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St. Antony's College  
University of Oxford

# Advanced Technologies and Public Policy Implications

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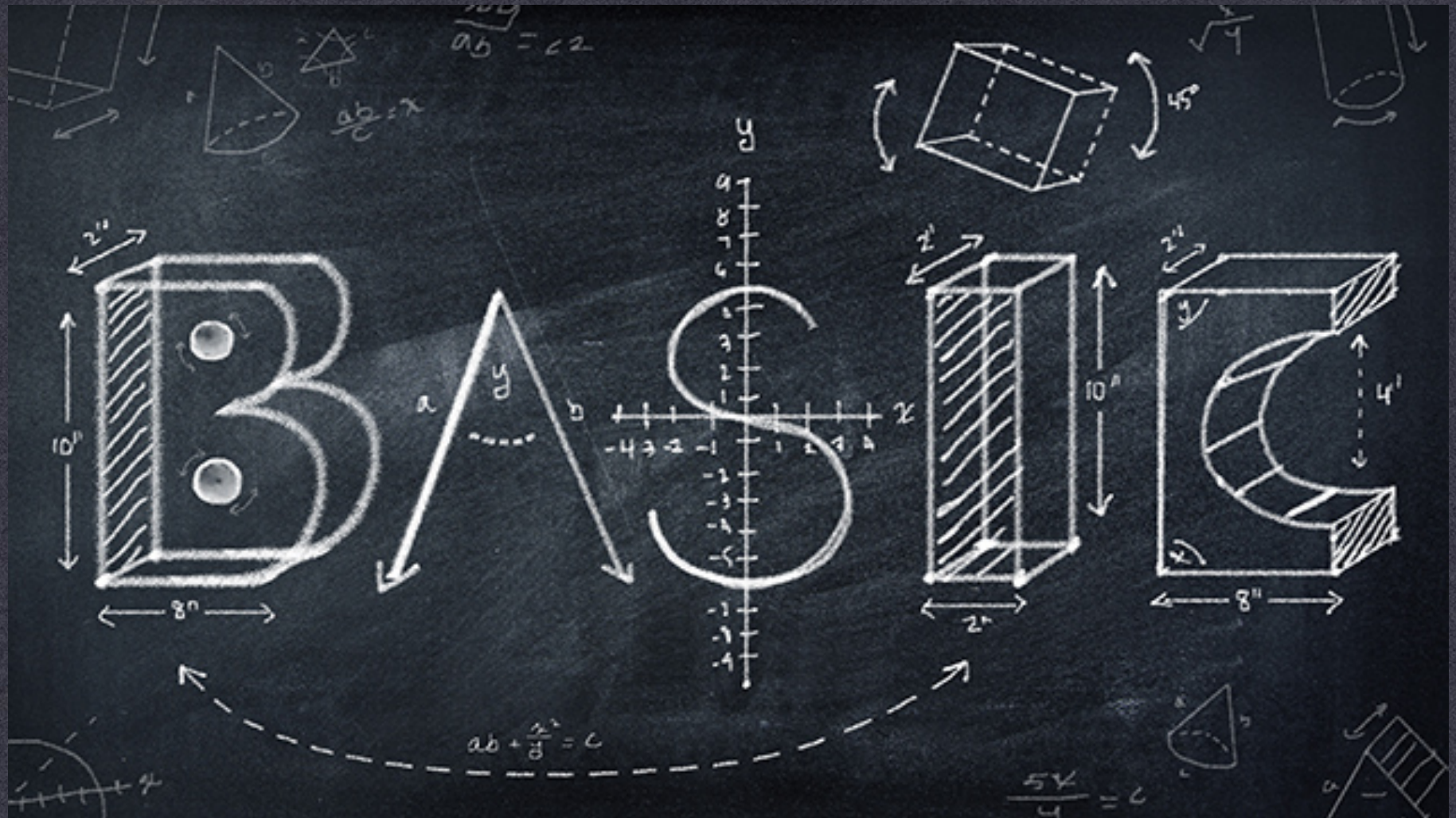
**FENIX** INVESTORS



**PRIVATE EQUITY**

Leveraged buyouts, venture capital, and distressed value





# BASIC\* TECHNOLOGIES

Acronym = Blockchain, AI, Security, Internet of things, Computing





## LEASED LINES => PUBLIC INTERNET

Driver: cost; Issue: privacy; Solution: security (encryption)



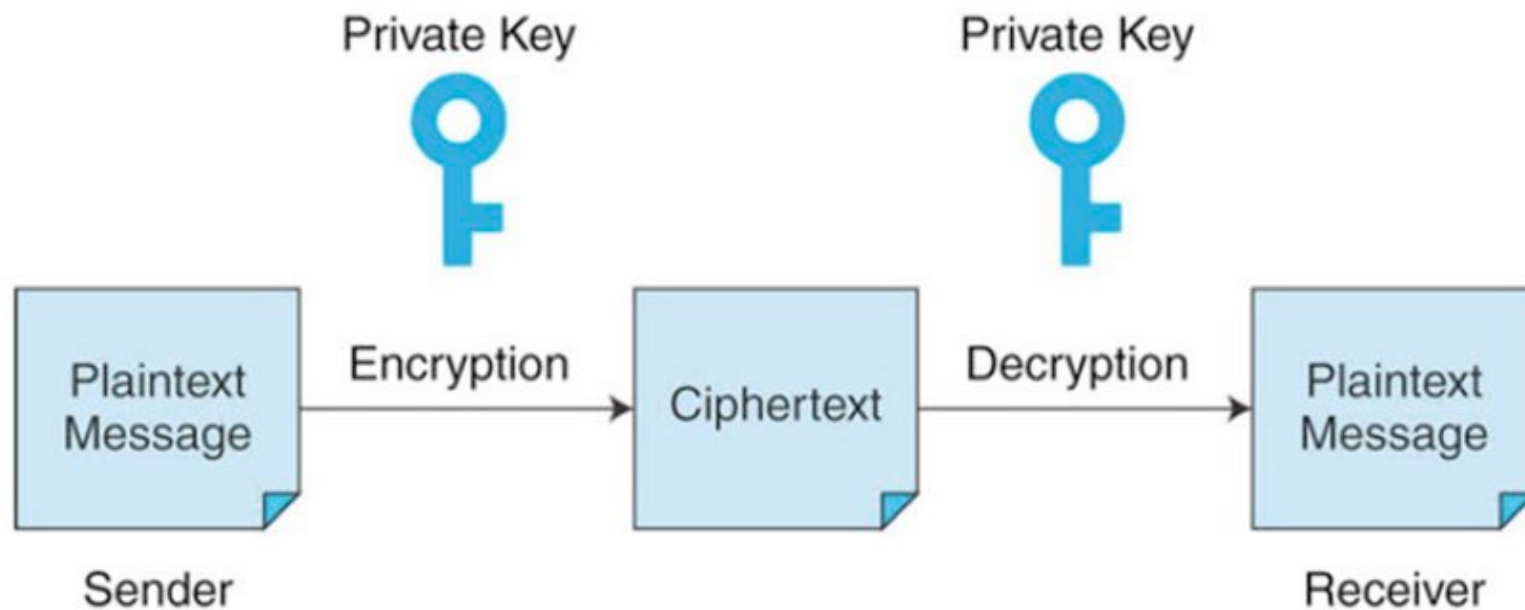
## Security: Entrust Technologies (1996 Nortel Spinout)

- \* Circuits v Packets
- \* Regulated v Unregulated
- \* Asymmetric Cryptography
- \* Security: PKI
- \* IPO (1998)





# Symmetric (Private) Key Encryption



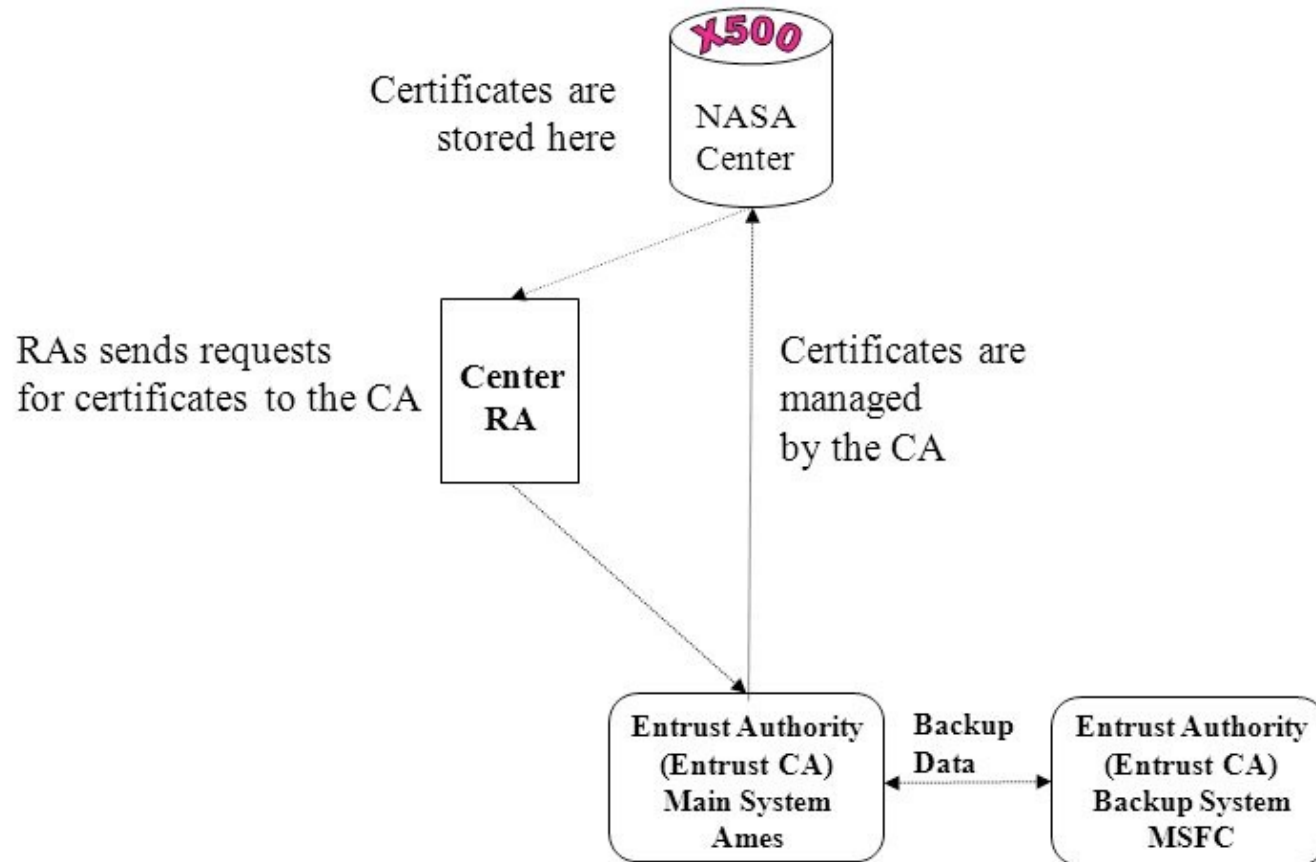
## ASYMMETRIC CRYPTOGRAPHY

Multiple keys: private key + public key





# NASA PKI Architecture

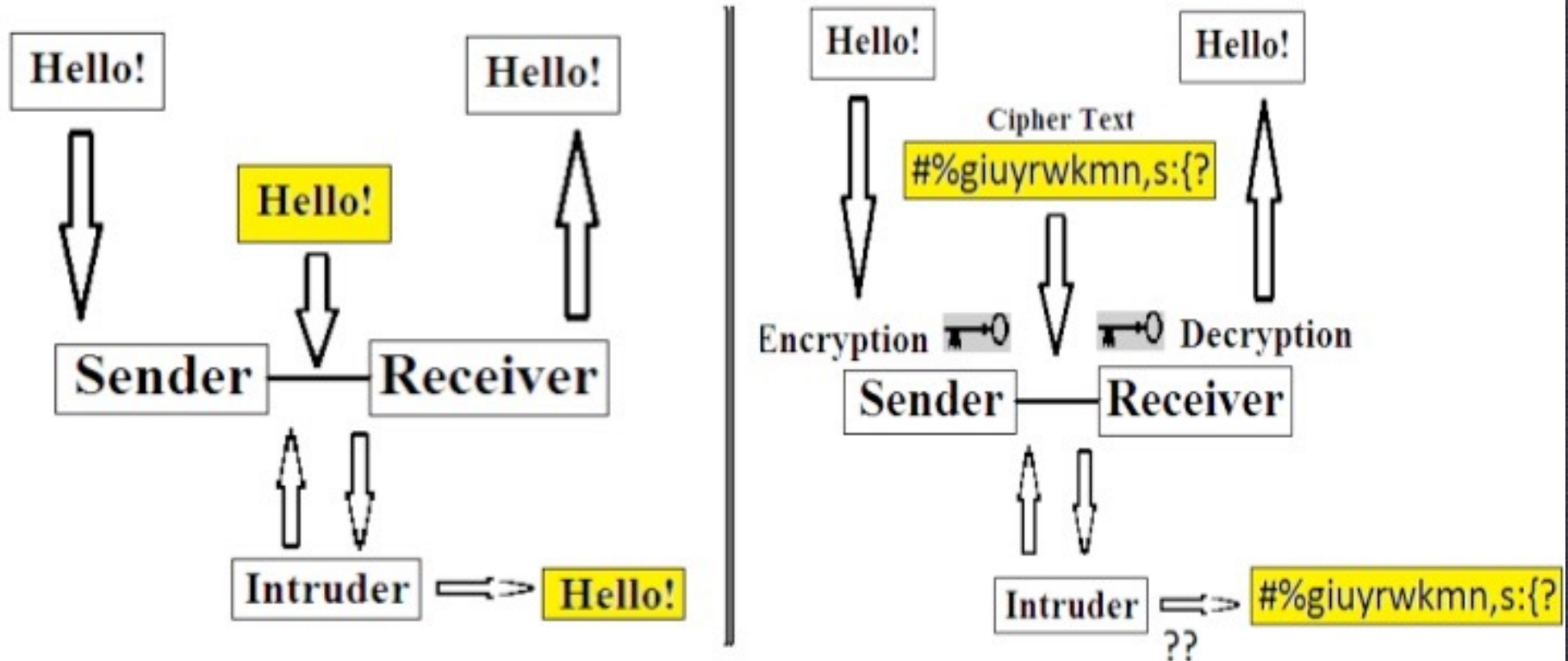


## ENTRUST TECHNOLOGIES

Authentication, encryption and non-repudiation; government and enterprise customers



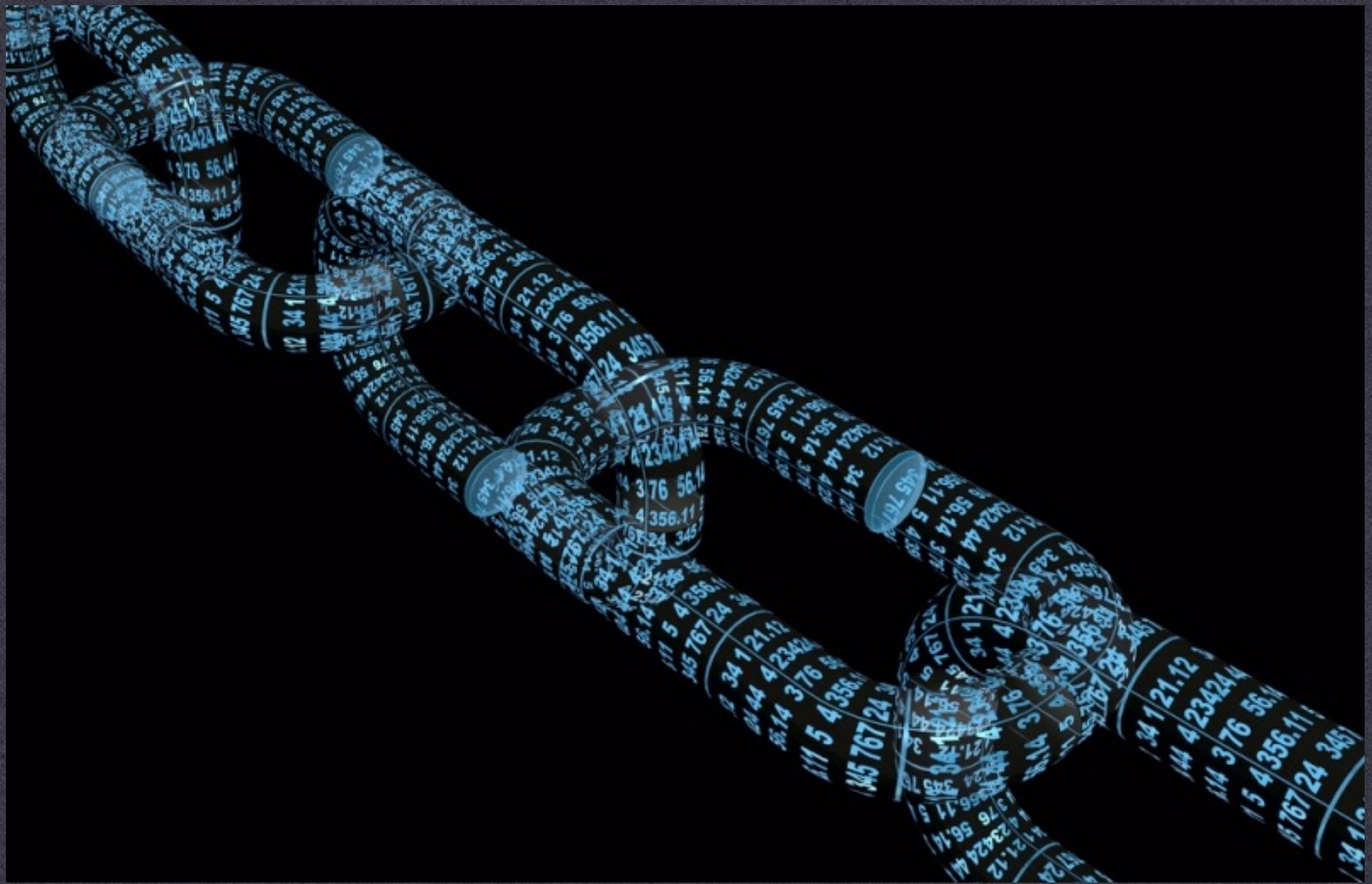
# Why SSL exists?



## SECURE SOCKETS LAYER

Security is most effective when transparent to the user

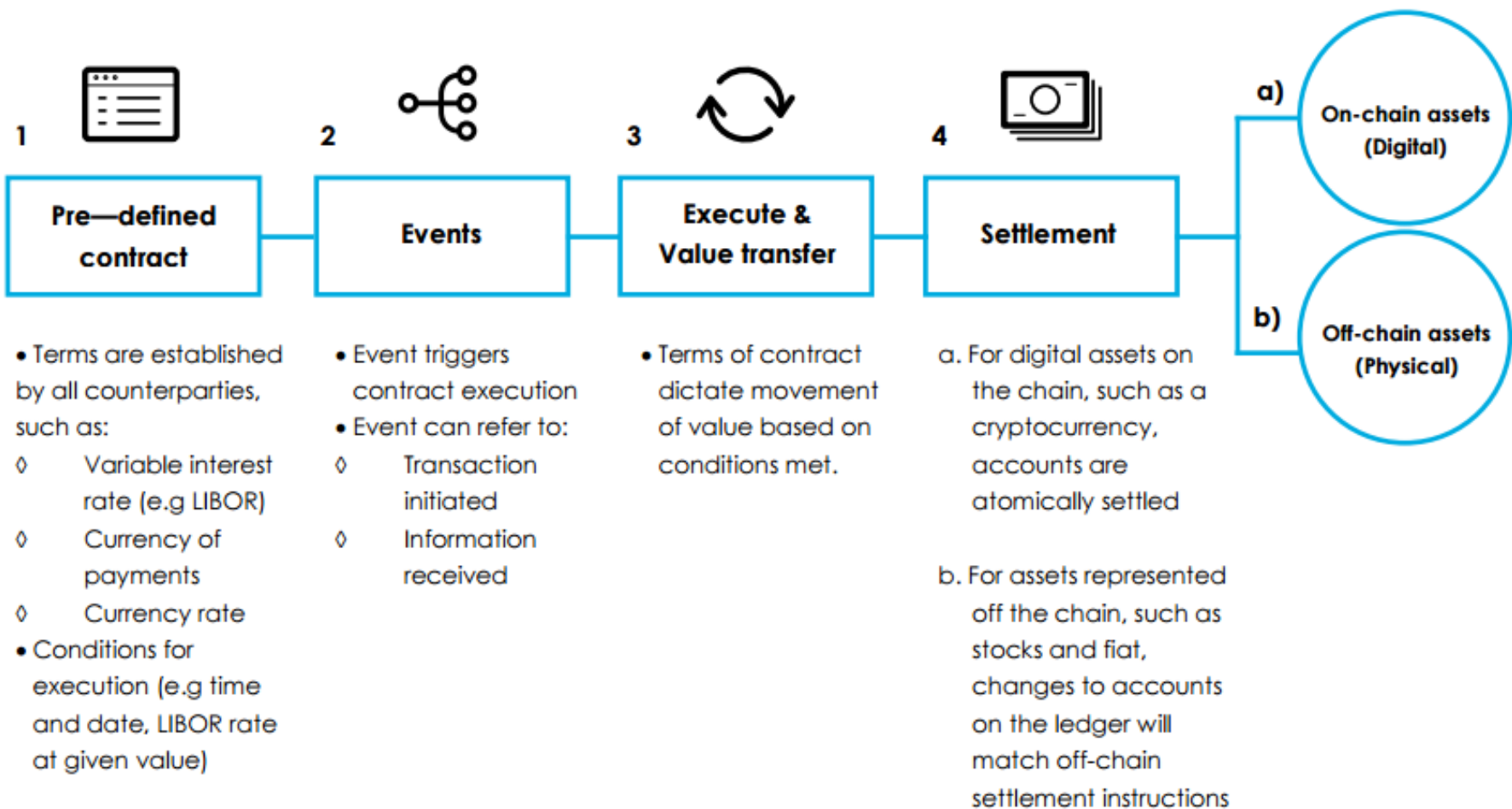




# BLOCKCHAIN

Database + Cryptography





# BLOCKCHAIN

Smart contracts: Code as law



# Smart Contracts Use Cases

**Blockchain** is a cryptographic or encoded ledger (database) of transactions in the form of blocks arranged in a chain

**Smart contract**, a complex set of software codes with components designed to automate execution and settlement, is the application layer necessary to make blockchain technology a reality. Although smart contracts technology is in its infancy, use cases are evolving quickly.



**Trade finance:** Smart contracts can be set up as escrow accounts that monitor an exchange between two parties. It can track the location of the goods and when ownership has been transferred it can trigger payments.



**Securities issuance:** Securities based on payments and rights to be executed according to predefined rules can be written as smart contracts. Current live examples being issuance of smart bonds and private stock markets.



**P2P insurance:** Insurance firms can automate the insurance policy by writing it into a smart contract. This technology can enable P2P insurance business models through templated smart contracts.



**Syndicated loans:** Smart contracts can help reduce the settlement time for syndicated loans and help reduce loan issuance time and operational risks.



**Loyalty and rewards:** E-commerce, retail, and travel & tourism are some of the industries that can create a smart contract-driven loyalty and rewards system stored on a distributed ledger allowing interoperability.



**Event-driven insurance:** Connected devices that store data on a distributed ledger help underwrite insurance and automate claims servicing.



**Digital rights management and micropayments:** Smart contracts that allow access to digital content such as music, images, and videos with access keys stored on distributed ledgers and also automates micropayments.



**Post-trade services:** Smart contracts are triggered to ensure regulatory compliance of trades, ensure trade is executed as per the requirements, and take corrective steps as needed.



**Land registry:** Store the ownership of land/property on a distributed database and create safeguards for secure updates to this registry when transferring ownership through involvement of government/central body.

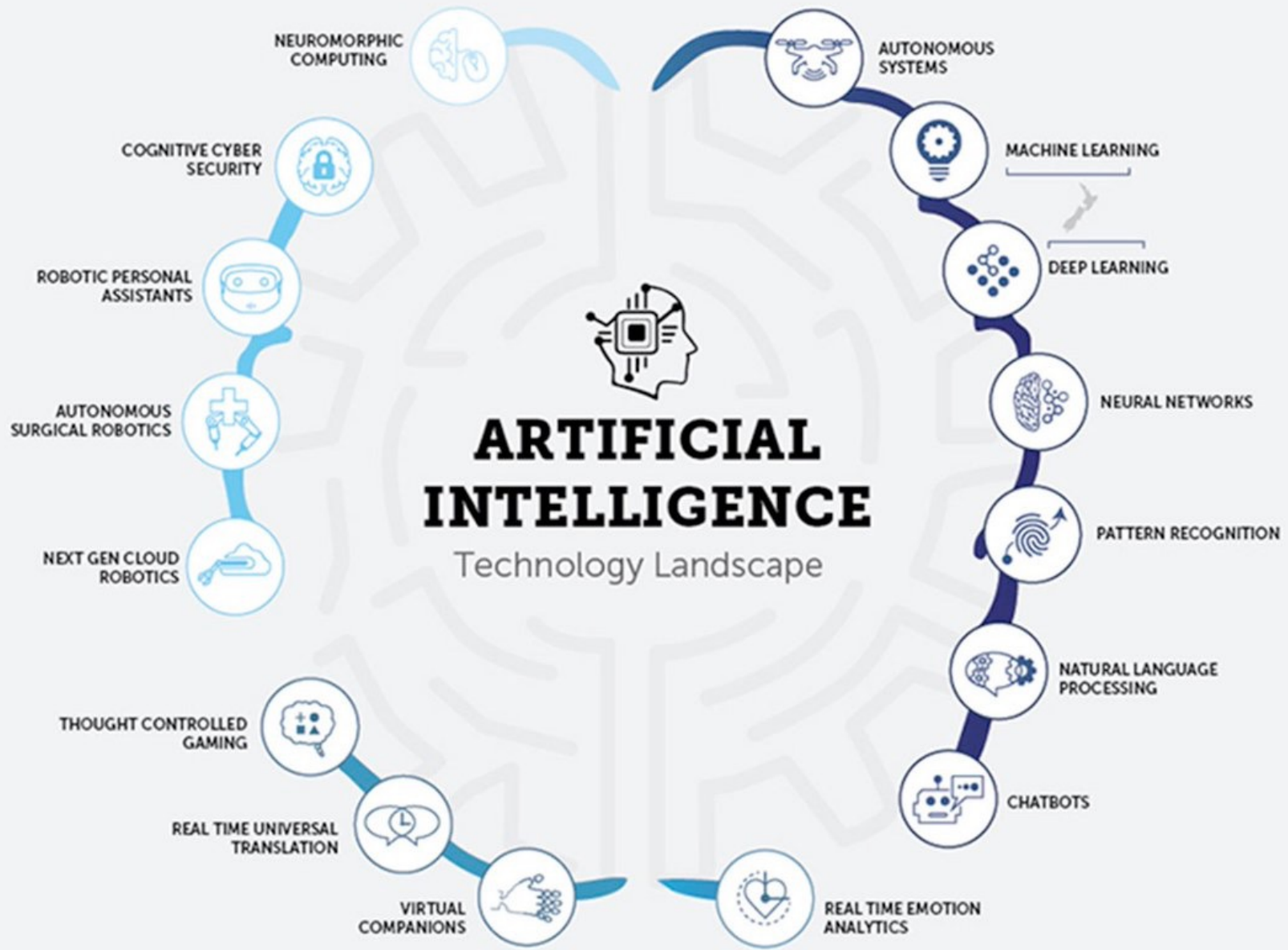


**Distributed smart power grid:** Ability for users to generate power and sell it over the grid that enables P2P payments and micro-transactions using smart contracts and distributed ledger.

## BLOCKCHAIN

Cryptographically-secure transactional databases





# ARTIFICIAL INTELLIGENCE

Computational models of human behavior



# AI: TIME

Person : Person

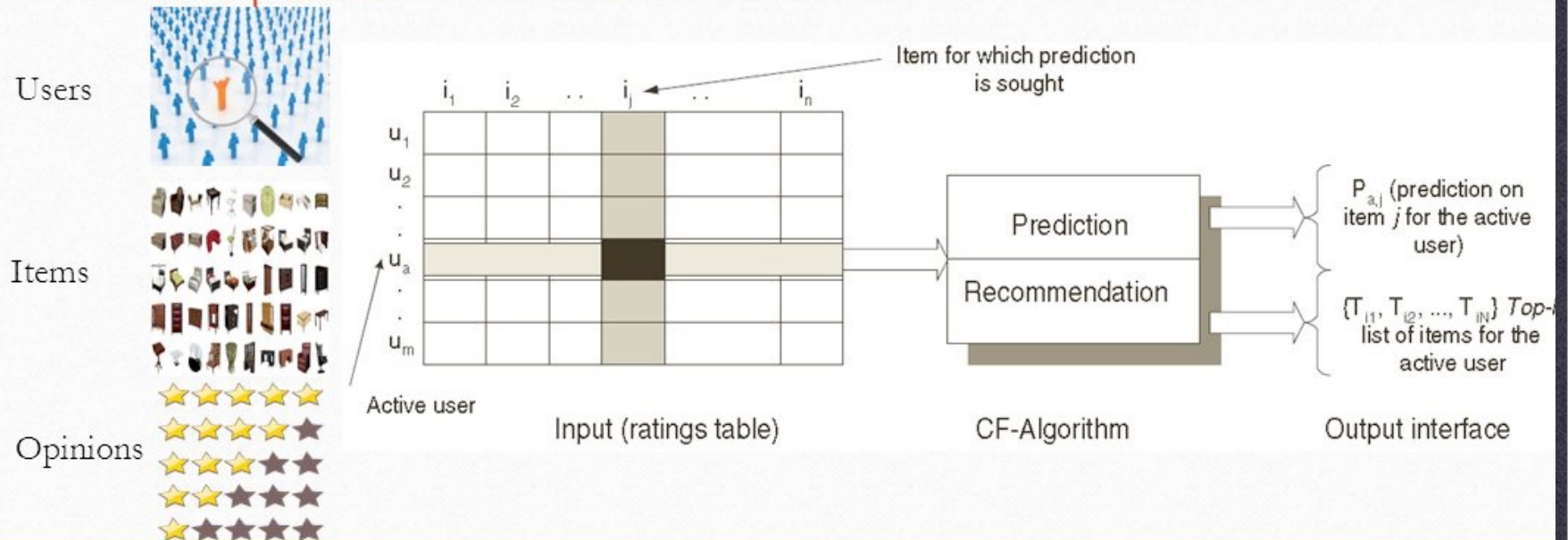
Person : Machine

Machine : Machine



# Collaborative filtering based recommender systems

- Collaborative filtering: to provide item recommendations or predictions based on **opinions** of other **like-minded users**.



**AI: BEHAVIORAL DATA**

Better data enables better predictions



## Artificial Intelligence: LikeMinds, Inc. (1997)

- \* Personalization
- \* Behavioral data
- \* Collaborative filtering
- \* Weak management
- \* Lacked distribution





## ENTERPRISE CUSTOMERS

LIKEMINDS // ANDROMEDIA // MACROMEDIA // ADOBE



A chalkboard-style graphic with the text "IDEA LOADING..." and a progress bar. The text is written in a white, hand-drawn, chalk-like font. The word "IDEA" is on the top line, "LOADING" is on the second line, and "..." is on the third line. Below the text is a horizontal progress bar with a hatched pattern on the left side, indicating that the loading is not yet complete. The background is a dark, textured blue with some light spots, resembling a chalkboard or a night sky.

IDEA  
LOADING...  
[Progress bar]

## FUTURE TRENDS

Public policy implications

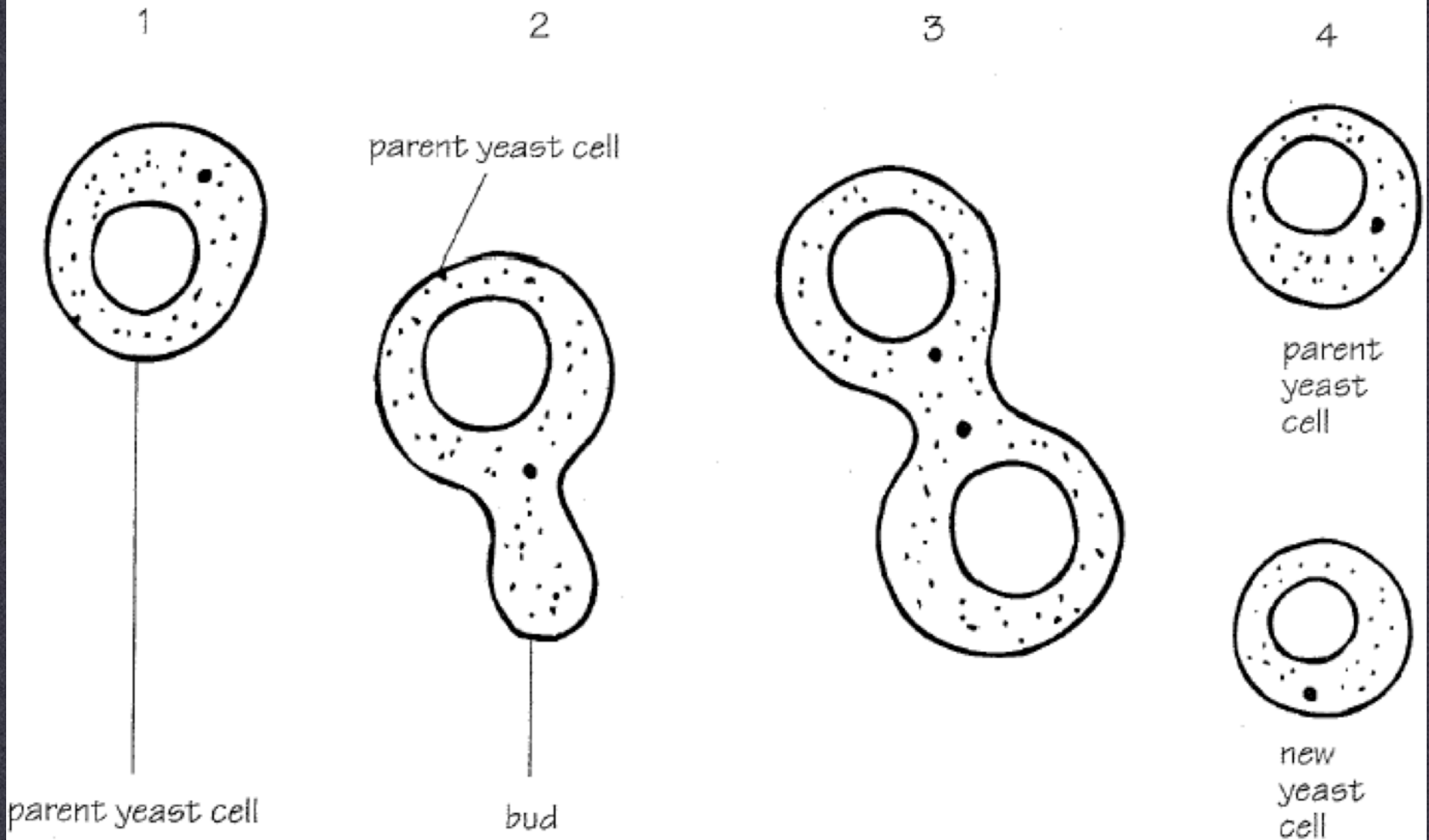




# FRAGMENTATION

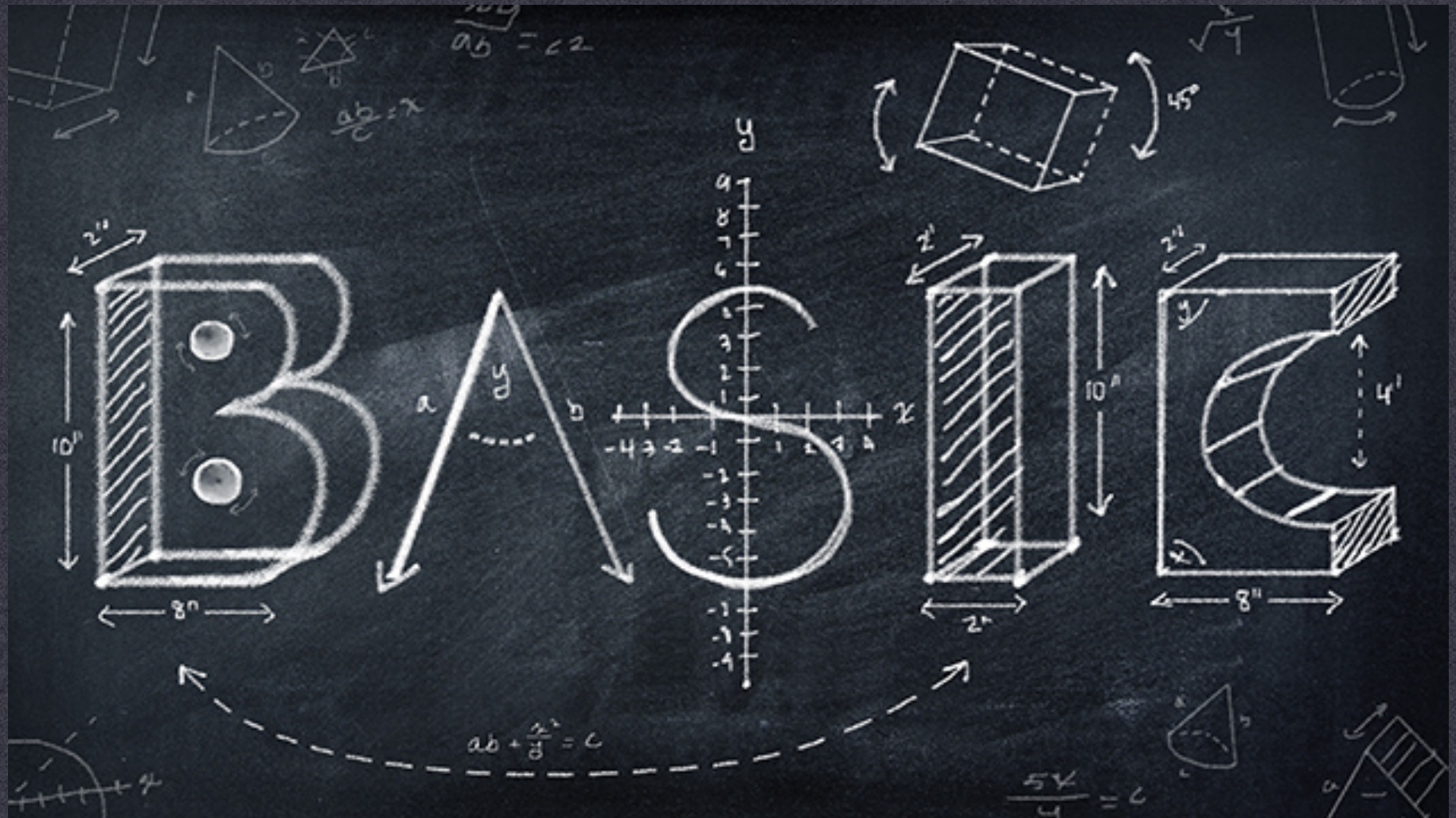
Decentralization versus Nation-State





**FRAGMENTATION => GROWTH**

How accurate is the analogy to reproduction?



# BASIC\* TECHNOLOGIES

The interconnection of various technologies enables unique solutions



# The Building Blocks of Autonomy

Prepared by  VISION SYSTEMS INTELLIGENCE

## AUTONOMOUS SOLUTIONS



## PROCESSING



## SENSORS



## CONNECTIVITY



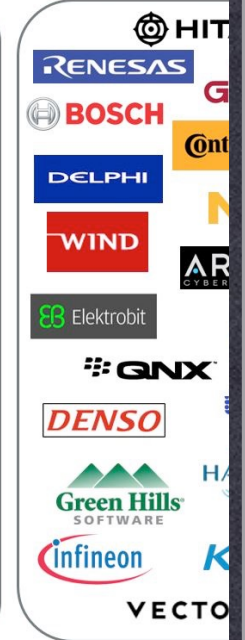
## MAPPING



## ALGORITHMS



## SECURITY/SAFETY



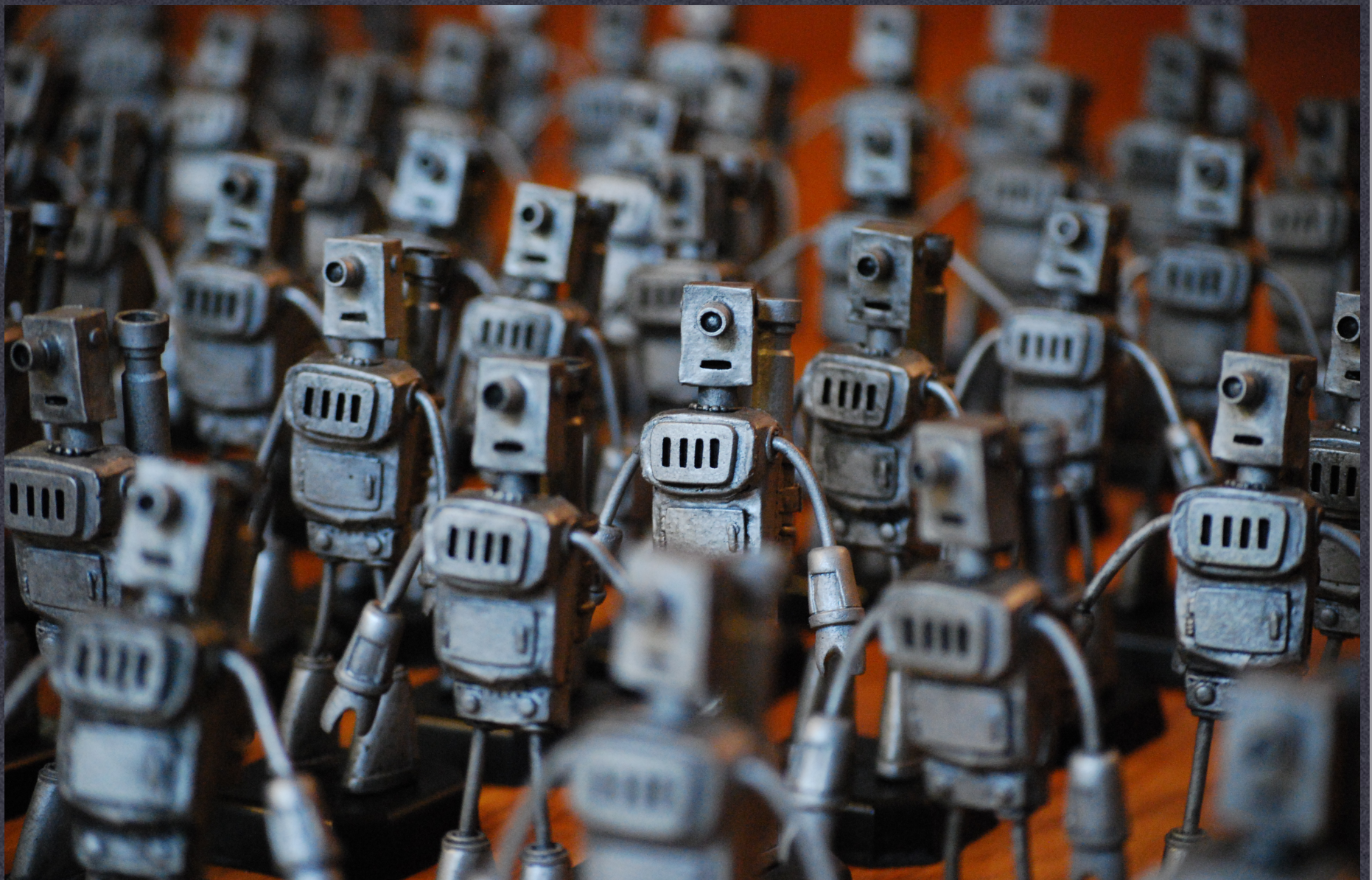
## DEVELOPMENT TOOLS



# BASIC\* TECHNOLOGY

Autonomous driving: enabled by the interconnection of multiple BASIC\* technologies





## **BASIC\* TECHNOLOGY**

The autonomous corporation: what will happen to the workers?



"All the News  
That's Fit to Print"

# The New York Times

Late Edition

New York: Today, increasing clouds. High 62-67. Tonight, cloudy, breezy, showers likely. Low 51-57. Tomorrow, showers ending. High 58-65. Yesterday: High 68, low 48. Details on page B6.

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NEW YORK, TUESDAY, OCTOBER 20, 1987

36 cents beyond 15 cents from New York City, except on Long Island

30 CENTS

## STOCKS PLUNGE 508 POINTS, A DROP OF 22.6%; 604 MILLION VOLUME NEARLY DOUBLES RECORD

### U.S. Ships Shell Iran Installation In Gulf Reprisal

### Offshore Target Termed a Base for Gunboats

By STEVEN V. ROBERTS

Special to The New York Times

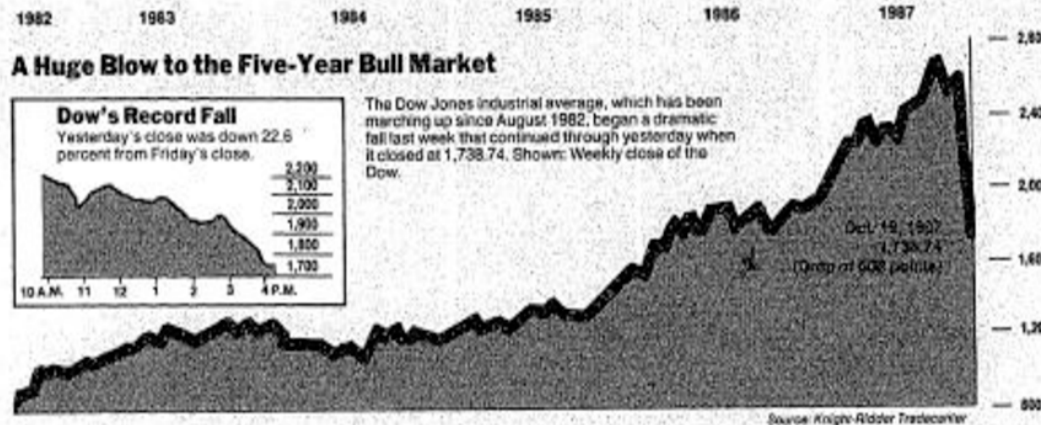
WASHINGTON, Oct. 19 — United States naval forces struck back at Iran today for attacks on American-registered vessels and other Persian Gulf shipping by shelling two connected offshore platforms that American officials said were a base for Iranian gunboats.

A few hours later, a naval commando detachment boarded a third platform five miles away and destroyed radar and communications equipment, Pentagon officials said.

No American casualties were reported in the actions, which occurred 120 miles east of Bahrain at about 2 P.M. (7 A.M., Eastern daylight time).

#### A 20-Minute Warning

American officials said the attacking force took pains to avoid killing Iranians, giving the crew on the first two platforms a 20-minute warning before four destroyers, stationed about three



### WORLDWIDE IMPACT

### Frenzied Trading Raises Fears of Recession — Tape 2 Hours Late

By LAWRENCE J. De MARIA

Stock market prices plunged in a tumultuous wave of selling yesterday, giving Wall Street its worst day in history and raising fears of a recession.

The Dow Jones industrial average, considered a benchmark of the market's health, plummeted a record 508 points, to 1,738.74, based on preliminary calculations. That 22.6 percent decline was the worst since World War I and far greater than the 12.82 percent drop on Oct. 28, 1929, that along with the next day's 11.7 percent decline preceded the Great Depression.

Since hitting a record 2,722.42 on Aug. 25, the Dow has fallen almost 1,000 points, or 36 percent, putting the blue-chip indicator 137.5 points below the level at which it started the year. With Friday's plunge of 108.35 points, the Dow has fallen more than 25 percent in the last two sessions.

#### Unprecedented Trading

Yesterday's frenzied trading on the nation's stock exchanges lifted volume

### Does 1987 Equal 1929?

By ERIC GELMAN

As stock prices soared this year, a chorus of pessimists warned that 1987 was looking more like 1929, when a stock market crash helped to usher in the Great Depression. Yesterday, after a plunge reminiscent of the worst days of 1929, one pressing question was whether the aftershocks

News  
Analysis

whether the aftershocks

Moore, director of the Center for International Business Cycle Research at Columbia University.

To be sure, there are some unsettling similarities between the current era and the pre-Depression years. Like the Roaring Twenties, the 1980's have seen an astonishing boom Wall Street. Now as then, individual and corporate debt



## BLACK MONDAY (1987)

Failures are inevitable, e.g. program trading



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