



# information & economics

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**concepts of information**

**April 8, 2010**



# overview

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**economics**  
why?

**communication & information**

**economics & information**

**economics, information, &  
development**



# why economics?

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**information age/economy**

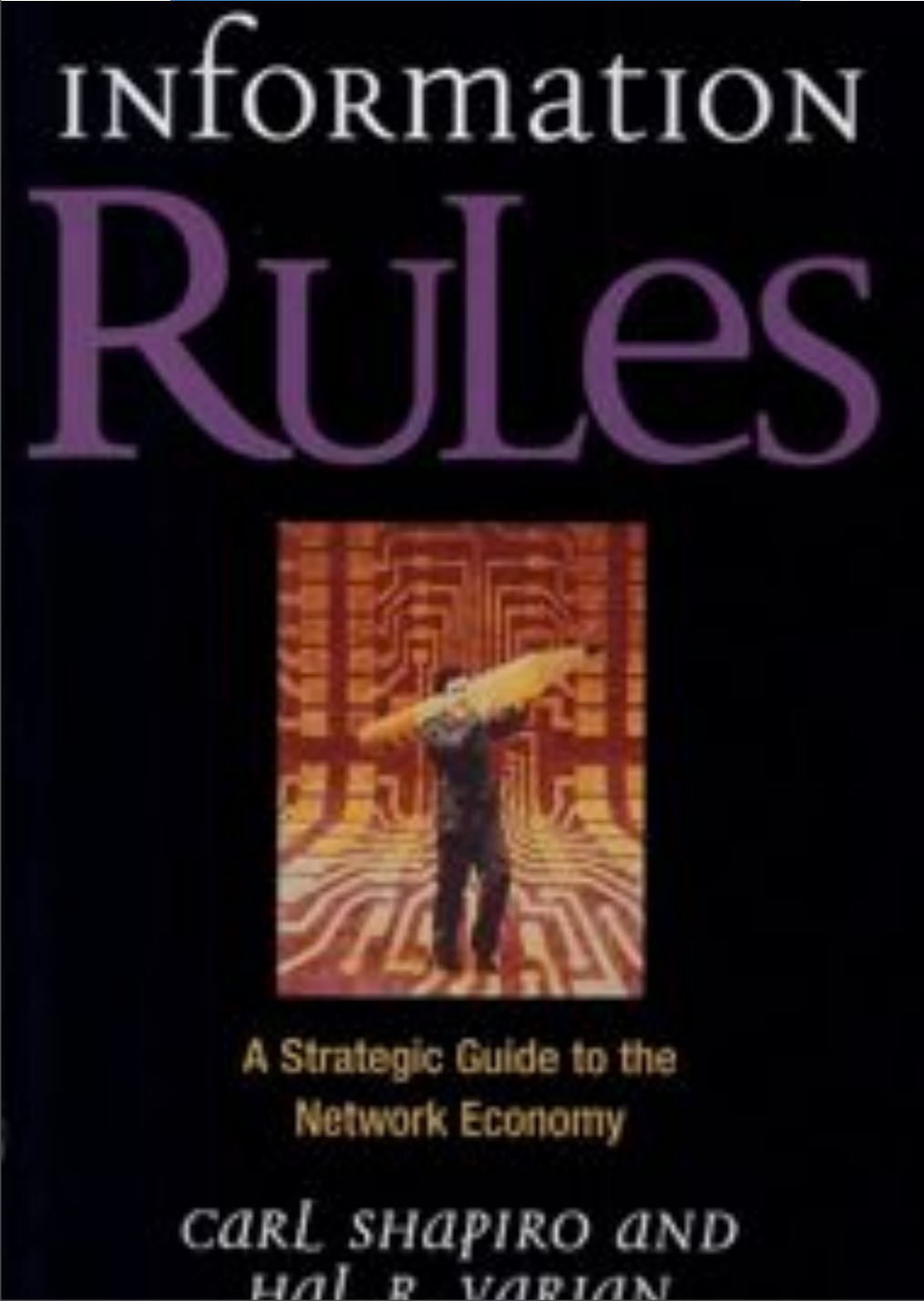
who *owns* information

law, library science, philosophy, economics?

***information rules***



# why economics?



**information age/economy**

who *owns* information

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# why economics?

INFORMATION

PUNK RULES OK  
CHRIS HALTER



CARL SHAPIRO AND  
HAL R. VARIAN

**information age/economy**  
who owns information  
law, library science, philosophy, economics?

***information rules***



ok?

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## so what are we talking about

"we use the term very broadly to mean anything that can be digitized." --Shapiro & Varian

basic results [of information theory] are aimed in a very specific direction ... not necessarily relevant to such fields as psychology, economics, and other social sciences."

--Shannon, "Bandwagon Effect"

"When there is uncertainty, there is usually the possibility of reducing it by the acquisition of information. Indeed, information is merely the negative measure of uncertainty." --

Arrow, "Information & Economic Behavior," 1973



# the Summers dodge?

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# why economics?

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**information age gurus?**





# why economics?

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## **information age gurus?**

Charles Hamlin  
William Harding  
Daniel Crissinger  
Roy Young  
Eugene Mayer  
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# why economics?

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"But the notion that somehow my views on regulation were predominant and effective at influencing the Congress is something you may have perceived. But it didn't look that way from my point of view."

Alan Greenspan,  
testimony, 4/7/2010

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## information dilemmas information & practice





[NYT] until now, has had three economics columns. Economic Scene was written by economists: it rotated between Tyler Cowen, Austan Goolsbee, Robert Frank, and Hal Varian. Economic View was written by journalists, including Daniel Altman, Dan Gross, and Louis Uchitelle. Finally, Times staffer David Leonhardt had his own Wednesday column, Economix. Today, all that changed. This is not good news for economic discourse in the mainstream press.

# economics & the public sphere

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## **econopundits**

*New York Times*: Paul Krugman

*New York Times*: “the economic scene”

*New Yorker*: Malcolm Gladwell

*New Yorker*: James Surowieki

*The Wisdom of Crowds*

## **econoblogging:**

Brad deLong, Tyler Cowan, Matthew Yglesias,  
Marginal Revolution, Crooked Timber ...



# economics & the public sphere

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"Caplan is the sort of economist (are there other sorts? there must be) who engages with the views of non-economists in the way a bulldozer would engage with a picket fence if a bulldozer could express glee."

## **economic argument & contrarian glee**

Steven Leavitt & Stephen Dubner,  
*Freakonomics*, 2006  
*Superfreakonomics*, 2009

Brian Caplan, *The Myth of the Rational Voter: Why Democracies Chose Bad Politics*, 2007

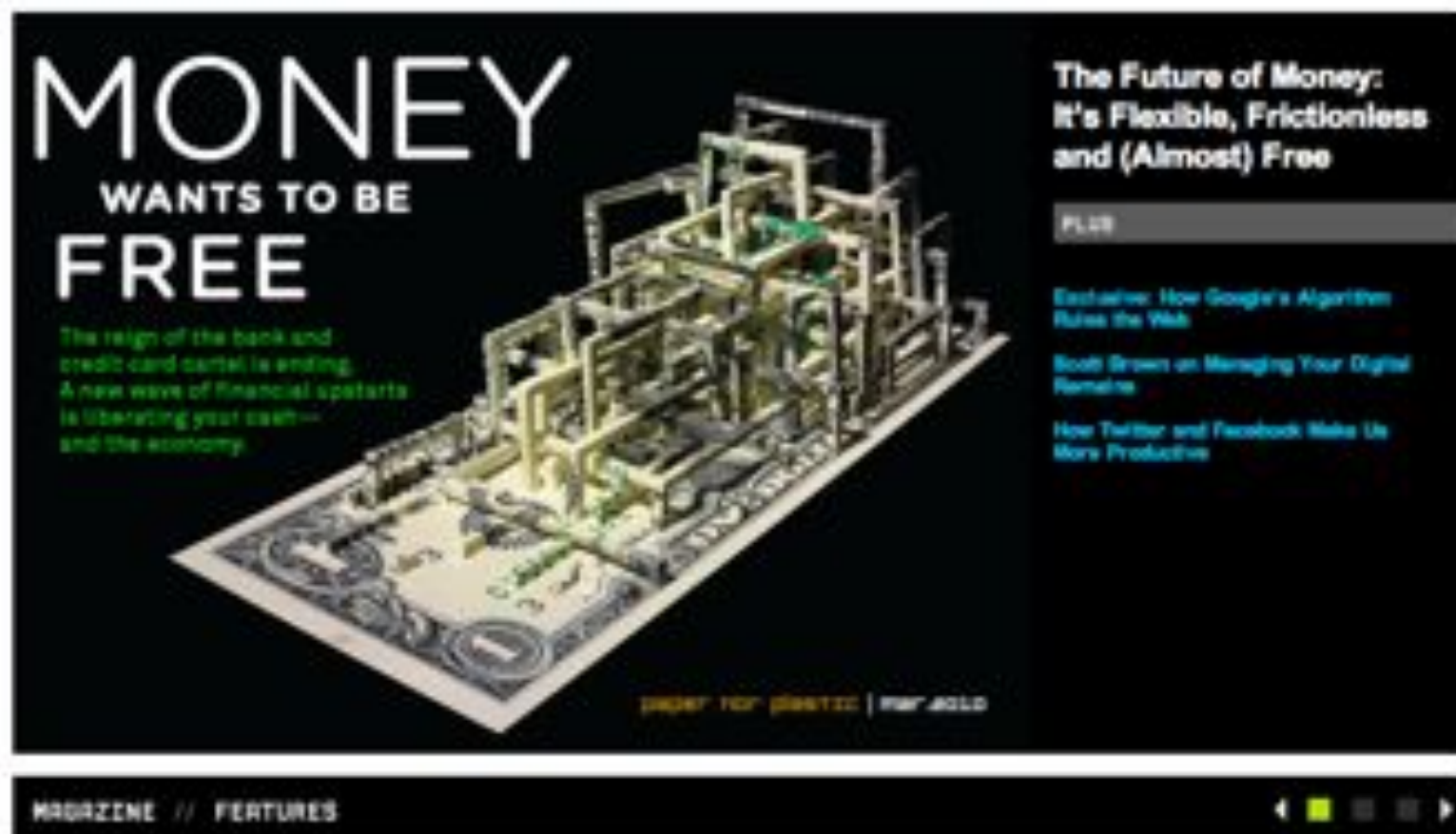


lest we forget



# / MAGAZINE

**freedom, free information  
& the free market**



Lou Rosetto, MBA

Kevin Kelly

Chris Anderson

... Esther Dyson

George Gilder

Newt Gingrich

Alvin Toffler



# lest we forget



## / MAGAZINE

### freedom, free information & the free market

**MONEY**  
WANTS TO BE  
**FREE**

The reign of the bank and credit card cartel is ending. A new wave of financial startups is liberating your cash—and the economy.

**The Future of Money: It's Flexible, Frictionless and (Almost) Free**

PLUS

- Exclusive: How Google's Algorithm Rules the Web
- Scott Brown on Managing Your Digital Remains
- How Twitter and Facebook Make Us More Productive

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# lest we forget



## freedom, free information & the free market

### / MAGAZINE

**On Newsstands Now**  
Issue 2.12 | Dec 1994

#### E-Money (That's What I Want)

Page 1 of 13  
[previous](#) | [start](#) | [next](#)  
Printing? Use [this version](#)

**The killer application for electronic networks isn't video-on-demand. It's going to hit you where it really matters - in your wallet. It's, not only going to revolutionize the Net, it will change the global economy.**

By Steven Levy

Clouds gather over Amsterdam as I ride into the city center after a day at the headquarters of DigiCash, a company whose mission is to change the world through the introduction of anonymous digital money technology. I have been inundated with talk of smart cards and automated toll takers and tamper-proof observer chips and virtual coinage for anonymous network ftps. I have made photocopies using a digital wallet and would have bought a soda from a DigiCash vending machine, but it was out of order.

My fellow passenger and tour guide is David Chaum, the bearded and ponytailed founder of DigiCash, and the inventor of cryptographic protocols that could catapult our currency system into the 21st century. They may, in the process, shatter the Orwellian predictions of a Big Brother dystopia, replacing them with a world in which the ease of electronic transactions is

Lou Rosetto, MBA

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Chris Anderson

... Esther Dyson

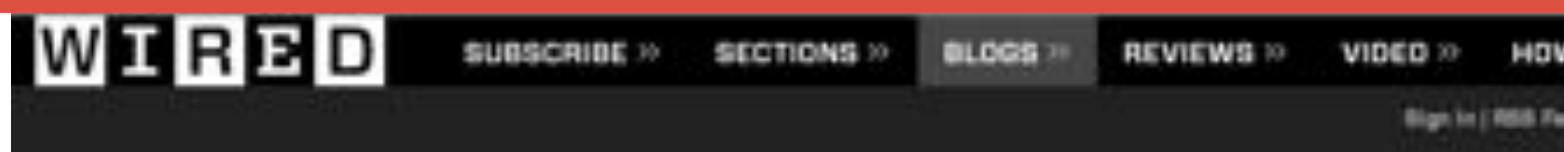
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lest we forget



freedom, free information & the free market

**/ MAGAZINE**

On Newsstands Now

**Inc.**



Rosetto, MBA

Kevin Kelly

START-UP ▶ RUNNING A BUSINESS ▶ FINANCE ▶ LEADERSHIP & MANAGING ▶ SALES & M

Chris Anderson

Topics > Leadership and Managing > Strategy and Planning >

# All Dressed Up and No IPO

While going public can yield a huge payoff for many companies, it can be a disastrous undertaking for others. Here's why Wired magazine's IPO proved a stunning failure.

Esther Dyson  
George Gilder  
Newt Gingrich  
Alvin Toffler

By Jerry Useem | Feb 1, 1998

fi10\_Economics 9



# economics and academia



## BLOGS

Justin Fox

On: Finance, Competition, Economy

### Wresting the Economic Debate Away from the Economists

9:00 AM Wednesday March 31, 2010 | [Comments \(11\)](#)

David Brooks **wondered** in his *New York Times* column last week if economists shouldn't try to become more like historians. That was interesting to read, given that I had just spent time with a bunch of historians (and a few other humanities professors) who were wondering how they could become more like economists.

- Email
- Tweet This
- Post to Facebook
- Share on LinkedIn
- Print



## hence 'imperialism'

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"Economics is far more versatile than its critics believe. It is a method of analysis and not just a field of study. The method is to combine two core assumptions—individual optimization and equilibrium—with various sets of specific assumptions adapted to different fields of application. The method is applicable not only to the market system but also the social and political environment within which this system is embedded. Social and psychological insights can be encapsulated in the specification of interdependent preferences, which hold the key to modelling all kinds of institutional behavior in rational terms."

Buckley & Casson. "Economics as an imperialist social science" 1993





or

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"Economics is not only a social science, it is a genuine science ... refutable implications. ...By almost any market test, economics is the premier social science. The field attracts the most students, enjoys the attention of policy-makers and journalists, and gains notice, both positive and negative, from other scientists. In large part, the success of economics derives from its rigor and relevance as well as from its generality. The economic toolbox can be used to address a large variety of problems drawn from a wide range of topics."

E.P. Lazear, "Economic Imperialism," 2000



# attractiveness

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**broad explanatory power**

**robust modelling**

mathematically tractability

**whiggish history**

- Mandeville's "harlot & highwayman"
- progress: rising height, weight, gdp

**pareto efficiency**

**predictable future**

"the competitive model virtually made economics a branch of engineering" -- Stiglitz

**self-regulating systems**

information as feedback



# a field in step

broad explanatory power  
**political economy to economics**

robust modelling  
law and economics

keeping the market free

mathematically tractability  
**academic consensus**

whiggish history - pareto efficient

**conceptual consensus**

progress: rising height, weight, gdp  
markets, preferences, equilibrium &

predictable future  
rationality

"economics as a branch of engineering"

**modelling consensus**

-- Stiglitz  
"do the math"

self-regulating systems  
the decline of "high-development theory"

cyber - ...

political economy to economics



# predictability: back to the zeitgeist

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## THE TECHNIUM

### Progression of the Inevitable

The procession of technological discoveries is inevitable. When the conditions are right – when the necessary web of supporting technology needed for every invention is established – then the next adjacent technological step will emerge as if on cue. If

inventor X does not produce it, inventor Y will. ...

the paths of technologies are inevitable. They are 1) that quantifiable trajectories of progress don't waver despite attempts to shift them (**see my Moore's Law**).

-- Kevin Kelly, 2009



# lest we forget

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## **Kurzweil Connoptions**

"Contrary to popular claims, it appears that the common versions of Moore's Law have not been valid during the last decades. As semiconductors are becoming important in economy and society, Moore's Law is now becoming an increasingly misleading predictor of future developments...

"True innovation, however, is not predictable. It requires that we remember our history so that we are not doomed to repeat it."

Ilkka Tuomi, "The Lives and Death of Moore's Law," 2002

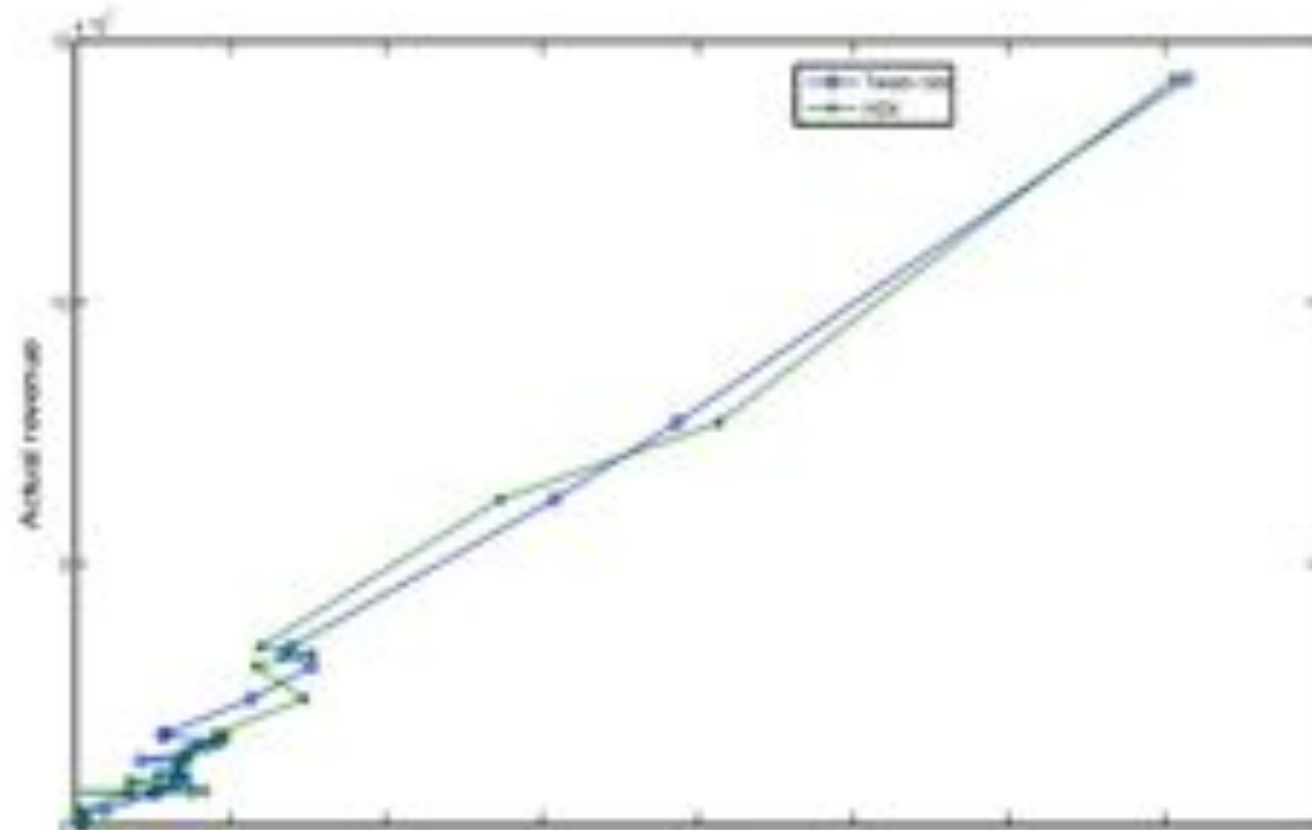


# THE TECHNIUM

## Twitter Predicts the Future **all a twitter**

The chatter in Twitter can accurately predict the box-office revenues of upcoming movies weeks before they are released. In fact, Tweets can predict the performance of films better than market-based predictions, such as **Hollywood Stock Exchange**, which have been the best predictors to date.

The **Social Computing Lab** at HP Labs in Palo Alto, CA found that using only the rate at which movies are mentioned could successfully predict future revenues. But when the sentiment of the tweet was factored in (how favorable it was toward the new movie), the prediction was even more exact. To quantify the sentiments in 3 million tweets the team used the anonymous human workers found by the Amazon Mechanical Turk to rate a sample of tweets, and then trained an algorithmic classifier to derive a rating for the rest.





# hesitations

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**goodhart not moore?**

**herd behavior**





# hesitations

**goodhart not moore?**

**herd behavior**

## Slate

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HOME / MONEYBOX : COMMENTARY ABOUT BUSINESS AND FINANCE.

### Don't Short Obama

Why political futures markets got the health care bill so wrong.

By David Green

Posted Monday, March 22, 2010, at 8:05 PM ET



It would be very difficult to tote up all the times pundits pronounced the health care bill dead, and the prospects for the Obama administration dire—especially after the election of Scott Brown in January. *Intraco*, the political futures market, which functions as a conventional-wisdom-processing machine, also got health care wrong. Check out the [chart](#) for the contract on health care reform being passed by June 2010. The contract is worth 100 if it is passed, zero if it is not. After Brown's election, it slumped to as low as 20. As recently as March 17, it was below 40. Even as late as Friday, it was trading in the mid-80s. These trading data show that "investors" in this market were skeptical of the Obama administration's ability to pass significant health care legislation, right up until the end.





# lest Surowieki forgot

Mississippi Scheme

South-Sea Bubble

Tulipomania

...

Dot.com boom?

...

sub-prime mortgages

MEMOIRS  
OF  
**EXTRAORDINARY POPULAR DELUSIONS**  
AND THE  
*Madness of Crowds.*

OC  
BY CHARLES MACKAY, LL.D.

AUTHOR OF "BENJAMIN," "THE SALAMANDER," ETC

1852



# end of empire?

---

## **a field in crisis?**

moderation- 1987, 2000, 2008

freshwater vs saltwater

## **old rebels**

Stiglitz, new Keynesians

## **new rebels**

Greenspan?

Posner??

## **marginal or purged?**

behaviorists

marxists

Richardson?



# end of empire?

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**or endurance**

*Zombie economics* --John Quiggin

"The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist."

--Keynes

The Great Moderation  
Efficient Markets  
Trickle Down  
Privatization



# just like bloggers?

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"More often than not, what seems to happen is that economists form a belief on the basis of the qualitative evidence and theoretical frameworks, and then amass whatever statistical evidence they can to support it."

Paul Romer, "Idea Gaps and Object Gaps in Economic Development," 1993

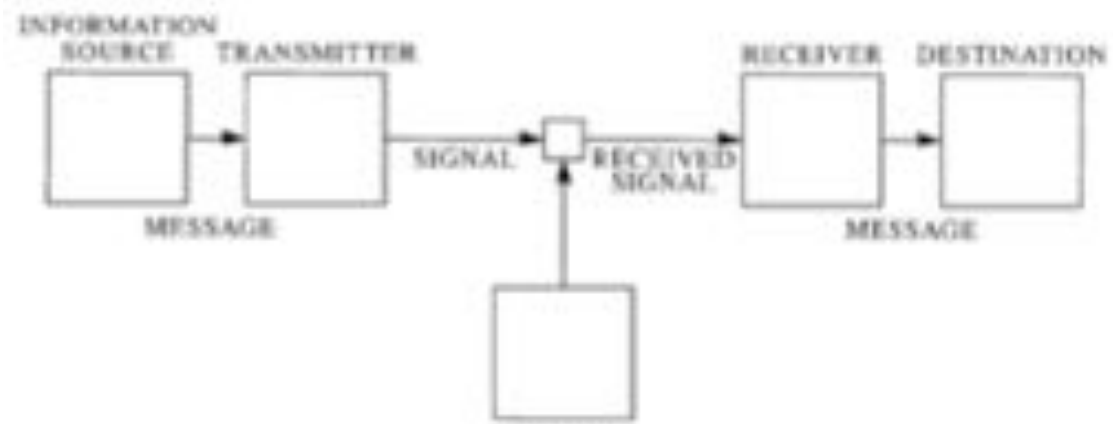


# communication, information & malfunction

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"The word communication will be used here in a very broad sense to include all the procedures by which **one mind may affect another**. This, of course, involves not only written and oral speech, but also music, the pictorial arts, the theatre, the ballet, and in fact all human behavior ... one which would include the procedures by means of which one mechanism (say automatic equipment to track an airplane and to compute its probable future positions) affects another mechanism (say a guided missile chasing an airplane)."

Warren Weaver, *The Mathematical Theory of Communication*, 1949



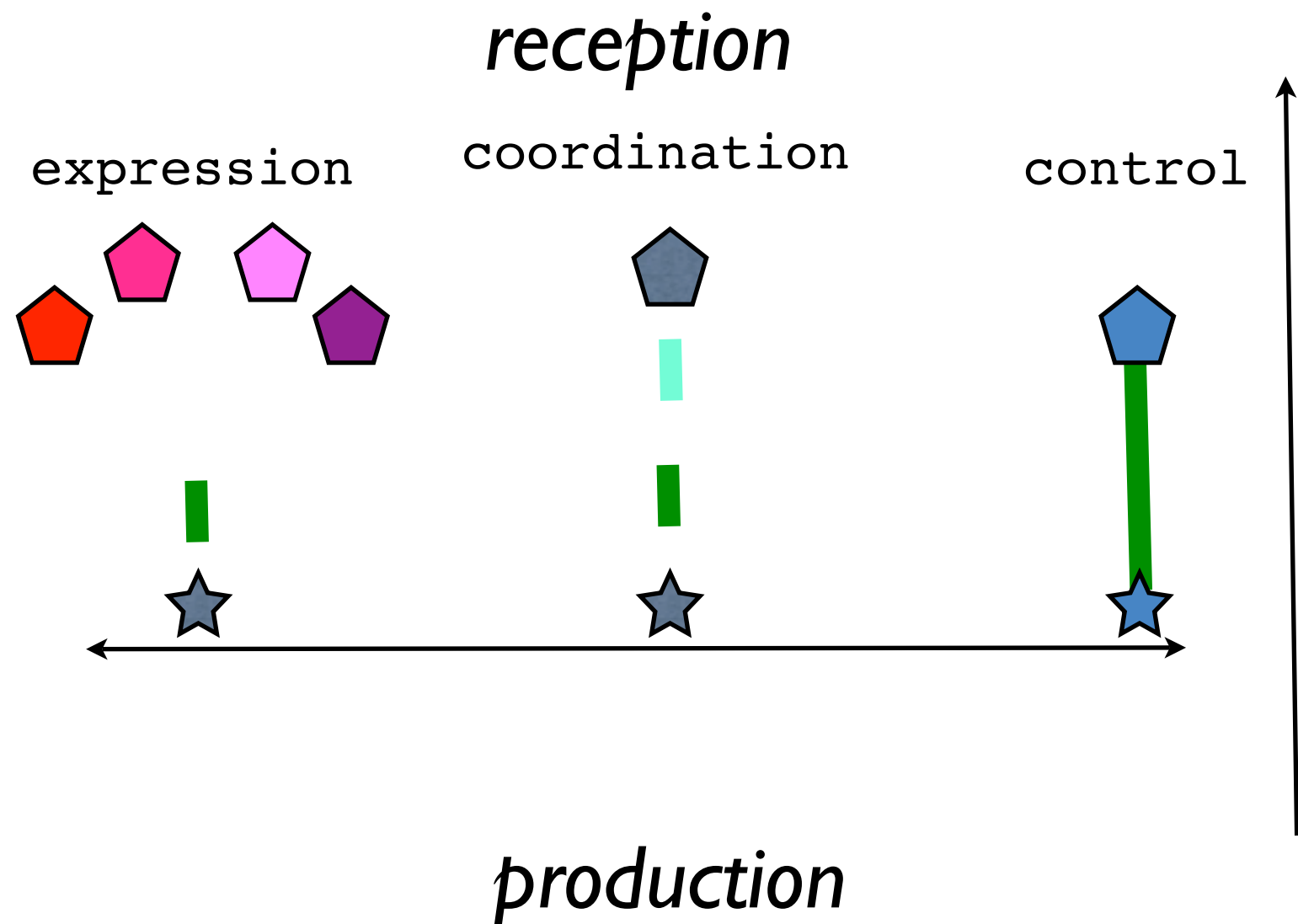
# a range of views?

"The image of literature to be found in ordinary culture is tyrannically centred on the author ... ."

Roland Barthes

"I do not, like a *jure divino* Tyrant, imagine that [readers] are my slaves or, my commodity."

Henry Fielding, *Tom Jones*



**breakdown?**



# range or binary?

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"While there is a single way in which information is perfect, there are an infinite number of ways in which information can be imperfect."

Stiglitz



# economics & *information*

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**coming into a discipline**





# antecedents

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## **Adam Smith**

"the real interests of the servants is by no means the same with that of the country, and the **most perfect information** would not necessarily put an end to their oppressions"

## **Thomas Malthus**

"the nerves which carry the information of [pain] to the brain"



## **Alfred Marshall**

"Perfectly reflex actions, such as that of breathing during sleep, are performed by the responsibility of the local nerve centres without any reference to the supreme central authority of the thinking power, which is supposed to reside in the cerebrum.

But all deliberate movements require the attention of the chief central authority: it receives information from the nerve centres or local authorities and perhaps in some cases direct from the sentient nerves, and sends back detailed and complex instructions to the local authorities, or in some cases direct to the muscular nerves, and so co-ordinates their action as to bring about the

required results"



# so to Hayek

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**1889-1992**

**self-regulation**

*The Road to Serfdom, 1944*

*The Fatal Conceit, 1988*

**knowledge & information**

“Economics and Knowledge”, 1937

“The Use of Knowledge in Society”, 1945

Hayek, 1937

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# Hayek, 1937

---

"Clearly there is here a problem of the division of knowledge which is quite analogous to, and at least as important as, the problem of the division of labour. ... instead of showing what bits of information the different persons must possess in order to bring about the result, we fall in effect back on the assumption that everybody knows everything"

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"Economics has come nearer than any other social science to an answer to that central question of all social sciences, how the combination of fragments of knowledge existing in different minds can bring about results which, if they were to be brought about deliberately, would require a knowledge on the part of the directing mind which no single person can possess"

Hayek, 1937

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# Hayek, 1937

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"... the spontaneous actions of individuals will under conditions which we can define bring about a distribution of resources ... as if it were made according to a single plan"



# Hayek, 1937

---

"... the spontaneous actions of individuals will under conditions which we can define bring about a distribution of resources ... as if it were made according to a single plan"

"equilibrium analysis ... seems to have so extraordinarily little to say about the institutions, such as the press, the purpose of which is to communicate knowledge. ... a peculiar blindness to the rôle played in real life by such institutions as advertising"

# Hayek, 1945

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# Hayek, 1945

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"*If* we possess all the relevant information, *if* we can start out from a given system of preferences and *if* we command complete knowledge of available means ..."

# Hayek, 1945

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"a problem of the utilization of knowledge not given to anyone in its totality"

# Hayek, 1945

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"a problem of the utilization of knowledge not given to anyone in its totality"

"If it is today so widely assumed that [the expert] will be in a better position, this is because one kind of knowledge, namely, scientific knowledge, occupies no so prominent a place in public imagination"

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"a problem of the utilization of knowledge not given to anyone in its totality"

"If it is today so widely assumed that [the expert] will be in a better position, this is because one kind of knowledge, namely, scientific knowledge, occupies no so prominent a place in public imagination"

"A body of suitably chosen experts may be in the best position to command all the best knowledge available--though this is of course merely shifting the difficulty to the problem of selecting the experts"

# Hayek, 1945

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# Hayek, 1945

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"almost heresy to suggest that scientific knowledge is not the sum of all knowledge. But ... a body of very important but unorganized knowledge which cannot possibly be called scientific in the sense of knowledge of general rules ..."



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"... practically every individual has some advantage over all others in that he possesses unique information of which beneficial use might be made"

"economists who regard themselves as definitely above the crude materialist fallacies ... commit the same mistake [of prejudice] toward the acquisition of such practical knowledge ... because in their scheme of things such knowledge is supposed to be 'given'"

# perfect information?

---

# perfect information?

---

**efficient market hypothesis**

# perfect information?

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## **efficient market hypothesis**

"the price system ... a mechanism for communicating information"

# perfect information?

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"the price system ... a mechanism for communicating information"

"in a system where knowledge of the relevant facts is dispersed among many people, prices can act to coordinate the separate actions"

# perfect information?

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## **efficient market hypothesis**

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"the unavoidable imperfection of man's knowledge and the consequent need for a process by which knowledge is constantly communicated and acquired"

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--Hayek



# perfect information?

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--Hayek

"The adjustment of Stock Prices to New Information" --Eugene Fama, 1969

# perfect information?

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"the price system ... a mechanism for communicating information"

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--Hayek

"The adjustment of Stock Prices to New Information" --Eugene Fama, 1969

**a Dretskean view?**



# gaining ground

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"One should hardly have to tell  
academicians that information is a  
valuable resource: knowledge is power"

George Stigler, "The Economics of  
Information," 1961



also 1945

von Neumann & Morgenstern  
*Theory of Games*, 1944

JSTOR economic journals -- hits

"perfect information"

1880-1944	0
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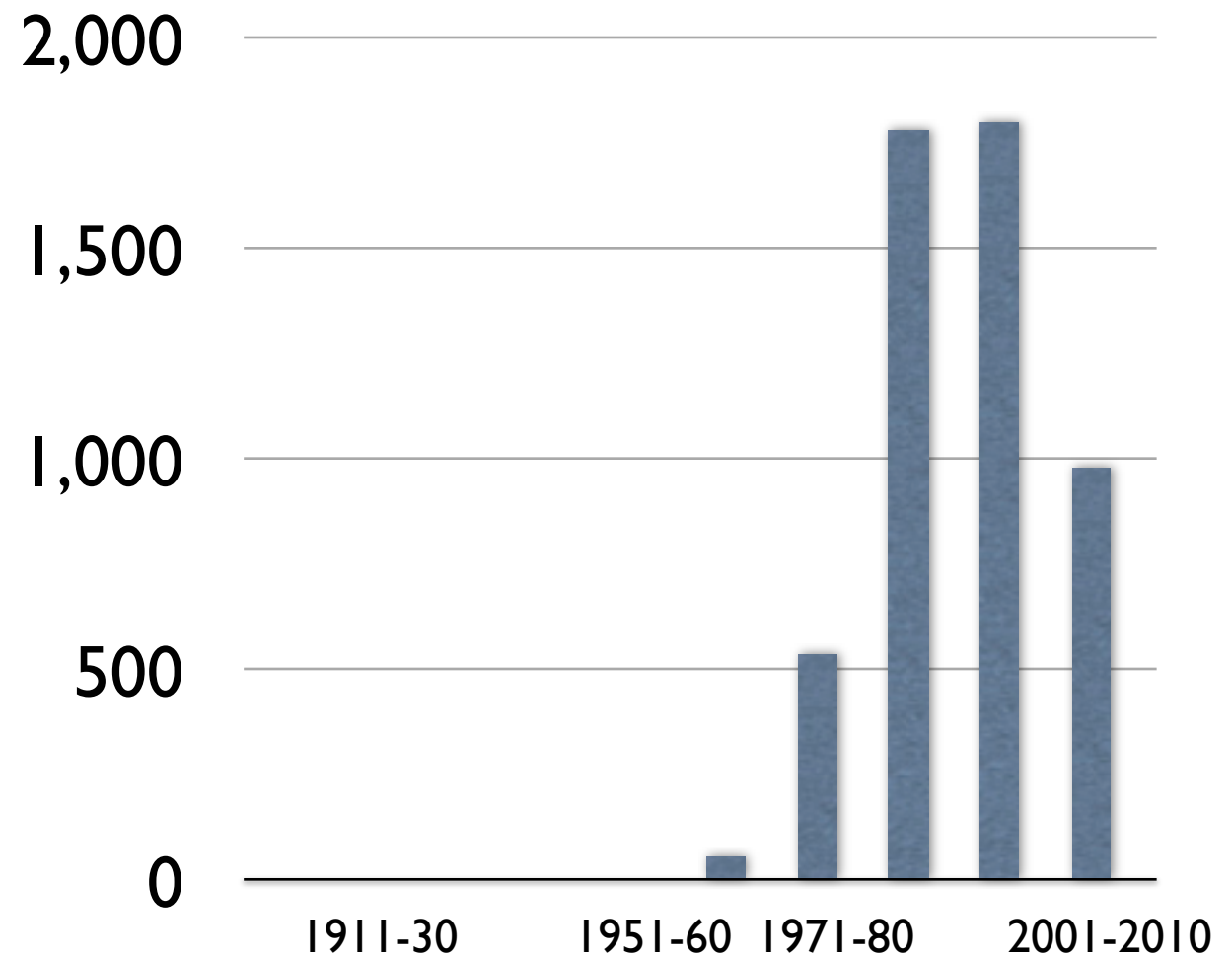
1945-1950	4
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**backbearings?**

1952, Shubik, "Information, theories of competition, and the theory of games"



# "imperfect information"





# information's place

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"Stigler ... argued that once the real costs of information were taken into account, the standard results would still hold. Information was just a transaction cost. ... Stigler was wrong."

--Stiglitz

"As the market grows in these dimensions, there will appear a set of firms which specialize in collecting and selling information. They may take the form of trade journals or specialized brokers ... there is a strong tendency towards monopoly ... a 'standard' source for trade information".

--Stigler, "The Economics of Information"



# closer to shannon?

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## **the difference that makes a difference**

"When there is uncertainty, there is usually the possibility of reducing it by the acquisition of *information*. Indeed, information is merely the negative measure of uncertainty. ... I will think rather of information as a general descriptive term for an economically interesting **category of goods** which has not hitherto been accorded much attention by economic theorists. ... economic behavior depends not only on the variables we usually regard as relevant, primarily prices, but also on signals which may themselves have little economic significance but which help reduce the uncertainty in predicting other as yet unobservable variables. ... [in equilibrium theory] the economic behavior of **individuals is governed primarily by prices ... actual economic behavior is partly governed by nonprice variables.**" --Arrow, "Information & Economic Behavior", 1973

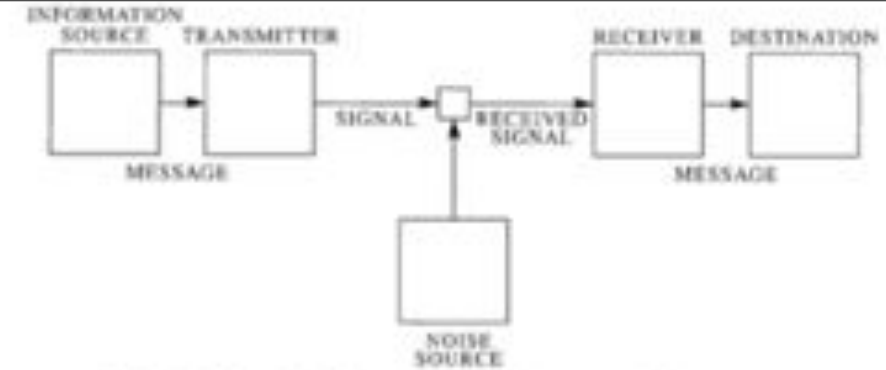


Fig. 1—Schematic diagram of a general communication system.

# communication system

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"Economy arises only if the signals transmitted are summaries of the information received . . . the costs of transmission are much lower than those of acquisition, and it is possible that joining the observers into a single organization can represent a net economy. . . . Once learned, however, it is cheaper to reuse the same system than to learn a new one . . . If external conditions change, an originally optimal communication system may no longer be the one that would be chosen. . . . Eventually the communication system may be very inefficient at handling signals, and the firm may vanish." -- Arrow





# back to knowledge

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"information as that which is  
being communicated becomes  
identical with 'knowledge' in the  
sense of that which is known"

Fritz Machlup, *The Production and  
Distribution of Knowledge*, 1963



# no problem

---

"Chicago School ...  
one simply analyzed  
the special factors  
determining the  
demand for and  
supply of  
information, just as  
one might analyze  
the factors  
affecting the market  
for wheat."

--Stiglitz

"All the aspects of knowledge--its creation,  
its storage, its retrieval, its treatment as  
property, its role in the functioning of  
societies and organizations--can be (and have  
been) analyzed with the tools of economics.

Knowledge has a price and a cost of  
production; there are markets for knowledge,  
with their supply curves, and marginal rates  
of substitution".

Herbert Simon,

"The many shapes of knowledge," 1999



# continuing dissent?

---

"knowledge" is rarely reducible  
to information"

G.B. Richardson,  
*Information & Investment*, 1960

[or "the economics of imperfect  
knowledge"]



out

"by neglecting the whole problem of information, the perfect competition model condemns itself not only to unrealism but to inadequacy even as a hypothetical system"

--Richardson



## tacit fears?

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[the idea of] "personal knowledge that is not readily transmitted as information [is a challenge to] virtually every construction of rational decision processes as the basis for modeling and explaining the behaviors of individual agents".

Cowan, David, Foray, "The Explicit Economics of Knowledge Codification and Tacitness," 2000



# nihilistic acts

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## **the Denning assumption**

dissent from methodological individualism "implies that the behavior of men is directed by mysterious forces that defy analysis and description."

Ludwig von Mises, *The Ultimate Foundation of Economic Science*, 1962

"Many resource-based theorists reject formal modelling altogether, and adopt the nihilistic stance that in a complex world any model of the firm will distort more than it illuminates."

Mark Casson, *Information and Organization*, 1997



# more problems?

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## **asymmetrical information**

"There is an incentive for sellers to market poor quality merchandise ...

The difficulty of distinguishing good quality from bad is inherent in the business world.

An asymmetry in available information has developed: for the sellers now have more knowledge about the quality of a car than the buyers

...Gresham's law has made a modified reappearance."

George Akerlof, "The Market for Lemons: Quality, Uncertainty, and the Market Mechanism," 1970

## **market failure**



# influential

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JSTOR economic journals -- hits

"asymmetric information"

1880-1970	0
1971-1980	13





but

**what do we mean by**  
*full, im/perfect, in/complete, or a/symmetrical*  
information?

and how do we perfect, complete, or make  
full or symmetrical?



# information plugs a gap?

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"I was struck by the imperfections of information ... asymmetries ... between those governing and those governed ."

"peculiar implications of the model ... it seemed not to address issues such as incentives and motivation. But much of the research was directed not at these big gaps."

--Stiglitz



# better?

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"it is hard to imagine what a  
world with perfect information  
would be like"

--Stiglitz



# moving knowledge?

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**knowledge management**

**the HP conundrum**

**sticky vs leaky**

**resolution**



# a place for wisdom?

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"We do not receive wisdom, we must discover it for ourselves, after a journey through the wilderness which no one else can make for us, which no one can spare us."

*Proust, Within a Budding Grove*



## moreover

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"perfect information ... free, complete, instantaneous, and universally available ... [is] one of the defining features of the perfect market ... "

"at the same time, both the perfect and the actual market structure ... depend on information being a commodity, ... costly, partial, and deliberately restricted"

James Boyle, *Shamans, Software & Spleen*, 1996



# back to the state

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**Society for the Distribution of Useful  
Knowledge**

VS

**Habermas**

news as commodity vs  
news as informing the public sphere



and so to development

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# spatial divisions

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"somewhere in the world a new opportunity  
for the use of some raw material, say  
tin, has arisen ..."--Hayek, 1945

**divisions of**

commodities

labor

knowledge



# localization

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[T]he mechanical faculty of Lancashire is said to be due to the influence of Norman smiths who were settled at Warrington by Hugo de Lupus in William the Conqueror's time. And the greater part of England's manufacturing industry before the era of cotton and steam had its course directed by settlements of Flemish and other artisans; many of which were made under the immediate direction of Plantagenet and Tudor kings. These immigrants taught us how to weave woollen and worsted stuffs, .... They taught us how to cure herrings, how to manufacture silk, how to make lace, glass, and paper, and to provide for many other of our wants.

Alfred Marshall, *Principles of Economics*, 1920 [1890]



# mysteries

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When an industry has thus chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighbourhood to one another. **The mysteries of the trade become no mysteries; but are as it were in the air,** and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. And presently subsidiary trades grow up in the neighbourhood, supplying it with implements and materials, organizing its traffic, and in many ways conducing to the economy of its material. -- Marshall



# limits to localization?

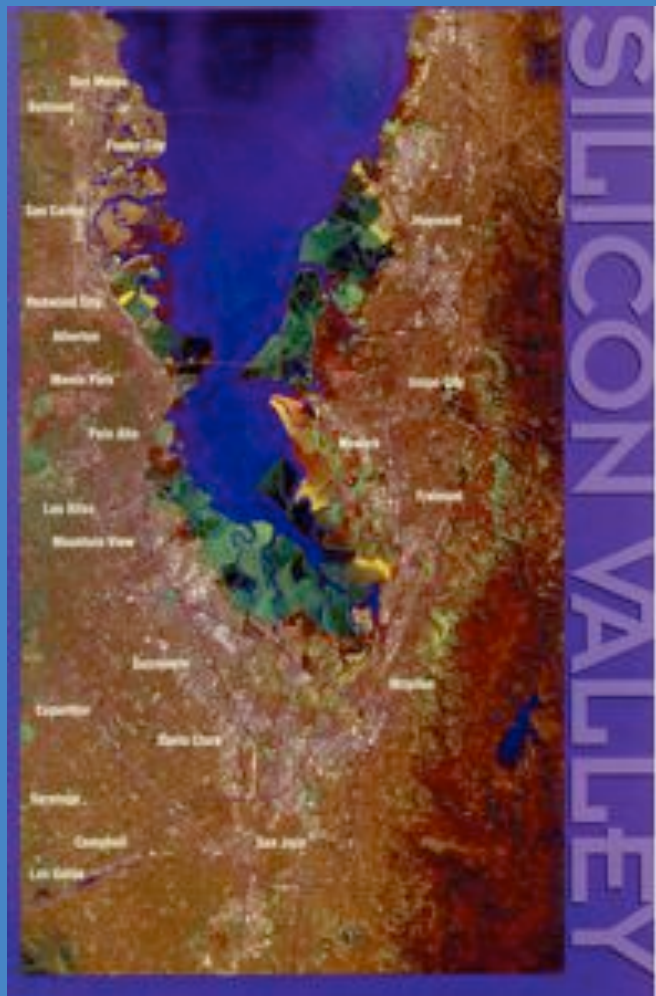
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**Every cheapening of the means of communication, every new facility for the free interchange of ideas between distant places alters the action of the forces which tend to localize industries.** Speaking generally we must say that a lowering of tariffs, or of freights for the transport of goods, tends to make each locality buy more largely from a distance what it requires; and thus tends to concentrate particular industries in special localities: but on the other hand everything that increases people's readiness to migrate from one place to another tends to bring skilled artisans to ply their crafts near to the consumers who will purchase their wares. --Marshall



# cheaper and cheaper

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## **regions of innovation**

radio, television  
oscillator, microprocessor  
personal computer  
ethernet, web  
search  
web 2.0

## **regional policy**

market making or market interference



## gaps

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"human capital .. could be studied using the economic tools developed for objects"

"Must economic theory recognise a different kind of good--ideas--if it is to explain .. growth?... If there are only object gaps, the implications for poor countries are much more pessimistic than if there are also idea gaps"

--Romer



## gap bridging

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"Idea gaps, in contrast are relatively easy to solve. ... an important fraction of worldwide poverty may be due to an idea gap that can be reduced at relatively low cost. ... the world already possess the knowledge needed to provide a decent standard of living for everyone on Earth ... crucial pieces of specialized, highly trained human capital can be put to work domestically by inviting in managers and technicians." --Romer



# gap bridging

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## **the object gap disappears?**

"Access... through unimpeded flows of the capital goods that are produced in industrialized nations."

..."absorption capacity ..."





# disequilibrium?

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**economic discourse**

**communication theory**

**economics and information/  
knowledge**

**the place of information**