
Professional Societies	Society of Exploration Geophysicists	American Association of Petroleum Geologists	Society of Petroleum Engineers

MEX47L

The CAI Formula:



CAI = Computer Aided Interpretation

MEX47R

New Types of Hydrocarbon Plays:

- The Shell "Mars" Prospect is drilled into basin floor fans in a syncline.
- Petrobras discovered giant field in the Campos Basin that was a deep-water submarine fan.
- Pemex recently announced a significant discovery in the deeper water of the Bay of Campeche.
- Exxon's "Micky-Mouse" field is a significant pre-salt discovery.

- Acquisition, processing, interpretation, and drilling improvements will let us image and drill beneath salt-wings.
- Imagine recovering hydrocarbons from replenishable reserves, drilling into a stream rather than a pool.

Automation of E & P Processes is the future:

Saudi Aramco has started a 10-year project to automate each stage of the E & P process:

- Design new surveys based on holes in the data bases.
- Collect 3-D seismic every six months over existing surveys to monitor fluid movement.
- Adjust production based on water/hydrocarbon boundary locations.
- Optimize the methods of transporting fluids to refineries or shipping terminals.
- Run reservoir simulators with parameters that are automatically derived from seismic and production data.

MEX62L

EAEG Motto:
Quaere et Invenies
(seek and ye shall find)

"This conviction of our best minds that little or no oil remains to be found has continuously handicapped the search for oil. Unless men can believe that there is more oil to be discovered, they will not drill for oil. Where oil is found, in the final analysis, is in the minds of men. The undiscovered oil field exists only as an idea in the mind of some oil finder.

Wallace Pratt, 1952

MEX63L

The 3 "R's" for al Siglo XXI:

Recovering

Replenishable

Reserves

MEX63R

Acknowledgments:

- **The management and subsidiaries of Landmark Graphics Corporation.**
- **Computer Science Trends:**
  - Craig Warner of Landmark Graphics Corporation
  - Bill Rollwitz of Hypermedia eXchange Corporation
- **Bass Straits Interpretation:**
  - John Denham and BHPP.
- **Aeromagnetic and Seismic Integration:**
  - Parker Gay and Applied Geophysics, Inc.
- **Basin Analysis:**
  - Ced Snyder and Kevin Donihoo for the IES example.
- **Sedimentary Fill Simulation:**
  - Dr. Peter Vail and Scott Bowman Marco Polo sedimentary fill examples.
- **Well Log Interpretation:**
  - Doug Paul and Terry Filthaut for the Canadian Tableland example.
- **Petrophysical Interpretation:**
  - Dr. Pierre Samec for the Stanford University example.
- **Interactive Processing:**
  - Dr. Heloise Lynn and Dr. Don Lawton for the University of Calgary example.
- **Seismic Interpretation:**
  - 3-D Gulf of Mexico examples:
    - Dick Cole and Chevron for Garden Banks example.
    - Dynamic Graphics for the amplitude example.
  - Dr. Peter Traubaunt and BP for the 2-D sparker survey.
- **Reservoir Engineering:**
  - The Global Basins Research Network video example of basin fluid flow.
  - Dr. Roger Anderson and Dr. Larry Cathles of Dynamic Oil & Gas Corp.

MEX64L

Landmark History
comments by
John Morton

NAME: H. Roice Nelson, Jr.

TITLE: Founder/Consulting Geoscientist
Landmark Graphics Corporation
333 Cypress Run, Suite 100
Houston, Texas 77094

CV: B.S. Geophysics University of Utah, 1974
M.B.A. Southern Methodist University, 1981

July 1974-January 1980: Mobil Exploration and Producing Services Inc.
January 1980-November 1982: Senior Research Scientist at
the University of Houston's Seismic Acoustic Laboratory and
General Manager of the Allied Geophysical Laboratories.
December 1982-Present: Landmark Graphics Corporation.
Presentations and publications:
New Technologies in Exploration Geophysics: Gulf Publishing.
Over 100 papers and presentations for professional organizations
Society Memberships:
American Association of Petroleum Geologists
Canadian Society of Exploration Geoscientists
Chinese National Society for Scientists
European Association of Exploration Geophysicists
Houston Geological Society
Geophysical Society of Houston
Society of Exploration Geophysicists

ABSTRACT: Entrando

"Entrando al siglo XXI: busquedo de hidrocarburos"
"Reaching the 21st-Century - looking for hydrocarbons"

"Entraudo al siglo XXI: busquedo de hidrocarburos"
"Reaching the 21st-Century - looking for hydrocarbons"

H. Roice Nelson, Jr.
Landmark Graphics Corporation

New technologies are literally opening windows into the earth and dramatically changing most of the rules relating to the exploration and production of hydrocarbons. Since the first innovators discovered techniques for remote definition of subsurface geology, earth-science professionals have continued to "push the envelope." This paper will review significant advances in data acquisition, processing and interpretation and predict how they will change the landscape of hydrocarbon exploration and production as we reach for the 21st-century.

age-date

New techniques in seismic acquisition, like 3-D seismic acquisition, have provided the means of extrapolating well information horizontally with great accuracy. This includes the ability to identify and map sequence boundaries and the packages of sediments bounded by these sequence boundaries, i.e. Systems Tracts. Biostratigraphic data are allowing us to age-date these packages of sediment with great accuracy. Cross-hole tomography and vertical seismic profiles have increased the vertical resolution available with seismic techniques, allowing detailed studies of fluid content using multi-component data and the relationships between seismic amplitudes and offsets. These new technologies are providing new and better data for geophysical, geological and engineering studies. The distance between these basic exploration and production professional disciplines is shrinking.

Many of these new technologies have been enhanced by computer data storage, processing, and interactive interpretation techniques. In hydrocarbon exploration and production, the 1990's are becoming the age of interactive workstations. As these data handling and interpretation technologies continue to improve and mature we will see tremendous increases in the integration of data and disciplines, improvements in productivity and better results at the drilling site. A key reason for these improvements is that we will be providing meaning to the data, turning data into information. Theoretically we have tremendous amounts and types of data available to improve the probability of successful wells. Key parameters derived from these data include: location; age; pressure; temperature; fluid mass flux; sedimentation rate; rate of sea level change; pore fluid salinity; rate of fluid flow; permeability; heat flow; long-term compressibility; yield strength of sediment matrix; porosity; thermal conductivity of media; total pore fluid thermal expansion; thermal sources; cold water hydrostatic pressure; non-hydrostatic pressure; dynamic viscosity; fluid density; reference fluid density; initial sediment density; and full thermochemical data for all minerals involved in diagenetic and metasomatic alteration.

Technologies available today are going to be effectively implemented by the 21st-century, providing us the tools to quickly and reliably access required data in order to determine these key geoscience parameters. These parameters can then be used for simulations, from basin scale to reservoir scale, allowing us to optimize production and maximize successful wildcat wells. In fact, it is likely that new data access and interpretation technologies will result in the discovery of new types of reservoirs. Imagine looking for a replenishable reservoir, a stream, rather than the typical reservoir, an underground pond. Furthermore, it seems reasonable that we will someday be able to image and drill beneath salt layers. The potential is here to automate the process ranging from the drilling of new wells to delivering hydrocarbons to the refinery. In fact, this process is being worked on today and is intended to be implemented within this decade by Aramco.

CIRCULATION VITA

H. Roice Nelson, Jr.
Sr. Vice President
Landmark Graphics Corporation
333 Cypress Run, Suite 100
Houston, TX 77094
Telex: 750203 LNDMARK HOU UD
Fax: 713-579-4814

Born: November 3, 1949
Age: 41
Married, 6 children
Office: (713) 579-4794
Home: (713) 578-3966

BACKGROUND:

LANDMARK GRAPHICS CORPORATION, HOUSTON, TX

5/90 TO Present - CONSULTING GEOSCIENTIST

Mr. Nelson started working 60% of the time in May of 1990 in order to have time to pursue projects of interest in a new type of urban planning. His time at Landmark has been spent in long-range research and planning for new geoscience products, working up sequence stratigraphy case histories and software specifications, marketing work at key conventions and with key clients, and supporting the Landmark University Program.

6/88 to 5/90 - STAFF GEOSCIENTIST, MARKETING

Mr. Nelson's responsibilities have been to set LANDMARK's geoscience direction. As manager of Applied Geoscience Research he has been involved in the design of the new LANDMARK products, and several that are yet under development in areas ranging from gravity and magnetics modeling to wave-equation seismic modeling to basin modeling to sequence stratigraphy to development of an on-line outcrop references, etc. As Chairman of LANDMARK's University Partnership program he has been intimately involved with the developments and use of Landmark products at 17 universities around the world including Imperial College in London, Cambridge College in England, Lamont-Doherty Geological Observatory of New York's Columbia University, Cornell University, Rice University in Houston, Colorado School of Mines in Golden, Stanford University in California, The University of Calgary in Canada, and CURTIN University in Perth, Australia.

12/83 to 6/88 - SENIOR VICE PRESIDENT, TECHNOLOGY TRANSFER

Mr. Nelson's responsibilities include advanced training on using LANDMARK workstations, assisting clients with problem interactive interpretation projects, designing interactive interpretation procedures for general use, specifying software enhancement and new product requirements, as well as preparing and making presentations about Landmark geological and geophysical technology for the general education of the user community.

12/82 to 12/83 - SENIOR VICE PRESIDENT, OPERATIONS

I wouldn't count Kevin Kinsella a Founder — but this is Roice's choice if he wants to. (I would have said "four founders".)

Mr. Nelson introduced the concept of <u>LANDMARK GRAPHICS CORPORATION</u> and is one of the five founders. Major accomplishments included establishing and organizing the marketing and manufacturing departments; training LANDMARK programmers in seismic interpretation; procuring of early sales and joint marketing agreements; and the creation of a market penetration plan. He has contributed toward the professional image of LANDMARK by publishing a major text book, providing training through an internationally known training organization, and presentations at professional society meetings.

UNIVERSITY OF HOUSTON, HOUSTON, TX
1/80 to 12/82 - GENERAL MANAGER ALLIED GEOPHYSICAL LABORATORIES

As a General Manager and principal administrator, Mr. Nelson's major responsibility was the conversion of the 17 researchers, graduate students, and staff at the Seismic Acoustics Laboratory (SAL) into an integrated set of 5 research labs with 65 employees. Specifics are described on the next page.

ALLIED GEOPHYSICAL LABORATORIES (AGL)
General responsibilities included coordinating the daily activities and contracts for the AGL and the University of Houston administration. He was responsible for an average annual budget of $1.1 million.

SEISMIC ACOUSTICS LABORATORY (SAL)
As a Senior Researcher, Mr. Nelson was the principal technical contact between the SAL and the 42 sponsors from the oil industry. He was responsible for the design of proprietary physical models, building scaled models and collecting seismic data over them. He designed the SAL catalog models and the physical model catalog; coordinated model building and data collection; published monthly newsletters; and developed methods of working with 3D data volumes, i.e. interactive 3D interpretation. He organized and instructed three SAL schools. He was intimately involved in raising $1.1 million from two foundations and SAL sponsors for equipment to expand research activities at SAL and form the AGL. He was instrumental in the growth of SAL sponsorship from 33 (and declining) to 42. Mr. Nelson brought the developers of the five most advanced true 3D display devices to SAL meetings to evaluate the potential of this equipment for geophysical research. This had a major impact on the productization of the B,B&N SpaceGraph by Genisco Computers and the selling of the first 5 systems (IPL, Amoco, Cities Services, Phillips, and a Japanese Genisco affiliate). As well as Adage, Evans & Sutherland, Megetek, Scitex, and other graphics companies efforts to penetrate the seismic community market.

KECK RESEARCH COMPUTATION LABORATORY (RCL)
Mr. Nelson coordinated the purchase, installation and upgrading of a Digicon VAX seismic processing system; the formation of the RCL; funding through selling computer time to off campus users; the acquisition of over $400,000 in grants from Control Data Corporation; installation of an HASP interface that allowed the VAX to talk directly to a CDC-205 vector computer; as well as handling initial staffing and equipment maintenance.

CULLEN IMAGE PROCESSING LABORATORY (IPL)
He helped Dr. Anne L. Simpson adjust to the University by negotiating her retention of software ownership and marketing rights. He also assisted her in the organization of the IPL, specifically with oil industry contacts in forming what has become a 15 company sponsoring consortium. He initiated and correlated the development of interactive geophysical interpretation application programs for the SAL through the IPL.

FIELD RESEARCH LABORATORY (FRL)
Mr. Nelson was involved in two grants for the FRL: (1) a D.O.E. grant in conjunction with the University of Southwestern Louisiana ($75,000 for 1982-83) to study a geopressure zone using 3D sign-bit seismic; and (2) an oil company sponsored processing test to study how well 3D seismic data could image beneath surface volcanics ($110,000 for 1982-1983).

Mr. Nelson was given one day a week to act as a geophysical consultant, primarily with:

1) Geosource Petty-Ray Research - getting the GeoDisplay 3D color interactive processing and interpretation system to the 1981 SEG Convention in Los Angeles,
2) and with Evans & Sutherland - defining geophysical demos, coordinating advertisi brochures, and helping in the booths at the 1979 SEG Convention in New Orleans a the 1980 SEG Convention in Houston.

MOBIL EXPLORATION AND PRODUCING SERVICES, INC., DALLAS, TX
7/74 to 1/80 GEOPHYSICIST IV

Fifteen months were spent in field operations as the junior of two geophysicists coordinating the activities of four company seismic crews. During this assignment responsibilities included: quality control, geophysical training, staffing, new equipment, as well as budgeting and cash flow for the $1.5 million average annual expenses per crew. He worked in 7 states under varied conditions.

He worked as a seismic interpreter for approximately four years, mostly in the international arena. Interpretation projects covering most prospective basins of the world, included prospect evaluations, regional studies and farm-in examinations.

Other responsibilities included seismic processing, "bright-spot" modeling, velocity analysis, gravity and magnetics modeling, remote imagery analysis, management, producing movies for training and public relations, and interviewing prospective employees.

UNIVERSITY OF UTAH, SALT LAKE CITY, UT
Student Assistant in the Department of Geological and Geophysical Sciences

APPLIED GEOPHYSICS, SALT LAKE CITY, UT
Technical Assistant

AMOCO PRODUCTION COMPANY, DENVER, CO
Professional Assistant to Interpretation Geophysicists.
(Employed during the summers of 1970 and 1973 while doing his undergraduate studies.)

ACADEMIC HISTORY:

MBA (emphasis in entrepreneurship), Southern Methodist University, Dallas, TX, 1977-1981.

B.S. Geophysics, University of Utah, Salt Lake City, UT, 1968-1970, 1973-1974.