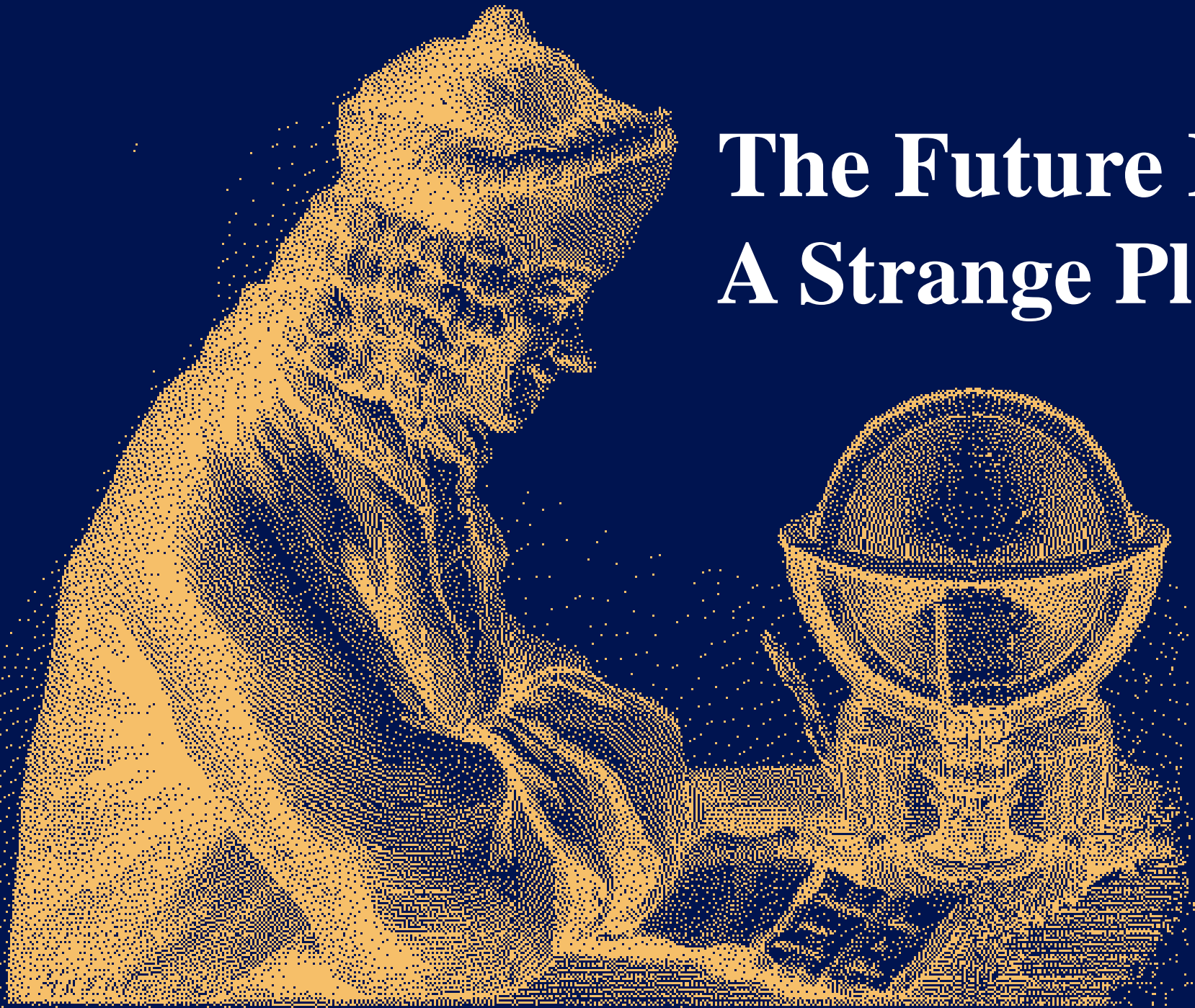
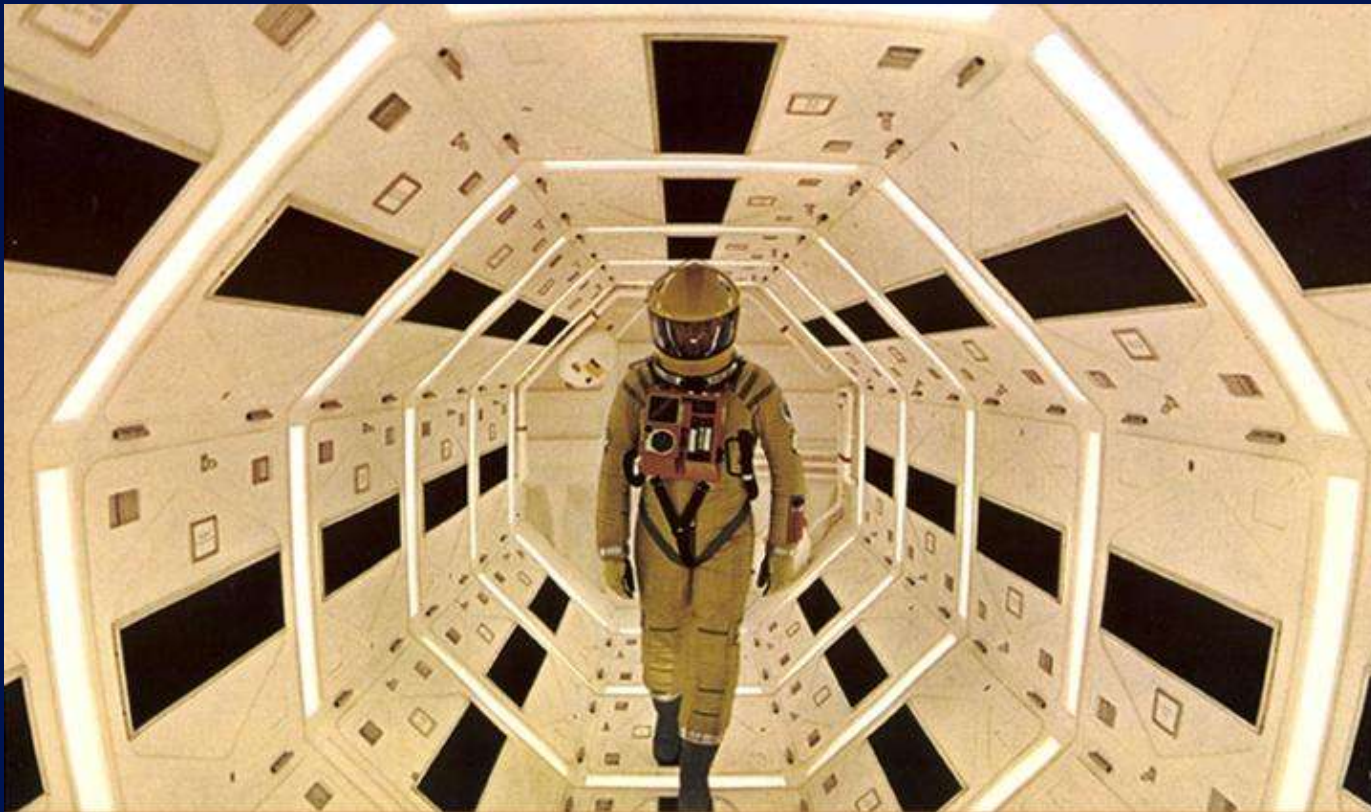


The Future Is A Strange Place



2004

Aren't we three years late for the Space Odyssey?



Technology Forecasting Is Always
Dependent on Context ... No Vacuums

1963 Culture

- The Beatles
- Lawrence of Arabia
- The Birds
- The Cold War
- Vietnam
- JFK Assassinated
- Moscow/Washington Hotline
- Interstate Nearly Complete



1963 Technology

- Apollo Program
- IBM System 360
- Selectric Typewriter
- 1st Artificial Heart
- 1st Liver Transplant
- 1st Commercial Nuke Plant
- 1st Comsat
- Sabre System
- ATT Dataphone (200 baud) & Picturephone



Major areas of Technology Development

- Electronics
- Materials and Coatings
- Computers and Communications
- Aerodynamics
- Safety Systems



Major Structural Trends In The Heavy-Duty Truck Market



- OEM Component Integration
- OEM Vocational Standardization
- Design for Recycle ability
- Supplier System Partnership
- Severe Technician Shortage

Electronics Have Defined The Pace of Change

Hallmark Musical Greeting Card

More computing power than existed in the entire world before 1950.

Timex Digital Watch

More computing power than existed in the entire world before 1961

Panasonic Home Video Camera

More processing power than the original IBM 360, the computer that gave birth to the mainframe computer age.

Play Station 2 Video Game System

Greater processor power than the original 1976 Cray supercomputer

A New Class 8 Peterbilt Tractor

Greater processor power than the first lunar lander.



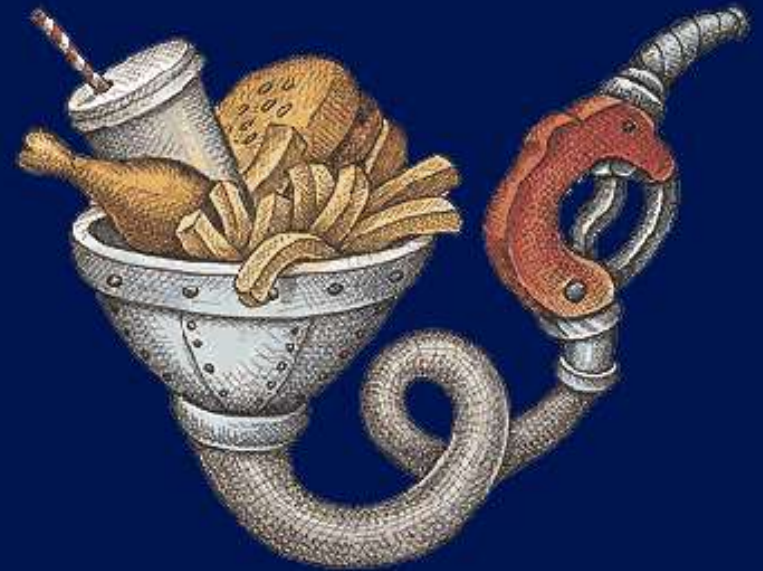


Vehicle Electronics

- **Wireless Control...**
Including Brake, Steering and Lighting Actuation
- **Engine and Drive Train Control...**
To Facilitate Both Fuel Economy and “Unitized Performance”
- **Glass Cockpit...**
Multi-Function Instruments with “Heads-up Display”

Materials and Coatings

- High Strength-to-Weight Structural Composites...
Trailers and Cargo Containers First
- Color Infused Plastic Body Panels...
No Dents, Rust, Painting
- Thermal Insulating and High Reflectivity Coatings...
Low-Cost Temperature Controlled Trailers
- Bio Fuels (Especially Diesel)...
Agricultural Product / By-Product Based
- Bio Coolants and Lubricants...
Degradable and Non-Toxic



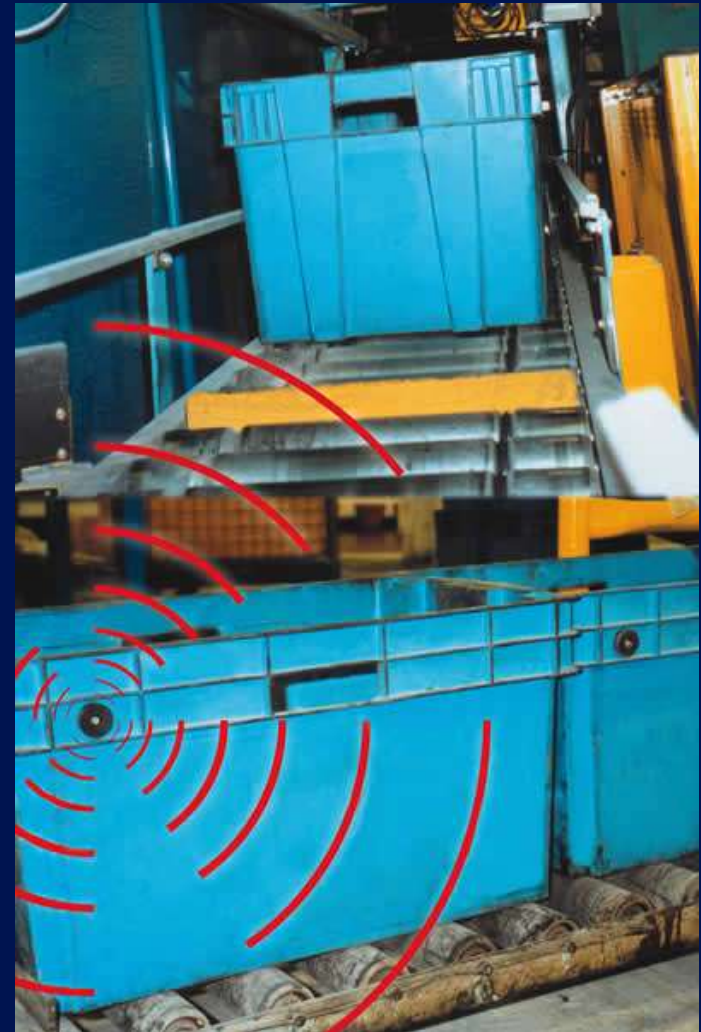
Computers and Communications Are Especially Hard to Predict



- “Future computers may weigh no more than 1.5 tons” ... *Popular Mechanics*, 1949
- “I think there is a world market for maybe four computers” ... *Thomas Watson, IBM Chairman*, 1943
- “There is no reason anyone would want a computer in their home” ... *Ken Olson, CEO, Digital Equipment*, 1977
- “This ‘telephone’ has too many shortcomings to be seriously considered... the device is inherently of no value to us” ... *Western Union Board Memo*, 1876

Computers and Communications

- GPS Integration...
 - JIT Notification and Drivers Logs
- Transmission of On-Board Equipment Parameters...
 - Diagnostics and Predictive Maintenance
- Shipping Unit Level Integrated Logistics
 - On-Line Pallet Tracking
- Real Time Traffic, Weather, Tolls, Weights, Fuel Consumption... and Taxes



Okay ... I'll Accept a "C+"

“The concept is interesting and well formed, but in order to earn better than a ‘C’, the idea must be feasible.”

A Yale University management professor in response to Fred Smith's paper proposing reliable overnight package delivery service, 1967



Heavy Truck Aerodynamics

Direct Influence of
Aerospace Design:

- Fuel Economy
- Vehicle Control
- Spray Control
- Even Speed Sensitive Shapes (Spoilers)



LEDs or Chips...

- “The Wireless Music Box Has No Imaginable Commercial Value. Who Will Pay For A Message Sent To Nobody In Particular ?”

RCA Board in Response to David Sarnoff's Request for Investment in the Radio, 1922



- “But... What Is It Good For ?”

Engineering Head of Advanced Computing Division of IBM, commenting on the microchip, 1968



Vehicle Safety

- Increased Passive Restraints
- Variable Focus Forward Lighting
- 360° Obstacle Detection (Visual-Ultrasonic)
- Forward / Reverse Ultrasonic Speed Control
- Low Drain, High-Intensity Internal Lighting

Adoption of Innovation

Internet Hosts

1969 - 4 sites

1979 - 188 sites

1989 - 80,000 sites

1999 - 56 million sites

2002 - 162 million
sites

LED Diodes (chips)

1,000

100,000

50,000,000

500,000,000

800,000,000

Information Overload: The Biggest Obstacle to Innovation

- A weekday *New York Times* contains more information than the average person was exposed to in an entire 17th century lifetime.
- There has been more information produced in the last 20 years than during the previous 5,000.
- Information available to us doubles every 5 years.
- In 1947, 85,000 books were in print.
There were 357 publishers.
- In 1997, 1.3 million were in print.
There were 49,000 publishers.
- 160,000 were published last year alone.



Our Workforce Has Changed.



In the early 1900's, 85% of North American employees worked in agriculture.



Today, less than 3% do.

In 1955, 73% of North American employees worked in production or manufacturing.



Now, fewer than 15% do.

Back to Basics Approach

- A recent survey showed that executives estimated that 37% of their employees lack fundamental math and writing skills.
Olsten Staffing Services, New York
- Bi-modal distribution of experienced technicians.
- Increased competition for talented entry-level people.
- Need for increased multi-media training materials for both technicians and parts people .

THE FACTORY
OF THE FUTURE
WILL HAVE
ONE MAN AND
ONE DOG.



The man's job will be to feed
the dog.

The dog's job will be to keep
the man from touching the
machines.

The next ten years will be a major inflection point in heavy truck technology.



*“Don’t look back ... they might
be gaining on you.”*

Satchel Page