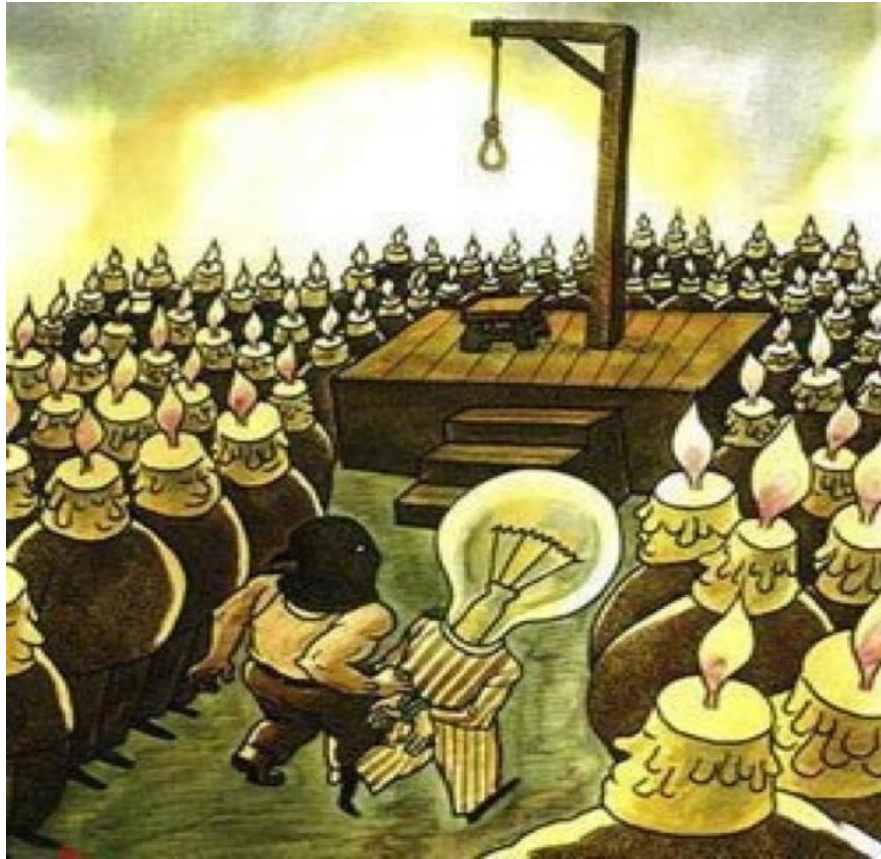
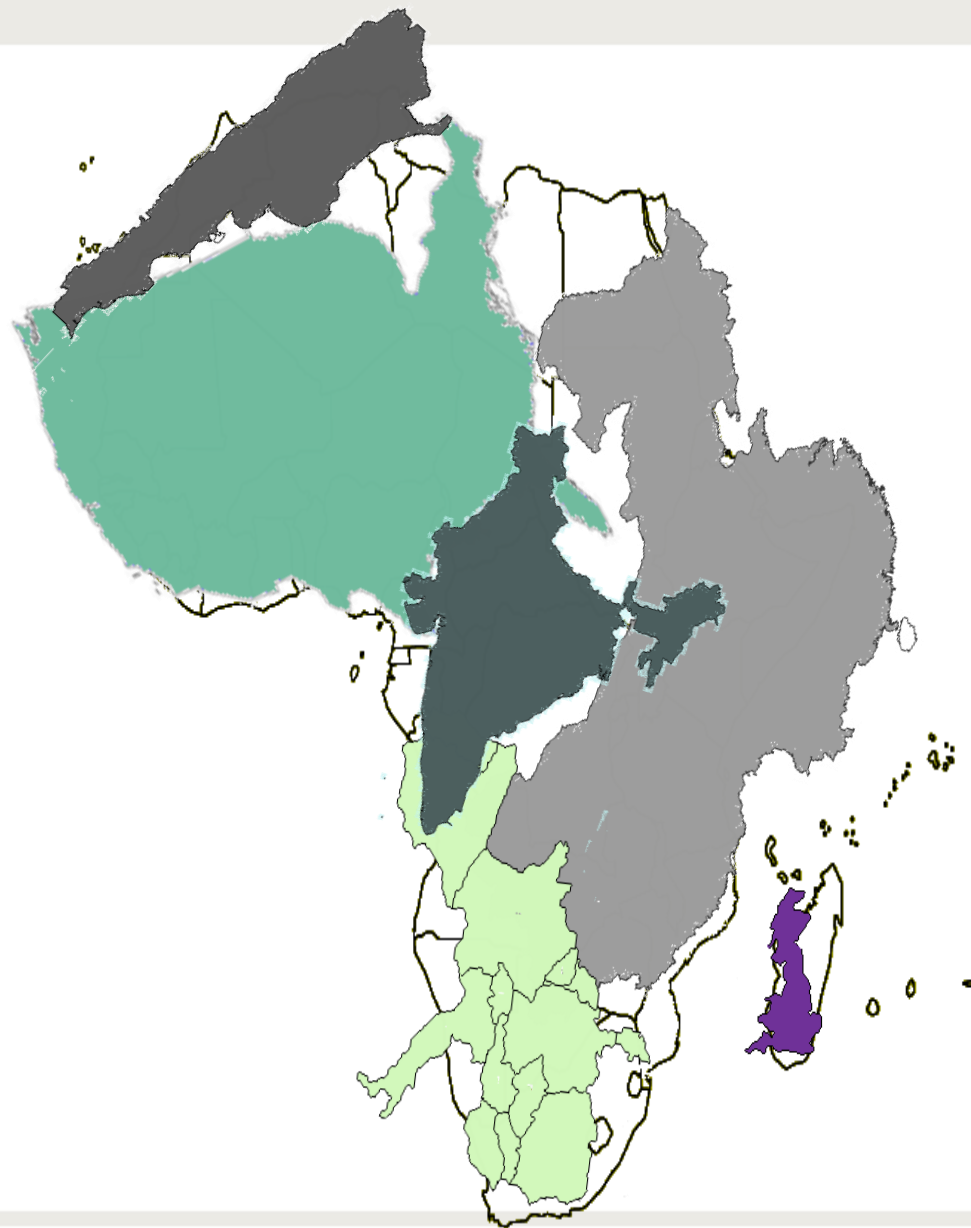




# **Innovation and Entrepreneurship in Low-Income Economies**

**Twitter @Calestous**





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## THE NEW HARVEST

Agricultural Innovation in Africa

Calestous Juma

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THE  
THEORY  
OF  
ECONOMIC  
DEVELOPMENT

Joseph A. Schumpeter

With a New Introduction  
by John E. Elliott

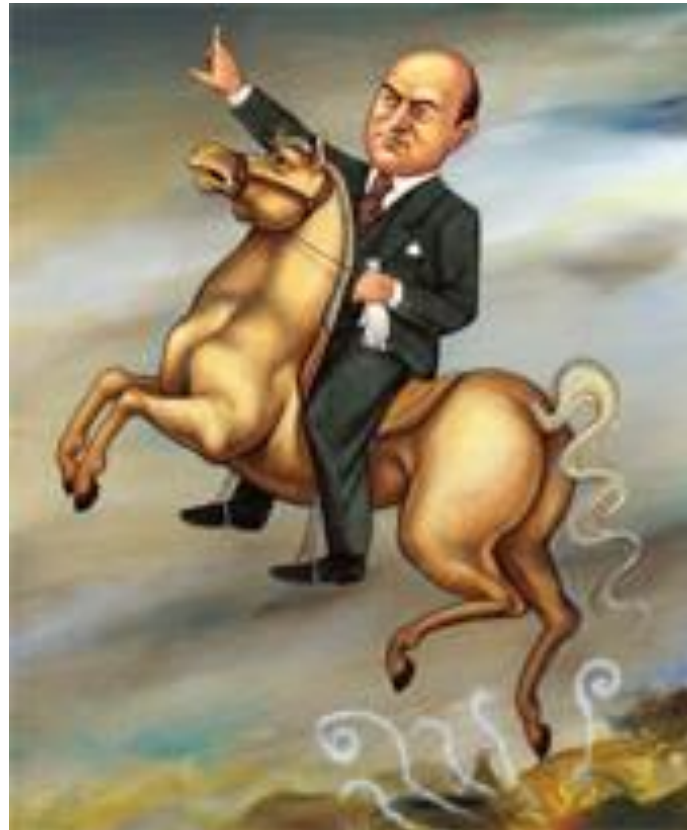


Corbis/The Economist

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**1952-1965**

# Revisiting Schumpeter



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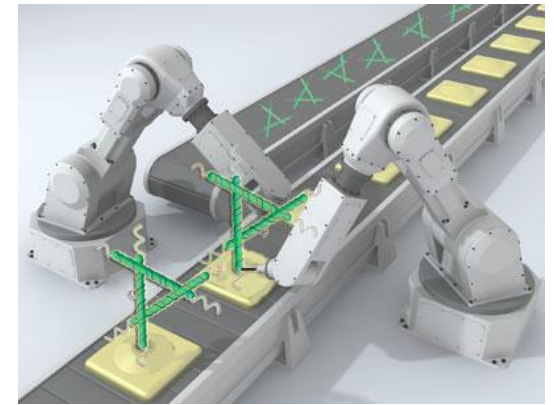
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# Debating Schumpeter





**“Schumpeter’s theory seems to...provide the mould which we must use, although we may use it with slightly different ingredients.”**

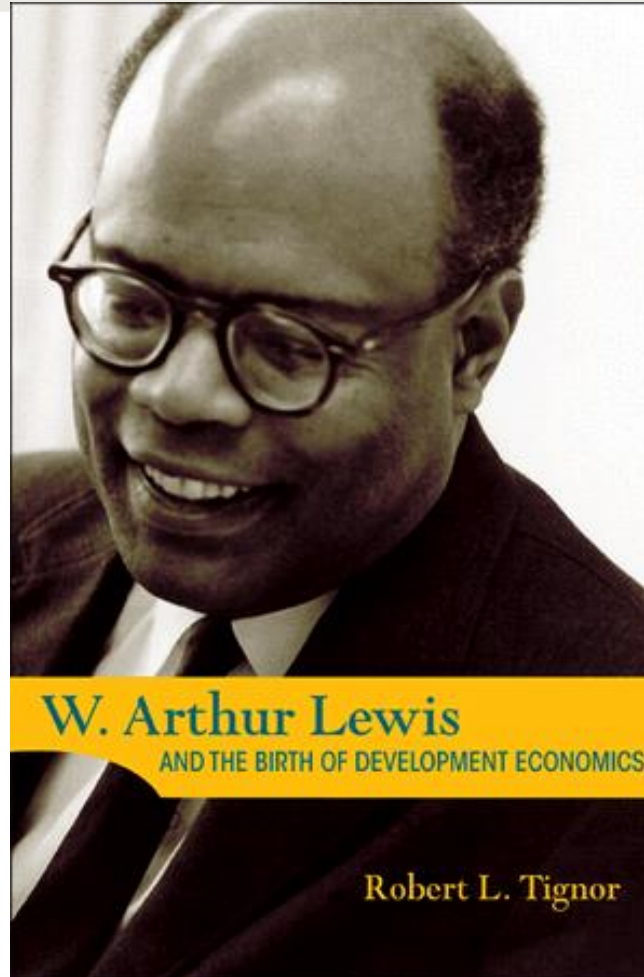
**-- Ragnar Nurkse, 1953**





“The **entrepreneur** is not the main driving force, **innovation** is not the most characteristic process, and private **enrichment** is not the dominant goal.”

-- Henry Wallich, 1952



**Schumpeter's theory is "very much narrower than its title implies." -- W. Arthur Lewis, 1955**



**Schumpeter's "theory is a good basis for a survey of obstacles to economic development, not because it applies to underdeveloped countries but because it **fails to apply.**"**

**-- Hans Singer, 1953**



**“Development in underdeveloped countries is not a self-induced process generated from within, it needs a **strong hand** to guide and protect it—a function which will have to be performed by **authorities.**”**

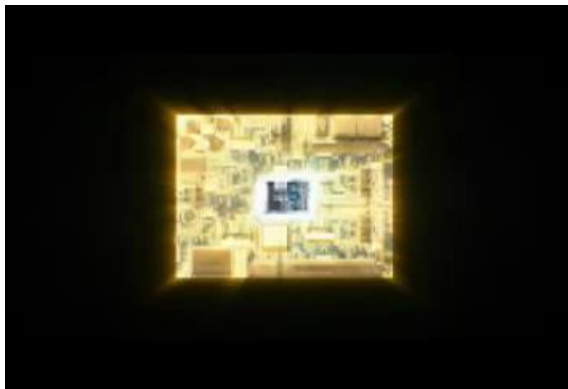
**-- Alfred Bonn , 1957**





# Updating Schumpeter





change...



By 2010, it was progressing more each hour than it did in its entire first 90 years

**COMPUTER RANKINGS**  
By calculations per second per \$1,000



**Analytical engine**  
Never fully built, Charles Babbage's invention was designed to solve computational and logical problems



Hollerith Tabulator



IBM Tabulator



National Ellis 3000



**Colossus**  
The electronic computer, with 1,500 vacuum tubes, helped the British crack German codes during WW II



**UNIVAC I**  
The first commercially marketed computer, used to tabulate the U.S. Census, occupied 943 cu. ft.

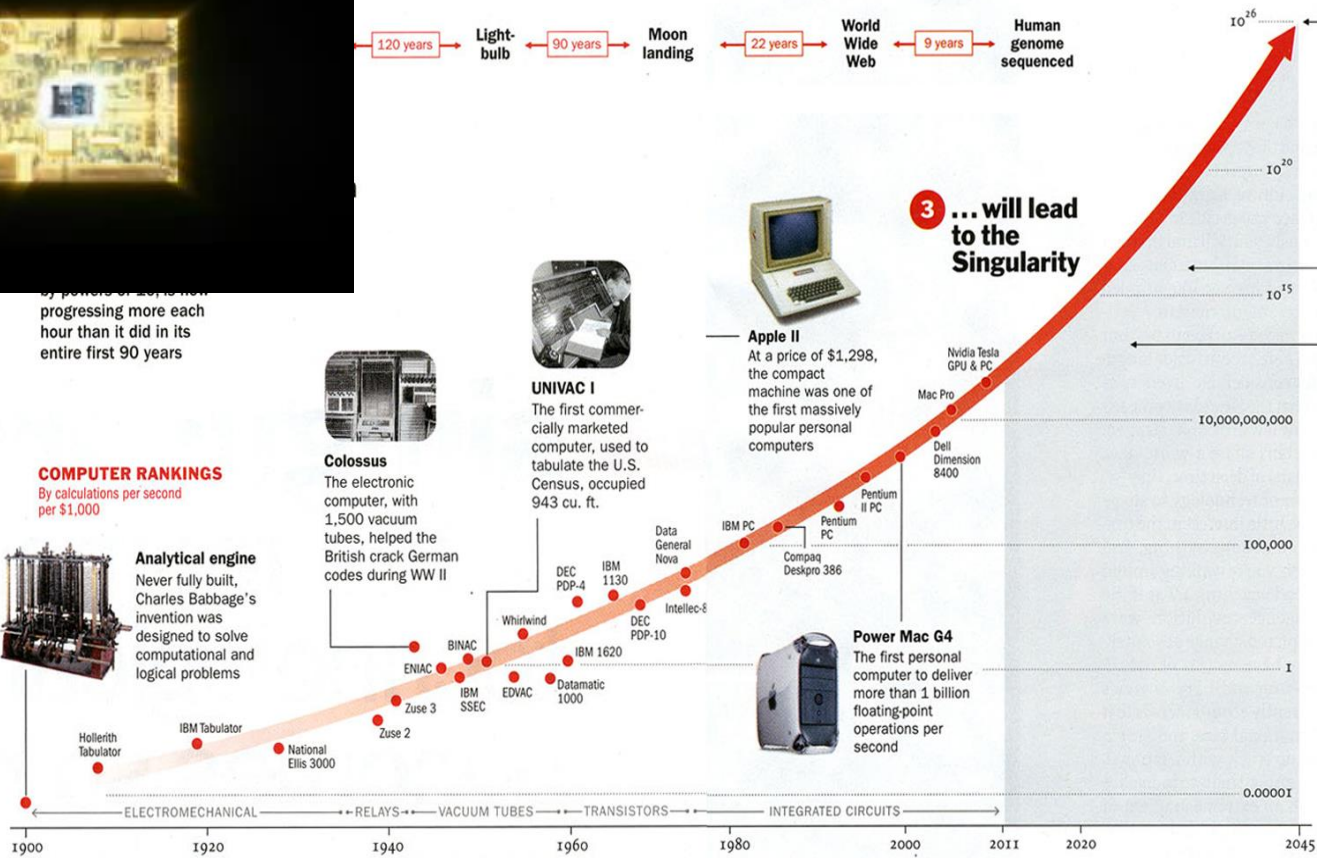


**Apple II**  
At a price of \$1,298, the compact machine was one of the first massively popular personal computers



**Power Mac G4**  
The first personal computer to deliver more than 1 billion floating-point operations per second

**3 ... will lead to the Singularity**



**2045**  
Surpasses brainpower equivalent to that of all human brains combined

Surpasses brainpower of human in 2023

Surpasses brainpower of mouse in 2015

# Technological abundance



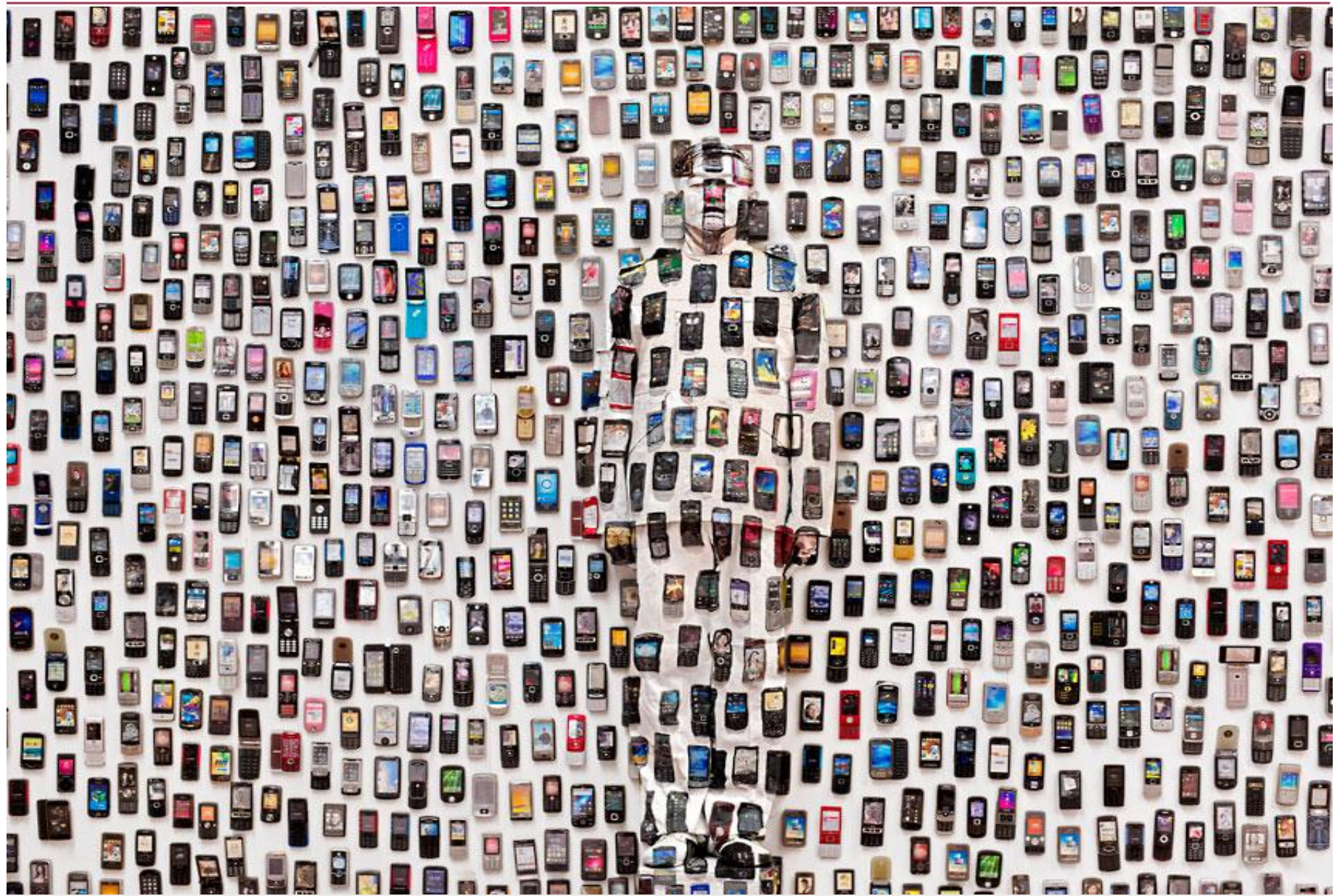










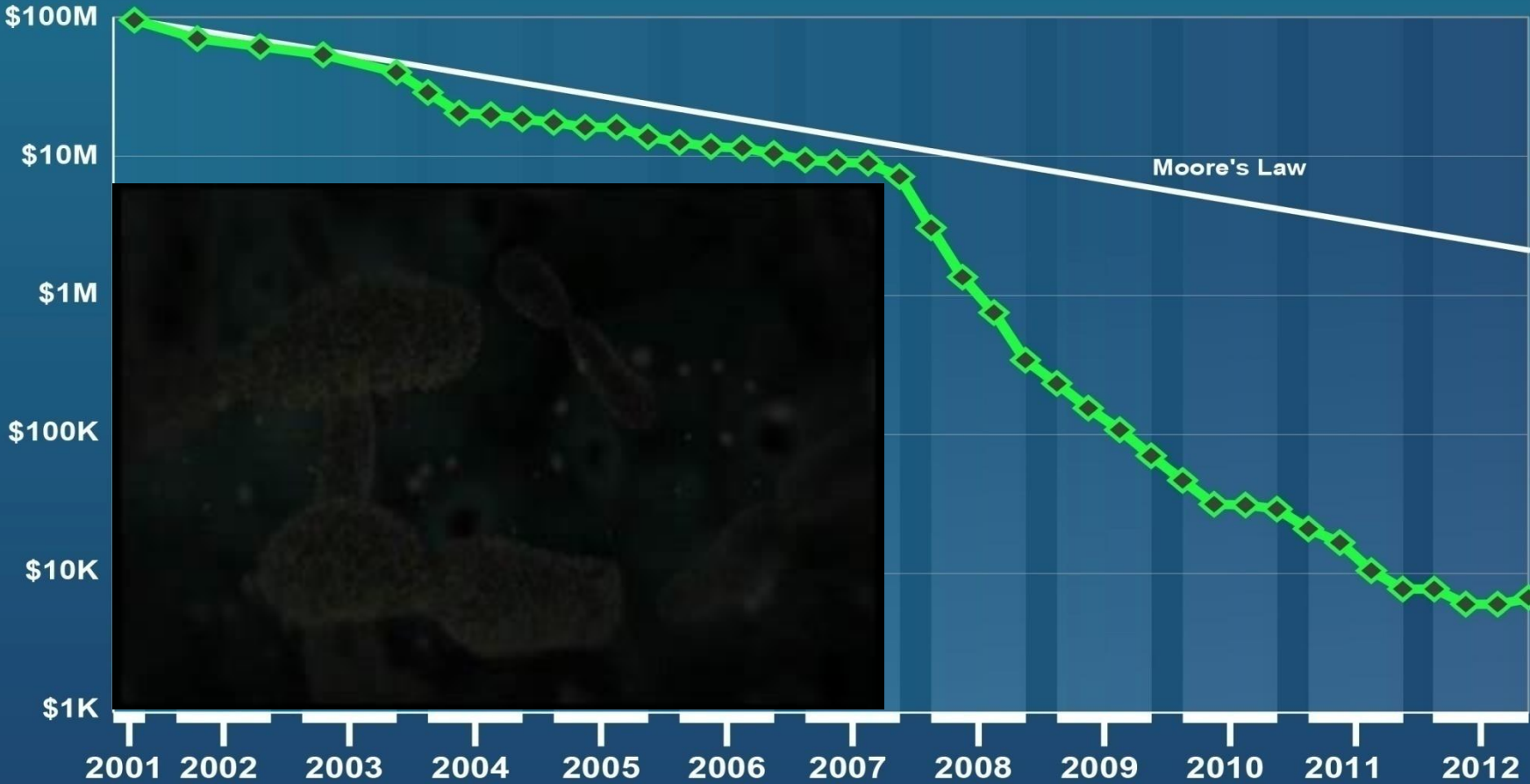








# Cost per Genome



A GENOMIC REVOLUTION:  
**THE MAPPING OF THE HUMAN GENOME**

THE SEQUENCING OF THE HUMAN GENOME WAS

**THE LARGEST**  
**SINGLE UNDERTAKING**  
IN THE HISTORY OF BIOLOGICAL SCIENCE.

1990 ..... IT TOOK **13 YEARS** ..... 2003  
**TO SEQUENCE 3 BILLION**  
DNA BASE PAIRS AND IDENTIFY  
EACH HUMAN GENE.



THE **\$14.5 BILLION** THE U.S. GOVERNMENT INVESTED IN THE  
HUMAN GENOME EFFORT SINCE 1988 HAS HELPED DRIVE:

**\$965 BILLION IN**  
**ECONOMIC IMPACT**

**\$293 BILLION**  
IN TOTAL PERSONAL INCOME

**\$169 BILLION**  
INCREASE IN ECONOMIC  
OUTPUT SINCE 2010



In 2012 alone, genomics-related research,  
development and commercialization activities generated:

**\$65B** IN U.S. ECONOMY    **152,314** SUPPORTED JOBS    **\$19B** IN PERSONAL INCOME

【 EVERY **\$1** INVESTED IN THE HUMAN GENOME PROJECT: 】

HAS TRIGGERED **\$178** IN  
U.S. ECONOMIC ACTIVITY

Genomics is also spurring major advances in human health.  
In 1990 only **61 diseases** or health conditions had an identified genomic cause.

**TODAY THERE ARE 4,850 AND COUNTING.**

Beyond human health, genomics is enabling new solutions in:



**RENEWABLE ENERGY  
DEVELOPMENT**



**INDUSTRIAL  
BIOTECHNOLOGY**



**AGRICULTURE AND  
FOOD SECURITY**



**VETERINARY  
MEDICINE**



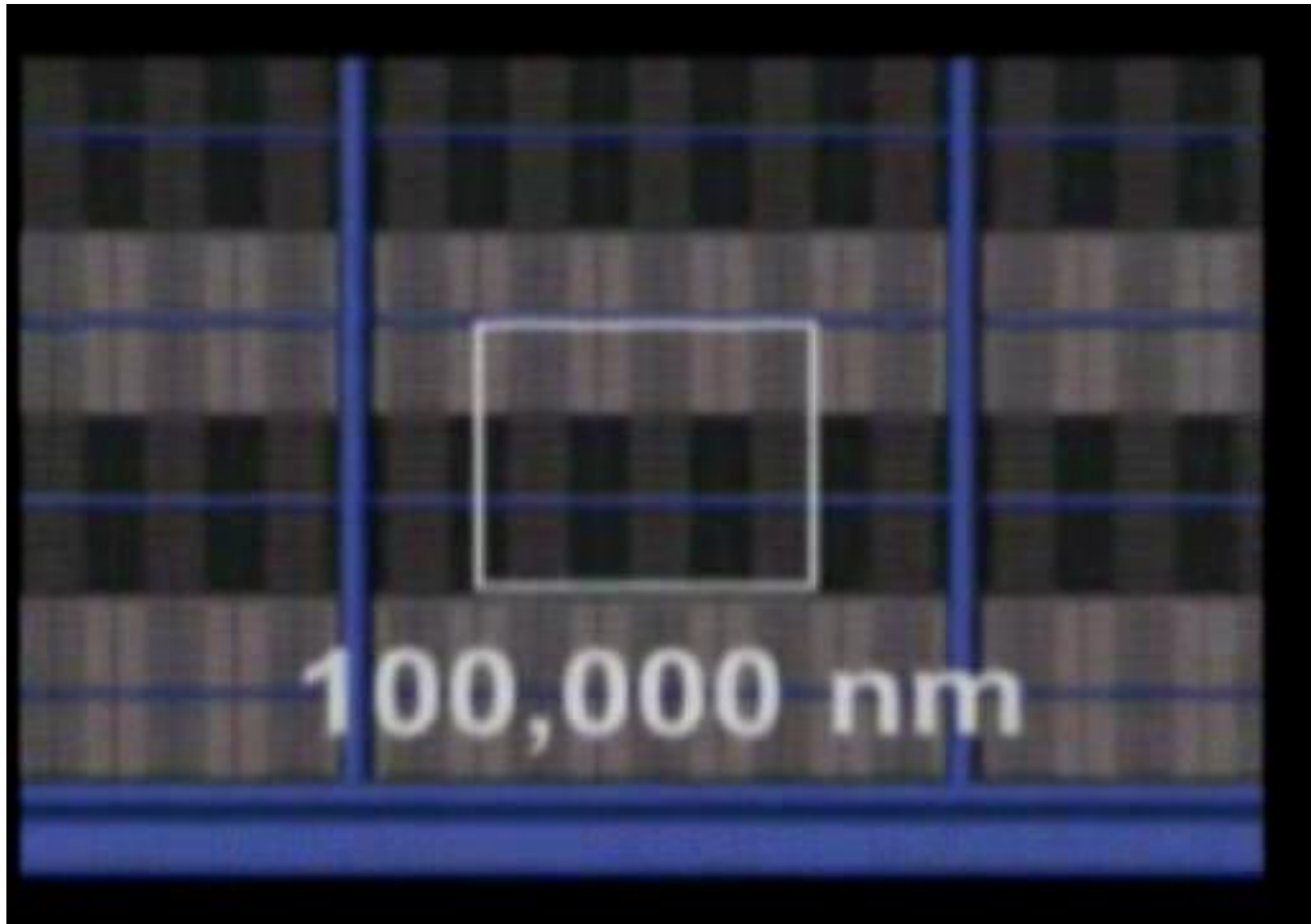
**ENVIRONMENTAL  
SCIENCE**

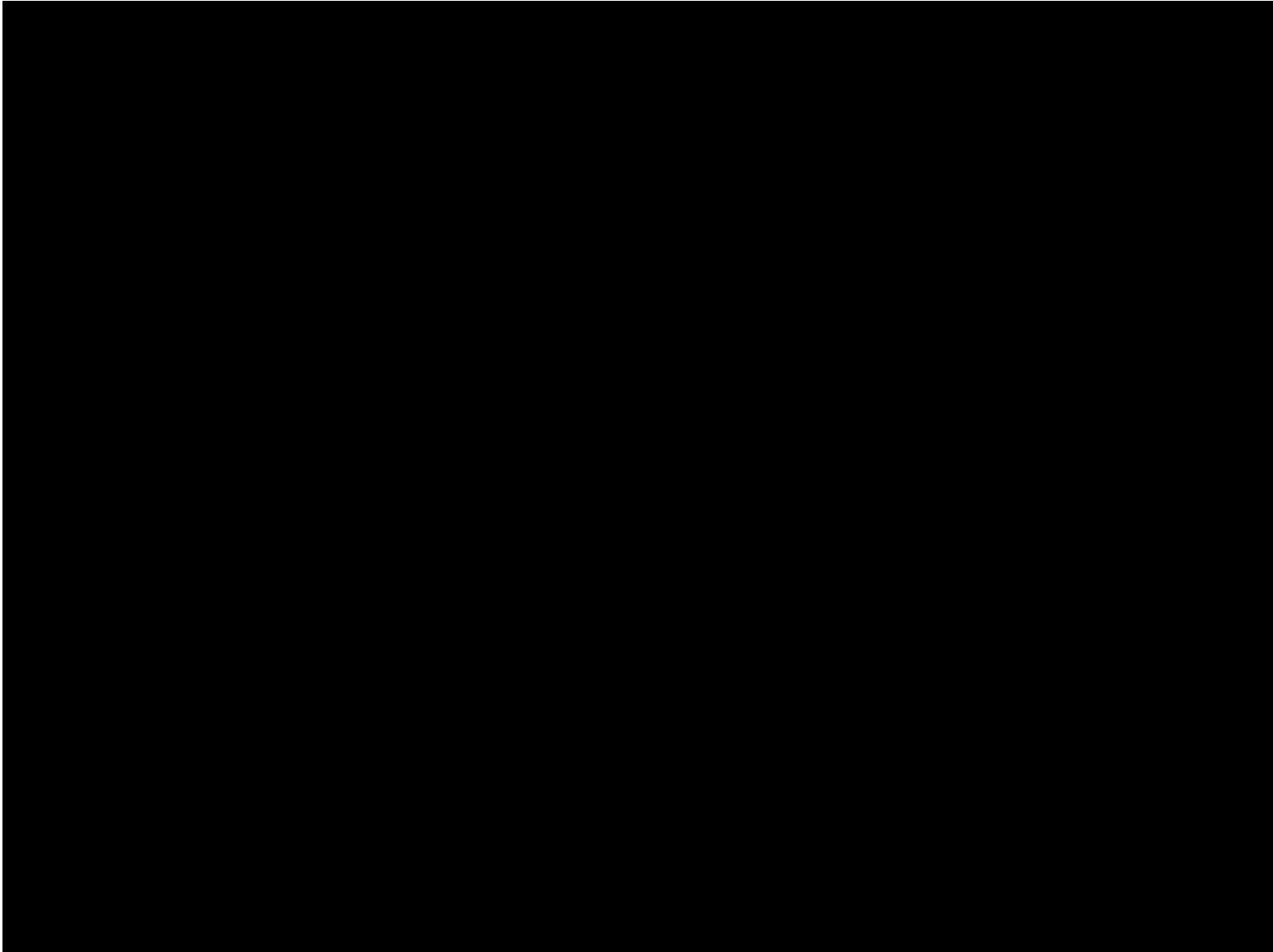


**FORENSIC SCIENCE AND  
HOMELAND SECURITY**

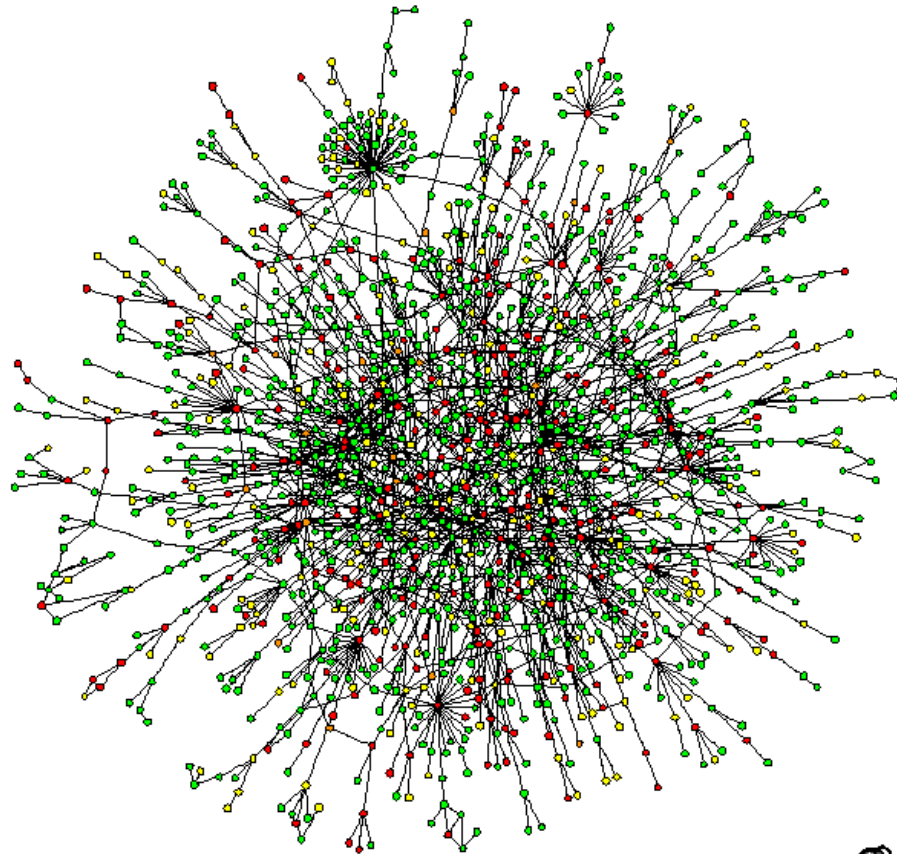


**ADVANCED STUDIES IN EVOLUTION,  
ZOOLOGY AND ANTHROPOLOGY**







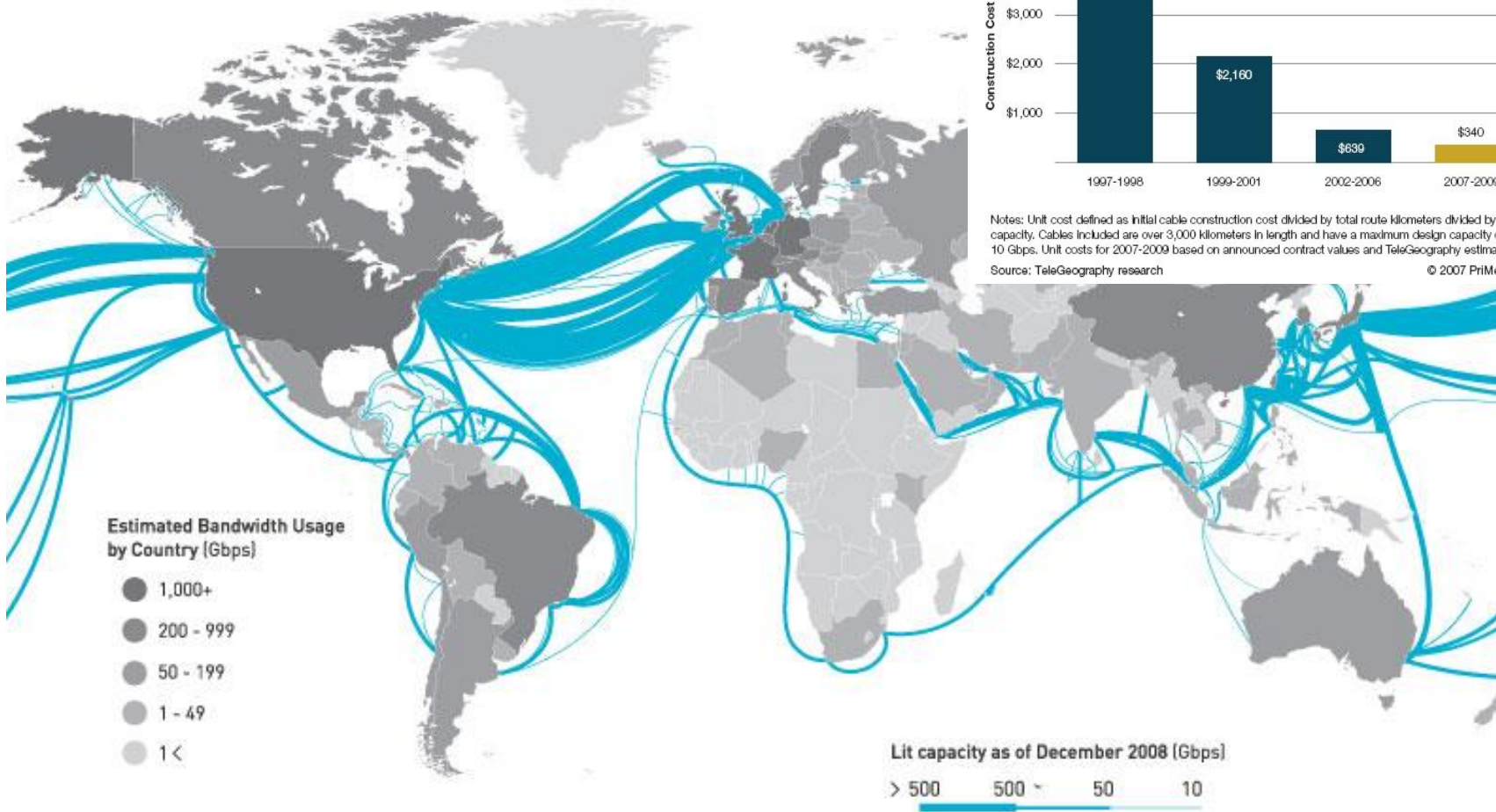


# The economy as a whole

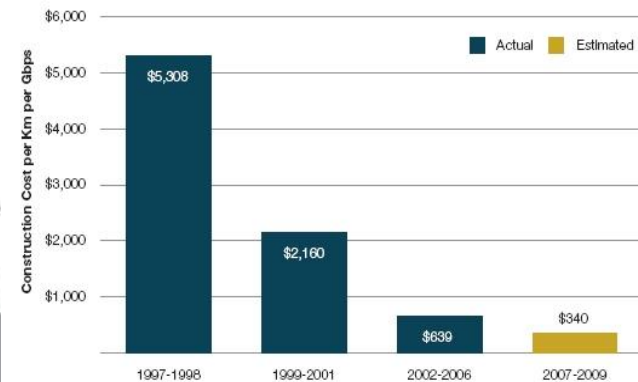




# GLOBAL LIT SUBMARINE CABLE CAPACITY



**FIGURE 3**  
Unit Cost of Submarine Cable Systems, 1997-2009

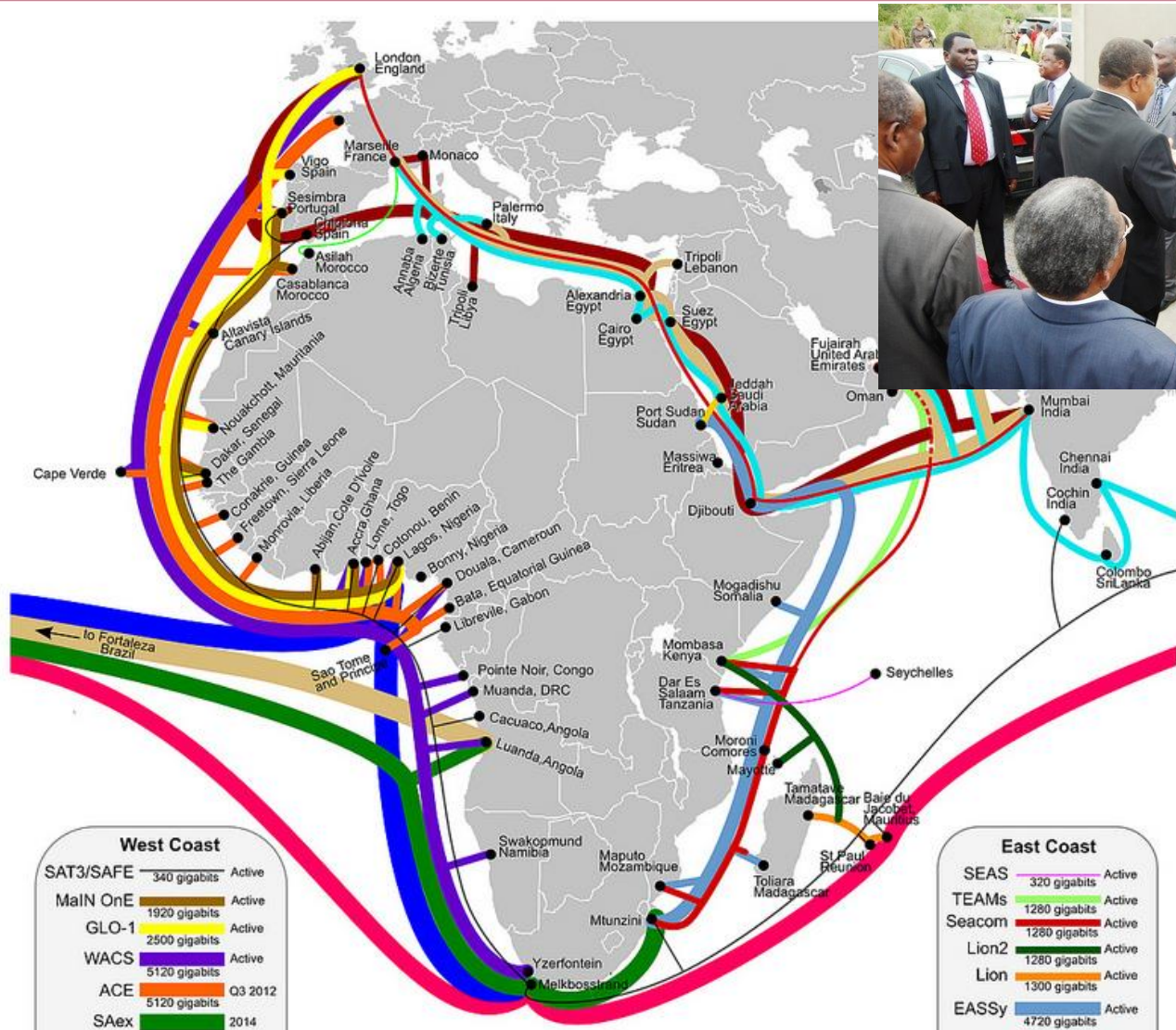


Notes: Unit cost defined as initial cable construction cost divided by total route kilometers divided by RFS capacity. Cables included are over 3,000 kilometers in length and have a maximum design capacity of at least 10 Gbps. Unit costs for 2007-2009 based on announced contract values and TeleGeography estimates.

Source: TeleGeography research

© 2007 PriMetrica, Inc.





**West Coast**

SAT3/SAFE	340 gigabits	Active
MAIN One	1920 gigabits	Active
GLO-1	2500 gigabits	Active
WACS	5120 gigabits	Active
ACE	5120 gigabits	Q3 2012
SAex	12.8 terabits	2014
WASACE	40 terabits	2014
SACS	40 terabits	2014

**East Coast**

SEAS	320 gigabits	Active
TEAMS	1280 gigabits	Active
Seacom	1280 gigabits	Active
Lion2	1280 gigabits	Active
Lion	1300 gigabits	Active
EASSy	4720 gigabits	Active
BRICS	12.8 terabits	2014

**African Undersea Cables (2014)**  
<http://manypossibilities.net/african-undersea-cables>  
 Version 34  
 Nov 2012



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# Capabilities







# Creative destruction



# **Role of the state**





**GLOBELICS**



[dreamstime.com](http://dreamstime.com)

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