

GM 4

Kobayashi
Marius

~~Sackett~~
~~last 28th~~

Vance Gordon
703-695-4311

What we had was stability

- ~~long-term goal~~
- long-term goal of ATT to finance growth
- Broadcast oligopoly (local & net network)
- FCC & Congress
- mkt & prices: advertisers; only game, worked
phone users; cat's detecting, worked

New tech

- radar, microwave, higher freqs
- new uses: computer data transfer
distinct signals
- threat to stability, mkt power, political status quo
- cost/price differential created
unsustainable incentives
- MCI financing
- Specialized Common Carriers
MCI & Dathan in earnest
FCC wanted single-case yardstick
- Satellites -

- Key entry point for competition
- Model for SCC competition & open entry
- Undermined main monop barrier to new network
& comp in TV

ATT antitrust - money in switches, primarily local.

MCI "didn't work"

'96 Det - local comp.
"didn't work"

Assent of cong but:
No short ban to sue
No tech limit to open entry
3-5 years "trial"
Takes nets limit to pricing power

September 2005

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
28	29	30	31	1	2	3
	Gelman renewal deadline 7:00 a Amtrak #2102 Ur 11:00 a Stuart Sucherm 1:00 p Scher 3:00 p Amtrak #2123 N	Jody's BD 11:30 a Dr. Davis (Dr. M 12:00 p Nanci 1:30 p Lisa - 416 2:30 p Dr. Douglas Feld 4:00 p Kim Cruze 6:30 p Nan at Teal Cent	9:30 a GMU Class	Bermuda Ask Abigail and Clay re January vacation March/April vacation? 7:00 a Joe will pick you 8:40 a US Air from Natio 4:00 p Kim Cruze	Jody off Bermuda	Bermuda
4	5	6	7	8	9	10
Bermuda	Labor Day Bermuda	Bermuda 12:45 p US Air from Ber	The Lowell Hotel; conf. 9:30 a GMU Class - Rol 4:00 p Tom will drive se 5:00 p Amtrak #2122 fro	Ask Abigail and Clay re 8:00 a Pru Bd. Mtgs 8:30 a Dr. Resnick; 30 B 1:00 p NYC - Sally 3:00 p Amtrak #2123 fro	10:00 a Lisa at GMU 11:00 a Tara Laskowski 4:00 p Kim Cruze	1:20 p Yankees vs Red
11	12	13	14	15	16	17
Grandparents' Day Patriot Day p.m. Barton and Rebec	A.M. Passport BMW pic Barton/Rebecca	Barton/Rebecca 4:00 p Kim Cruze	Barton/Rebecca 8:00 a GMU Class - Lar	Ask A & C re: Thanksg Make Thanksgiving and Finish fall clothes shopp 10:00 a Dr. Sibel, 2021 12:00 p Mike Kelley, Fai 3:00 p Kim Cruze - Mar 4:00 p Kim Cruze	10:30 a Polsby, Hazlett, 12:30 p Baker,Goldberg 2:00 p CALL BRIAN LAI 3:00 p UST meeting at f 4:30 p Penny Y	Citizenship Day (Constit
18	19	20	21	22	23	24
5:00 p Thompson's; 356	8:00 a CARE OF TREE 8:00 a Sandy Climan - S 10:00 a David Wilson 12:00 p Ed Miller for lun 2:00 p ??Jody's quilt "tru	Alice - dinner 10:00 a Lisa 3:00 p Tentative Kim Cr 4:00 p Kim Cruze 5:00 p Don Baker - Nats	Autumnal Equinox Craig surgery 9:30 a GMU Class - Ha 1:00 p Joe - BEI	12:30 p Charlie Schott, 3:00 p Kim Cruze - Mar 4:00 p Kim Cruze 6:30 p John Deutch - di		
25	26	27	28	29	30	1
	10:00 a Meyer Emco at	3:00 p Kim Cruze - Mar 4:00 p Kim Cruze	9:30 a GMU Class - Wil	4:00 p Kim Cruze	10:00 a Anya 11:30 a Andrew Murphy	Furnace check - both ho Finalize Mar/Apr vacatic ? CLS leaf removal; hov 3:00 p New Appt.

defn natural monop - protect public
 monopoly good - protect the monop
~~and NMAA - question for class~~
~~King's~~

CTW comments

scale/scope

- Nam Elkin
- King's
- (ICC)
- 34 Det
- 96 Det

scope

Cartaphone / Wackphone CPE/F.A.
 MC 1,390

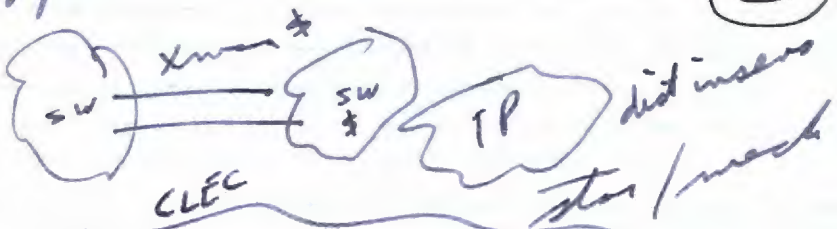
Computer 2 -
 Downcast / SCC

inf soc
 bus soc

???

74

Brattle 8
 Garfield 2



Brandt flag - game reg?

Cable - "beg" - indecency - public interest

Sepr infra & soc ; layered reg?

* intel at the edge vs ctr (switch... Skype, Gnutella)

* "Univ soc" : switchboard / exchanges

Brand X - inf soc a telecom soc?

- if inf soc, block Vonage? Google?

Chandler

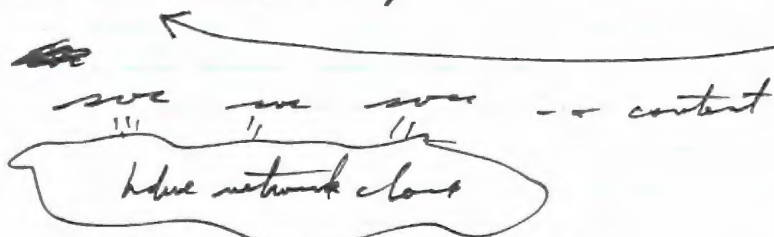
corp \rightarrow monop - corp
confusion \rightarrow giving order - confusion / proliferation
Vail, system, capital, Sanoff
"Find a monop. . .", but Paley

- Skips over a major focus of this course

corp \rightarrow monop \rightarrow corp
not just tel, but beg, then Internet then converg.

- Is software really such a fundamental change?

• soc \leftrightarrow have infrastructure \leftrightarrow regulated



WW I & 2 net security, nat'l mobilization, monop

TLP

blurring of lines: tech vs soc vs reg

34 Act = 27 Act + common carrier reg

but recog "comm"

(P 9)

Beg = amateurs, amateurs, but: H.P. Davis, Herbert Howe
Robert Sanoff, Bill Paley
Ed Young.

COMMUNICATIONS POLICY & LAW SEMINAR

Law 614-001

Professors Whitehead and Sockett

Seminar Class #8: October 12, 2005

Guest Speaker: Dale Hatfield, Adjunct Professor, University of Colorado at Boulder, former Chief of the Office of Engineering and Technology and Chief Technologist at the FCC (see Prof. Bios on TWEN). Please prepare 1-2 questions for the guest lecturer.

Written Assignments Due: If not already submitted, two copies in class of the student's 1-3 page outline of his or her paper proposal. Please e-mail all items to Profs. Whitehead and Sockett either before or after class.

Reading Assignments:

Seminar Class #8: New Approaches to Spectrum Policy

Themes: Proposals for ways to evolve the FCC's current "command and control" approach to spectrum policy into a more integrated, market-oriented approach that minimizes regulatory intervention while protecting against interference: spectrum flexibility, secondary markets, and commons access.

Please read:

1) ASR:

- call Dale*
- i) *Policing the Spectrum Commons*, by Philip J. Weiser and Dale N. Hatfield, paper presented at TPRC 2004,
<http://web.si.umich.edu/tprc/papers/2004/300/policing%20spectrum%20commons.pdf>.
 - ii) *FCC Policy Statement for Promoting the Efficient Use of Spectrum by Encouraging the Development of Secondary Markets*, FCC 00-401 (Dec. 1, 2000),
http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-00-401A1.pdf.

DER SPIEGEL 27/2005 - July 4, 2005

URL: <http://www.spiegel.de/international/spiegel/0,1518,363663,00.html>

SPIEGEL Interview with African Economics Expert

"For God's Sake, Please Stop the Aid!"

The Kenyan economics expert James Shikwati, 35, says that aid to Africa does more harm than good. The avid proponent of globalization spoke with **SPIEGEL** about the disastrous effects of Western development policy in Africa, corrupt rulers, and the tendency to overstate the AIDS problem.



Horst Friedrichs

Economist James Shikwati:
"Despite the billions that have poured in to Africa, the continent remains poor."

SPIEGEL: Mr. Shikwati, the G8 summit at Gleneagles is about to beef up the development aid for Africa...

Shikwati: ... for God's sake, please just stop.

SPIEGEL: Stop? The industrialized nations of the West want to eliminate hunger and poverty.

Shikwati: Such intentions have been damaging our continent for the past 40 years. If the industrial nations really want to help the Africans, they should finally terminate this awful aid. The countries that have collected the most development aid are also the ones that

are in the worst shape. Despite the billions that have poured in to Africa, the continent remains poor.

SPIEGEL: Do you have an explanation for this paradox?

Shikwati: Huge bureaucracies are financed (with the aid money), corruption and complacency are promoted, Africans are taught to be beggars and not to be independent. In addition, development aid weakens the local markets everywhere and dampens the spirit of entrepreneurship that we so desperately need. As absurd as it may sound: Development aid is one of the reasons for Africa's problems. If the West were to cancel these payments, normal Africans wouldn't even notice. Only the functionaries would be hard hit. Which is why they maintain that the world would stop turning without this development aid.

SPIEGEL: Even in a country like Kenya, people are starving to death each year. Someone has got to help them.

Shikwati: But it has to be the Kenyans themselves who help these people. When there's a drought in a region of Kenya, our corrupt politicians reflexively cry out for more help. This call then reaches the United Nations World Food Program -- which is a massive agency of **apparatchiks** who are in the absurd situation of, on the one hand, being dedicated to the fight against hunger while, on the other hand, being faced with unemployment were hunger actually eliminated. It's only natural that they willingly accept the plea for more help. And it's not uncommon that they demand a little more money than the respective African government originally requested. They then forward that request to their headquarters, and before long, several thousands tons of corn are shipped to Africa ...

SPIEGEL: ... corn that predominantly comes from highly-subsidized European and American farmers ...

Geller 10/5/05

1943 content reg = Pottsville
NBC — fiduciary.
1st level FA applic in bag

69 Red Lion

Turner (must carry) SC refund to septed
Red Lion to collect.

O'Brien — content neutral.
vs. strict scrutiny for directly content reg
narrowly tailored, no reasonable alt

Pacific based on personal awareness
not Red Lion

"lifted eyebrow" — *Tagliare* India

~~trans~~

- 1 ~~Robinson~~ Teach,
Early history radio
 - 2 Robinson Legislation, monopoly, process
340, 96
 - 3 Lamb network radio & TV
cable
TV & politics (+ internet)
 - 4 Goldberg p competition, p 96, satellites
Skype, Flarion, ... innov & reg.
 - * 5 Wiley q integrating competition
HDTV stds; color, bc TV, computer industries
 - 6 Geller • process & public interest
univ soc
beg, mult med corp
 - 7 Hatfield spectrum, auction, property rights
tech - softening of radios, wireless
ask Haylett.
 - 8 Baker anti trust, intl.
 - 9 Scalia BrodX
• scrutiny the Act, forbearance, judicial review
 - 10 Abrams FA & beg
content reg, politics, fairness
spectrum scarcity
 - 11 Goldberg →
 - 12 student
 - 13 student
 - 14 student
- content regulation & conduit.
- copyright, intellectual property, Grokster, Napster
- privacy

class 9/28/05

radio & rational

Begin & state

WWI - tubes \leftarrow ^{xmit} _{rec}

Early radio AM - only known tech

Tuning - BW control
- AM control bc band

RCA - patents for radio use

Purpose of radio was to sell tubes NBC
~~to pay tub~~

Radiola v/GE, ~~the~~ Westinghouse

Armstrong - FM 30's

Sarnoff wanted to sell radios, devel TV
* FM ~~is~~ stalled

TV & FM early 40's

Same model

RCA as owner of patents/tech + NBC-TV

WW2 \leftarrow ^{freeze} new/better tech for picture tubes, UHF xmit & rec

- Old sets for FM & TV to work

- VHF & FM as we now know it, NTSC

- UHF postponed - "TV Now" = no UHF
= sell TV sets

- CBS color

- Sarnoff stall - consolidate \leftarrow ^{meter} _{info position}

- RCA/NBC color TV stall

- licensed to all (practical)

HD TV \leftarrow ^{use to avoid giving up UHF spectrum}
no dominant player, ~~not~~
- net or info

- computer

- 1st major obsolescing of installed base

- TV/computer merging via IP - not foreseen

cable
disturb
local
FCC
How

ATT
cable control of sat

BC bands → FCC
H'mond →

Freeze
Protect UHF scheme UHF
Must carry
No more dist signals
No prog w/o explicit copyright
revenue

ATT rates
cable at 20-30 - power

- 1) alt to expansion ATT move → sat
- 2) copyright compromise to end freeze

WTBS * Pat Robertson
WYAH - Bob Rosner
MSG Net. Bob Rosner
CableSet Access Entity
group of cable ops
looking for content
* Bob Rosner

Real program TV
- Viewer
- Sig Cont
* Van Decker
* Russ Karp

O'Brien std content

Primer, Big Bus & Radio, ~~1939~~ 1939

Chap 12 250 - 276

Radio Group & Telephone Co Make Lease

	Wireline Telephony	Wireless Telephony	Radio Broadcast	TV Broadcast	Cable Television	Satellite TV	Internet
Who regulates							
Mobility							
Voice, data, video							
Private or Mass							
How make money							
Bandwidth							
Interactivity							
Content vs. Conduit							
Where evolving							

30 camera

~~Fred Silver~~

~~Herb Schlosser~~

~~Jim Rosenthal~~

~~The Economics of the X
Radio Industry, William James
Lundberg~~

203-025-9667

841-8000

Paper

Teleprompter

Brand X

Freeze

M.F.J.

NBC - Red Line -

96-UNE-P

VHF - cable copyright.

Private microwave

ERC Gen Data 40
7 small / 1 large

Monday, August 29, 2005

Amtrak res. no. 13A3CB. Redeem with coupon and pay First Class fee.

7:00a -- Amtrak #2102 from Union Station to NYP

9:59a -- Arrive NYP

10:05a - Tri State -- res. no. 570056 (800-722-7122, 212-777-7979)

11:00a -- Stuart Sucherman, 212-827 0101

1140 Avenue of the Americas, 17th Fl., Suite 1700

(6th Avenue between 44th & 45th Streets)

1:00p -- Dr. Scher; 353 East 68 Street, 2nd Fl. 646-422-4330

3:00p -- Amtrak #2123 from NYP to Union Station

6:09p -- Arrive Union Station

Top 10

- FRC Gen Order 40
Smith/Hoover
- VHF allocation
- NBC - Red Lion -
- cable freeze
- private microwave
- MCI
- Teleprompter + cable copyright
- 74 case + MFJ
- 96 Act & UNE-P
- Brud X

703 358-9255

Room: 348

Recording Info Infr
for the Industrial Age

current
topics

30-90

- 1 -
- 2 Overview/History ~~② Schaller 3 (55-106) (50 pp)~~
~~③ Schaller 3 (22-28) (50 pp)~~
- 3 Genesis/Tel ~~③~~ Robison '34 Act
③ NM/US 1894-1940
- 4 Beg 1 9/14 ~~④ Schaller 5 Radio, TV, Movie (137-176) (39 pp)~~
~~⑤ Tel Why Beg Beg~~
~~②~~
- 5 Tel 2/Beg ~~⑥~~ Goldberg
- 6 Beg 2 ~~⑦~~ Wiley
- 7 Beg 3 ~~⑧~~ Gellb ~~⑨~~
- 8 Tel 3 Hatfield
- 9 End 1 Baker
- 10 End 2 Scalia
- 11 Ahead 1 Thompson ~~⑩~~
- 12 Ahead 2 ~~⑪~~ ~~Monte White, M...~~
- 13 ~~⑫~~
- 14 ~~⑬~~

intl (reading?)
state TV
state Shypp

color TV state
miscany

Religion (NBC)
security & culture
beginning of coffee

Former security
living quarters
pulling together

#2
L: tech
cow: heat
L: mby
paper topics

written: pt pt / teleg, the teleph

~~standard~~

= electronic standards

WW I vac tubes

Marconi & AT&T patent rights prior to WW I

1922 titles sold separately

1919-20 RCA held "wireless" rights; AT&T "sound" telephony: comm com

recap

KDKA - H.P. Davis (lies)

Changft.

transmission & amplif.

WEAF - comm carrier.

Jay Sigs

Movie - costly AT&T control

networks

key.

interference / original

NBC

Red Blue

CBS & ABC

news to
papers
Titanic
Navy.

news
newspapers

adv

recorded music
= uplft to high power
sheet music sales

Finance
govt tax on tubes
adv
sponsorships or
microscopic adv

WEAF

turning = privacy

1922
60-500+

Communications Policy and the Law

Class Meeting Dates

	<u>Date</u>	<u>Topic</u>	<u>Speaker</u>		<u>Alt Speakers</u>		
1	Aug 24	Introduction		<i>Intro</i>			
2	Aug 31	Overview		<i>Overview & G1</i>			
3	Sep 07	Genesis 1	<i>Robinson</i>	<i>G2</i>			
4	Sep 14	Genesis 2 <i>Beq 1</i>	Lamb	<i>Beq 1</i>	<i>Lamb?</i>		
5	Sep 21	Broadcasting <i>2</i>	Goldberg	<i>Tel 1</i>		202-719-7010	
6	Sep 28	Broadcasting <i>3</i>	Wiley	<i>Beq 2</i>			
7	Oct 05	Competition 1	Geller	<i>Beq 3</i>	<i>+Abrams?</i>	202-362-4241	
8	Oct 12	Competition 2	Hatfield	<i>Tel 2</i>		303-589-4546	
9	Oct 19	End of Monopoly 1	Baker	<i>End 1</i>		202-663-7821	
10	Oct 26	End of Monopoly 2	Scalia	<i>End 2</i>		202-479-3116	
11	Nov 02	The Way Ahead 1	Flower		<i>Sidak, J. Cutter / Thompson</i>	202-862-5892	called
12	Nov 09	The Way Ahead 2			<i>Martin?</i>		
13	Nov 16	Presentations			<i>White?</i>		
	Nov 23	-					
14	Nov 30	Presentations					
	Dec 05	Papers due					
					Abrams? Lamb?		
					Thompson	703-917-0606	
					Cutter	212-878-6163	
					Lamb		Date TBD
					White	202-463-4150	

Dale - Table of Alloc? Hoover
CTW:

(3) Why FCC?

84 Cable Act? 92 Cable Act reg
76 dereg
Broad X ~~BC Flag~~
Freeze - BC Flag.

* BC security obsolete
Bernersford.

Don Baker 8/18/05

Law vs policy - meaningful?

Admin reg agency vs. antitrust

FCC, FTC, Justice

- Where & why has law inhibited adoption of new & better soc
- retarded

What are the most important, long-lasting examples?

Is the process self-corrective?

Current topics

Broad X

Teles TV

universal soc for what?

NBC - spectrum
sub int broad
mandate

VHF freeze
cable freeze

Don

- pref for policy may covert cross-subsidy

- universal soc - who pays, how dists?
extension to broadband, ...

- Random chance politically

ATT - how did it happen

antitrust in US: extraordinary that Justice not bring
antitrust div budget doubled
airline dereg.

oil price ↑, inflation

∴ argument for more competition
this looking for things to do
Sherman Act → policy

Don: need time to work on polit cycle process
get cartography on screen
example of how comp can be introduced w/ benefit

supervising legal remedies not role for court
or arbitrator

MFS system not illustrative - bussey

Core idea of Baxter settlement - ILEC out of value-added
LD
:

Current topics?

paper on bottleneck/morop compelling access
JV w/ Eur lawyer.
greater conf

Softbank - compet ~~over~~ bb using NTT elements

Reading?

Henry, Lisa 8/10/05

Overview/framework

What existed before sats? What impact did sats have?
1st task is keep genie in bottle; then let it be itself
Sats revolutionary

intl: monopolies dealing w/ monopolies

outside US: everyone was monopoly PTT

US voice, record

ATT

WHI
RCA
ITT

} FCC org cartel 1

cable IRU

- Com Sat Act 1962(?)

Creation of Comsat

Much other, big deal

avoid competition

Comsat directed to create IntelSat

industrial policy concern of world

US ~~has~~ only sat industry

Comsat given monopoly

ownership by Comsat

FCC reg
carriers to use
sat chs
1:1

- Open Skies 1969

space segment

earth stars

ATT excluded initially

Non common carrier

- mid 80's compet intl sats

US policy under private comp w/ IntelSat

'88 PAS-1

every country approved

WH policy - start
for off-air
defense
in nat'l interest

(DBS/DTH)

FSS
BSS
NSS

Intelecom privatized
Comcast elim

DSCO

WTO

consolidation, privatization, private eq

→

Indium

DBS

Mobile sat

Inmarsat

~~DBS~~ SHVA

Syllabus

NOTE: Where it is feasible, a syllabus (headnote) will be released, as is being done in connection with this case, at the time the opinion is issued. The syllabus constitutes no part of the opinion of the Court but has been prepared by the Reporter of Decisions for the convenience of the reader. See *United States v. Detroit Timber & Lumber Co.*, 200 U.S. 321, 337.

SUPREME COURT OF THE UNITED STATES

Syllabus

NATIONAL CABLE & TELECOMMUNICATIONS
ASSOCIATION ET AL. v. BRAND X INTERNET
SERVICES ET AL.

CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR
THE NINTH CIRCUIT

No. 04–277. Argued March 29, 2005 –Decided June 27, 2005*

Consumers traditionally access the Internet through “dial-up” connections provided via local telephone lines. Internet service providers (ISPs), in turn, link those calls to the Internet network, not only by providing a physical connection, but also by offering consumers the ability to translate raw data into information they may both view on their own computers and transmit to others connected to the Internet. Technological limitations of local telephone wires, however, retard the speed at which Internet data may be transmitted through such “narrowband” connections. “Broadband” Internet service, by contrast, transmits data at much higher speeds. There are two principal kinds of broadband service: cable modem service, which transmits data between the Internet and users’ computers via the network of television cable lines owned by cable companies, and Digital Subscriber Line (DSL) service, which uses high-speed wires owned by local telephone companies. Other ways of transmitting high-speed Internet data, including terrestrial- and satellite-based wireless networks, are also emerging.

The Communications Act of 1934, as amended by the Telecommunications Act of 1996, defines two categories of entities relevant here. “Information service” providers—those “offering . . . a capability for [processing] information via telecommunications,” 47 U.S.C.

*Together with No. 04–281, *Federal Communications Commission et al. v. Brand X Internet Services et al.*, also on certiorari to the same court.

Syllabus

§153(20)—are not subject to mandatory regulation by the Federal Communications Commission as common carriers under Title II of the Act. Conversely, telecommunications carriers—i.e., those “offering . . . telecommunications for a fee directly to the public . . . regardless of the facilities used,” §153(46)—are subject to mandatory Title II regulation. These two classifications originated in the late 1970’s, as the Commission developed rules to regulate data-processing services offered over telephone wires. Regulated “telecommunications service” under the 1996 Act is the analog to “basic service” under the prior regime, the *Computer II* rules. Those rules defined such service as a “pure” or “transparent” transmission capability over a communications path enabling the consumer to transmit an ordinary language message to another point without computer processing or storage of the information, such as via a telephone or a facsimile. Under the 1996 Act, “[i]nformation service” is the analog to “enhanced” service, defined by the *Computer II* rules as computer-processing applications that act on the subscriber’s information, such as voice and data storage services, as well as “protocol conversion,” i.e., the ability to communicate between networks that employ different data-transmission formats.

In the *Declaratory Ruling* under review, the Commission classified broadband cable modem service as an “information service” but not a “telecommunications service” under the 1996 Act, so that it is not subject to mandatory Title II common carrier regulation. The Commission relied heavily on its *Universal Service Report*, which earlier classified “non-facilities-based” ISPs—those that do not own the transmission facilities they use to connect the end user to the Internet—solely as information service providers. Because Internet access is a capability for manipulating and storing information, the Commission concluded, it was an “information service.” However, the integrated nature of such access and the high-speed wire used to provide it led the Commission to conclude that cable companies providing it are not “telecommunications service” providers. Adopting the *Universal Service Report’s* reasoning, the Commission held that cable companies offering broadband Internet access, like non-facilities-based ISPs, do not offer the end user telecommunications service, but merely use telecommunications to provide end users with cable modem service.

Numerous parties petitioned for review. By judicial lottery, the Court of Appeals for the Ninth Circuit was selected as the venue for the challenge. That court granted the petitions in part, vacated the *Declaratory Ruling* in part, and remanded for further proceedings. In particular, the court held that the Commission could not permissibly construe the Communications Act to exempt cable companies provid-

“basic svc” → “telecom svc”
“enhanced svc” → “inf svc”

Syllabus

ing cable modem service from mandatory Title II regulation. Rather than analyzing the permissibility of that construction under the deferential framework of *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, however, the court grounded that holding in the *stare decisis* effect of its decision in *AT&T Corp. v. Portland*, 216 F.3d 871, which had held that cable modem service is a "telecommunications service."

Held: The Commission's conclusion that broadband cable modem companies are exempt from mandatory common-carrier regulation is a lawful construction of the Communications Act under *Chevron* and the Administrative Procedure Act. Pp. 8-32.

1. *Chevron's* framework applies to the Commission's interpretation of "telecommunications service." Pp. 8-11.

(a) *Chevron* governs this Court's review of the Commission's construction. See, e.g., *National Cable & Telecommunications Assn., Inc. v. Gulf Power Co.*, 544 U.S. 327, 333-339. *Chevron* requires a federal court to defer to an agency's construction, even if it differs from what the court believes to be the best interpretation, if the particular statute is within the agency's jurisdiction to administer, the statute is ambiguous on the point at issue, and the agency's construction is reasonable. 467 U.S. at 843-844, and n. 11, 865-866. The Commission's statutory authority to "execute and enforce" the Communications Act, §151, and to "prescribe such rules and regulations as may be necessary . . . to carry out the [Act's] provisions," §201(b), give the Commission power to promulgate binding legal rules; the Commission issued the order under review in the exercise of that authority; and there is no dispute that the order is within the Commission's jurisdiction. Pp. 8-10.

(b) The Ninth Circuit should have applied *Chevron's* framework, instead of following the contrary construction it adopted in *Portland*. A court's prior construction of a statute trumps an agency construction otherwise entitled to *Chevron* deference only if the prior court decision holds that its construction follows from the unambiguous terms of the statute and thus leaves no room for agency discretion. See *Smiley, supra*, at 749-751. Because *Portland* held only that the best reading of §153(46) was that cable modem service was "telecommunications service," not that this was the only permissible reading or that the Communications Act unambiguously required it, the Ninth Circuit erred in refusing to apply *Chevron*. Pp. 10-14.

2. The Commission's construction of §153(46)'s "telecommunications service" definition is a permissible reading of the Communications Act at both steps of *Chevron's* test. Pp. 14-29.

(a) For the Commission, the question whether cable companies providing cable modem service "offe[r]" telecommunications within

Syllabus

§153(46)'s meaning turned on the nature of the functions offered the end user. Seen from the consumer's point of view, the Commission concluded, the cable wire is used to access the World Wide Web, newsgroups, etc., rather than "transparently" to transmit and receive ordinary-language messages without computer processing or storage of the message. The integrated character of this offering led the Commission to conclude that cable companies do not make a stand-alone, transparent offering of telecommunications. Pp. 15-17.

(b) The Commission's construction of §153(46) is permissible at *Chevron's* first step, which asks whether the statute's plain terms "directly address[es] the precise question at issue." 467 U.S. at 843. This conclusion follows both from the ordinary meaning of "offering" and the Communications Act's regulatory history. Pp. 17-25.

(1) Where a statute's plain terms admit of two or more reasonable ordinary usages, the Commission's choice of one of them is entitled to deference. See, e.g., *Verizon Communications Inc. v. FCC*, 535 U.S. 467, 498. It is common usage to describe what a company "offers" to a consumer as what the consumer perceives to be the integrated finished product, even to the exclusion of discrete components that compose the product. What cable companies providing cable modem service "offer" is finished Internet service, though they do so using the discrete components composing the end product, including data transmission. Such functionally integrated components need not be described as distinct "offerings." Pp. 17-21.

(2) The Commission's traditional distinction between basic and enhanced service also supports the conclusion that the Communications Act is ambiguous about whether cable companies "offer" telecommunications with cable modem service. Congress passed the Act's definitions against the background of this regulatory history, and it may be assumed that the parallel terms "telecommunications service" and "information service" substantially incorporated the meaning of "basic" and "enhanced" service. That history in at least two respects confirms that the term "telecommunications service" is ambiguous. First, in the *Computer II* order establishing the terms "basic" and "enhanced" services, the Commission defined those terms functionally, based on how the consumer interacts with the provided information, just as the Commission did in the order under review. Cable modem service is not "transparent" in terms of its interaction with customer-supplied information; the transmission occurs only in connection with information processing. It was therefore consistent with the statute's terms for the Commission to assume that the parallel term "telecommunications service" in §153(46) likewise describes a "pure" or "transparent" communications path not necessarily separately present in an integrated information processing service.

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from the end-user's perspective. Second, the Commission's application of the basic/enhanced service distinction to non-facilities-based ISPs also supports the Court's conclusion. The Commission has historically not subjected non-facilities-based information-service providers to common carrier regulation. That history suggests, in turn, that the Act does not unambiguously classify non-facilities-based ISPs as "offerors" of telecommunications. If the Act does not unambiguously classify such providers as "offering telecommunications," it also does not unambiguously so classify facilities-based information-service providers such as cable companies; the relevant definitions do not distinguish the two types of carriers. The Act's silence suggests, instead, that the Commission has the discretion to fill the statutory gap. Pp. 21–25.

(c) The Commission's interpretation is also permissible at *Chevron's* step two because it is "a reasonable policy choice for the agency to make," 467 U. S., at 845. Respondents argue unpersuasively that the Commission's construction is unreasonable because it allows any communications provider to evade common-carrier regulation simply by bundling information service with telecommunications. That result does not follow from the interpretation adopted in the *Declaratory Ruling*. The Commission classified cable modem service solely as an information service because the telecommunications input used to provide cable modem service is not separable from the service's data-processing capabilities, but is part and parcel of that service and integral to its other capabilities, and therefore is not a telecommunications offering. This construction does not leave all information-service offerings unregulated under Title II. It is plain, for example, that a local telephone company cannot escape regulation by packaging its telephone service with voice mail because such packaging offers a transparent transmission path—telephone service—that transmits information independent of the information-storage capabilities voice mail provides. By contrast, the high-speed transmission used to provide cable modem service is a functionally integrated component of Internet service because it transmits data only in connection with the further processing of information and is necessary to provide such service. The Commission's construction therefore was more limited than respondents assume.

Respondents' argument that cable modem service does, in fact, provide "transparent" transmission from the consumer's perspective is also mistaken. Their characterization of the "information-service" offering of Internet access as consisting only of access to a cable company's e-mail service, its Web page, and the ability it provides to create a personal Web page conflicts with the Commission's reasonable understanding of the nature of Internet service. When an end user

accesses a third party's Web site, the Commission concluded, he is equally using the information service provided by the cable company as when he accesses that company's own Web site, its e-mail service, or his personal webpage. As the Commission recognized, the service that Internet access providers offer the public is Internet access, not a transparent ability (from the end user's perspective) to transmit information. Pp. 25–29.

3. The Court rejects respondent MCI, Inc.'s argument that the Commission's treatment of cable modem service is inconsistent with its treatment of DSL service and is therefore an arbitrary and capricious deviation from agency policy under the Administrative Procedure Act, see 5 U. S. C. §706(2)(A). MCI points out that when local telephone companies began to offer Internet access through DSL technology, the Commission required them to make the telephone lines used to provide DSL available to competing ISPs on nondiscriminatory, common-carrier terms. Respondents claim that the Commission has not adequately explained its decision not to regulate cable companies similarly.

The Court thinks that the Commission has provided a reasoned explanation for this decision. The traditional reason for its *Computer II* common-carrier treatment of facilities-based carriers was that the telephone network was the primary, if not the exclusive, means through which information service providers could gain access to their customers. The Commission applied the same treatment to DSL service based on that history, rather than on an analysis of contemporaneous market conditions. The Commission's *Declaratory Ruling*, by contrast, concluded that changed market conditions warrant different treatment of cable modem service. Unlike at the time of the DSL order, substitute forms of Internet transmission exist today, including wireline, cable, terrestrial wireless, and satellite. The Commission therefore concluded that broadband services should exist in a minimal regulatory environment that promotes investment and innovation in a competitive market. There is nothing arbitrary or capricious about applying a fresh analysis to the cable industry. Pp. 29–31.

345 F. 3d 1120, reversed and remanded.

THOMAS, J., delivered the opinion of the Court, in which REHNQUIST, C. J., and STEVENS, O'CONNOR, KENNEDY, and BREYER, JJ., joined. STEVENS, J., and BREYER, J., filed concurring opinions. SCALIA, J., filed a dissenting opinion, in which SOUTER and GINSBURG, JJ., joined as to Part I.

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NOTICE: This opinion is subject to formal revision before publication in the preliminary print of the United States Reports. Readers are requested to notify the Reporter of Decisions, Supreme Court of the United States, Washington, D. C. 20543, of any typographical or other formal errors, in order that corrections may be made before the preliminary print goes to press.

SUPREME COURT OF THE UNITED STATES

Nos. 04-277 and 04-281

NATIONAL CABLE & TELECOMMUNICATIONS
ASSOCIATION, ET AL., PETITIONERS
04-277 v.
BRAND X INTERNET SERVICES ET AL.

FEDERAL COMMUNICATIONS COMMISSION AND
UNITED STATES, PETITIONERS
04-281 v.
BRAND X INTERNET SERVICES ET AL.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF
APPEALS FOR THE NINTH CIRCUIT

[June 27, 2005]

JUSTICE THOMAS delivered the opinion of the Court.

Title II of the Communications Act of 1934, 48 Stat. 1064, as amended, 47 U. S. C. §151 *et seq.*, subjects all providers of “telecommunications servic[e]” to mandatory common-carrier regulation, §153(44). In the order under review, the Federal Communications Commission concluded that cable companies that sell broadband Internet service do not provide “telecommunications servic[e]” as the Communications Act defines that term, and hence are exempt from mandatory common-carrier regulation under Title II. We must decide whether that conclusion is a lawful construction of the Communications Act under *Chevron U. S. A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U. S. 837 (1984), and the Administrative Procedure

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Act, 5 U. S. C. §555 *et seq.* We hold that it is.

I

The traditional means by which consumers in the United States access the network of interconnected computers that make up the Internet is through “dial-up” connections provided over local telephone facilities. See 345 F. 3d 1120, 1123–1124 (CA9 2003) (cases below); *In re Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities*, 17 FCC Rcd. 4798, 4802–4803, ¶9 (2002) (hereinafter *Declaratory Ruling*). Using these connections, consumers access the Internet by making calls with computer modems through the telephone wires owned by local phone companies. See *Verizon Communications Inc. v. FCC*, 535 U. S. 467, 489–490 (2002) (describing the physical structure of a local telephone exchange). Internet service providers (ISPs), in turn, link those calls to the Internet network, not only by providing a physical connection, but also by offering consumers the ability to translate raw Internet data into information they may both view on their personal computers and transmit to other computers connected to the Internet. See *In re Federal-State Joint Board on Universal Service*, 13 FCC Rcd. 11501, 11531, ¶63 (1998) (hereinafter *Universal Service Report*); P. Huber, M. Kellogg, & J. Thorne, *Federal Telecommunications Law* 988 (2d ed. 1999) (hereinafter *Huber*); 345 F. 3d, at 1123–1124. Technological limitations of local telephone wires, however, retard the speed at which data from the Internet may be transmitted through end users’ dial-up connections. Dial-up connections are therefore known as “narrowband,” or slower speed, connections.

“Broadband” Internet service, by contrast, transmits data at much higher speeds. There are two principal kinds of broadband Internet service: cable modem service and Digital Subscriber Line (DSL) service. Cable modem

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service transmits data between the Internet and users' computers via the network of television cable lines owned by cable companies. See *id.*, at 1124. DSL service provides high-speed access using the local telephone wires owned by local telephone companies. See *WorldCom, Inc. v. FCC*, 246 F.3d 690, 692 (CA DC 2001) (describing DSL technology). Cable companies and telephone companies can either provide Internet access directly to consumers, thus acting as ISPs themselves, or can lease their transmission facilities to independent ISPs that then use the facilities to provide consumers with Internet access. Other ways of transmitting high-speed Internet data into homes, including terrestrial- and satellite-based wireless networks, are also emerging. *Declaratory Ruling* 4802, ¶6.

II

At issue in these cases is the proper regulatory classification under the Communications Act of broadband cable Internet service. The Act, as amended by the Telecommunications Act of 1996, 110 Stat. 56, defines two categories of regulated entities relevant to these cases: telecommunications carriers and information-service providers. The Act regulates telecommunications carriers, but not information-service providers, as common carriers. Telecommunications carriers, for example, must charge just and reasonable, nondiscriminatory rates to their customers, 47 U.S.C. §§201–209, design their systems so that other carriers can interconnect with their communications networks, §251(a)(1), and contribute to the federal “universal service” fund, §254(d). These provisions are mandatory, but the Commission must forbear from applying them if it determines that the public interest requires it, §§160(a), (b). Information-service providers, by contrast, are not subject to mandatory common-carrier regulation under Title II, though the Commission has jurisdiction to impose additional regulatory obligations under its Title I

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ancillary jurisdiction to regulate interstate and foreign communications, see §§151–161.

These two statutory classifications originated in the late 1970's, as the Commission developed rules to regulate data-processing services offered over telephone wires. That regime, the “Computer II” rules, distinguished between “basic” service (like telephone service) and “enhanced” service (computer-processing service offered over telephone lines). *In re Amendment of Section 64.702 of the Commission's Rules and Regulations (Second Computer Inquiry)*, 77 F. C. C. 2d 384, 417–423, ¶¶86–101 (1980) (hereinafter *Computer II Order*). The *Computer II* rules defined both basic and enhanced services by reference to how the consumer perceives the service being offered.

In particular, the Commission defined “basic service” as “a pure transmission capability over a communications path that is virtually transparent in terms of its interaction with customer supplied information.” *Id.*, at 420, ¶96. By “pure” or “transparent” transmission, the Commission meant a communications path that enabled the consumer to transmit an ordinary-language message to another point, with no computer processing or storage of the information, other than the processing or storage needed to convert the message into electronic form and then back into ordinary language for purposes of transmitting it over the network—such as via a telephone or a facsimile. *Id.*, at 419–420, ¶¶94–95. Basic service was subject to common-carrier regulation. *Id.*, at 428, ¶114.

“[E]nhanced service,” however, was service in which “computer processing applications [were] used to act on the content, code, protocol, and other aspects of the subscriber's information,” such as voice and data storage services, *id.*, at 420–421, ¶97, as well as “protocol conversion” (i.e., ability to communicate between networks that employ different data-transmission formats), *id.*, at 421–422, ¶99. By contrast to basic service, the Commission

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decided not to subject providers of enhanced service, even enhanced service offered via transmission wires, to Title II common-carrier regulation. *Id.*, at 428–432, ¶¶115–123. The Commission explained that it was unwise to subject enhanced service to common-carrier regulation given the “fast-moving, competitive market” in which they were offered. *Id.*, at 434, ¶129.

The definitions of the terms “telecommunications service” and “information service” established by the 1996 Act are similar to the *Computer II* basic- and enhanced-service classifications. “Telecommunications service”—the analog to basic service—is “the offering of telecommunications for a fee directly to the public . . . regardless of the facilities used.” 47 U. S. C. §153(46). “Telecommunications” is “the transmission, between or among points specified by the user, of information of the user’s choosing, without change in the form or content of the information as sent and received.” §153(43). “Telecommunications carrier[s]”—those subjected to mandatory Title II common-carrier regulation—are defined as “provider[s] of telecommunications services.” §153(44). And “information service”—the analog to enhanced service—is “the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications . . .” §153(20).

In September 2000, the Commission initiated a rule-making proceeding to, among other things, apply these classifications to cable companies that offer broadband Internet service directly to consumers. In March 2002, that rulemaking culminated in the *Declaratory Ruling* under review in these cases. In the *Declaratory Ruling*, the Commission concluded that broadband Internet service provided by cable companies is an “information service” but not a “telecommunications service” under the Act, and therefore not subject to mandatory Title II common-carrier regulation. In support of this conclusion, the

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Commission relied heavily on its *Universal Service Report*. See *Declaratory Ruling* 4821–4822, ¶¶36–37 (citing *Universal Service Report* or *Report*). The *Universal Service Report* classified “non-facilities-based” ISPs—those that do not own the transmission facilities they use to connect the end user to the Internet—solely as information-service providers. See *Universal Service Report* 11533, ¶67. Unlike those ISPs, cable companies own the cable lines they use to provide Internet access. Nevertheless, in the *Declaratory Ruling*, the Commission found no basis in the statutory definitions for treating cable companies differently from non-facilities-based ISPs: Both offer “a single, integrated service that enables the subscriber to utilize Internet access service . . . and to realize the benefits of a comprehensive service offering.” *Declaratory Ruling* 4823, ¶38. Because Internet access provides a capability for manipulating and storing information, the Commission concluded that it was an information service. *Ibid.*

The integrated nature of Internet access and the high-speed wire used to provide Internet access led the Commission to conclude that cable companies providing Internet access are not telecommunications providers. This conclusion, the Commission reasoned, followed from the logic of the *Universal Service Report*. The *Report* had concluded that, though Internet service “involves data transport elements” because “an Internet access provider must enable the movement of information between customers’ own computers and distant computers with which those customers seek to interact,” it also “offers end users information-service capabilities inextricably intertwined with data transport.” *Universal Service Report* 11539–11540, ¶80. ISPs, therefore, were not “offering . . . telecommunications . . . directly to the public,” §153(46), and so were not properly classified as telecommunications carriers, see *id.*, at 11540, ¶81. In other words, the Commission reasoned that consumers use their cable modems

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not to transmit information "transparently," such as by using a telephone, but instead to obtain Internet access.

The Commission applied this same reasoning to cable companies offering broadband Internet access. Its logic was that, like non-facilities-based ISPs, cable companies do not "offe[r] telecommunications service to the end user, but rather . . . merely us[e] telecommunications to provide end users with cable modem service." *Declaratory Ruling* 4824, ¶41. Though the Commission declined to apply mandatory Title II common-carrier regulation to cable companies, it invited comment on whether under its Title I jurisdiction it should require cable companies to offer other ISPs access to their facilities on common-carrier terms. *Id.*, at 4839, ¶72. Numerous parties petitioned for judicial review, challenging the Commission's conclusion that cable modem service was not telecommunications service. By judicial lottery, the Court of Appeals for the Ninth Circuit was selected as the venue for the challenge.

The Court of Appeals granted the petitions in part, vacated the *Declaratory Ruling* in part, and remanded to the Commission for further proceedings. In particular, the Court of Appeals vacated the ruling to the extent it concluded that cable modem service was not "telecommunications service" under the Communications Act. It held that the Commission could not permissibly construe the Communications Act to exempt cable companies providing Internet service from Title II regulation. See 345 F. 3d, at 1132. Rather than analyzing the permissibility of that construction under the deferential framework of *Chevron*, 467 U. S. 837, however, the Court of Appeals grounded its holding in the *stare decisis* effect of *AT&T Corp. v. Portland*, 216 F. 3d 871 (CA9 2000). See 345 F. 3d, at 1128–1132. *Portland* held that cable modem service was a "telecommunications service," though the court in that case was not reviewing an administrative proceeding and the Commission was not a party to the case. See 216

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F. 3d, at 877–880. Nevertheless, *Portland's* holding, the Court of Appeals reasoned, overrode the contrary interpretation reached by the Commission in the *Declaratory Ruling*. See 345 F. 3d, at 1130–1131.

We granted certiorari to settle the important questions of federal law that these cases present. 543 U. S. ____ (2004).

III

We first consider whether we should apply *Chevron's* framework to the Commission's interpretation of the term "telecommunications service." We conclude that we should. We also conclude that the Court of Appeals should have done the same, instead of following the contrary construction it adopted in *Portland*.

A

In *Chevron*, this Court held that ambiguities in statutes within an agency's jurisdiction to administer are delegations of authority to the agency to fill the statutory gap in reasonable fashion. Filling these gaps, the Court explained, involves difficult policy choices that agencies are better equipped to make than courts. 467 U. S., at 865–866. If a statute is ambiguous, and if the implementing agency's construction is reasonable, *Chevron* requires a federal court to accept the agency's construction of the statute, even if the agency's reading differs from what the court believes is the best statutory interpretation. *Id.*, at 843–844, and n. 11.

The *Chevron* framework governs our review of the Commission's construction. Congress has delegated to the Commission the authority to "execute and enforce" the Communications Act, §151, and to "prescribe such rules and regulations as may be necessary in the public interest to carry out the provisions" of the Act, §201(b); *AT&T Corp. v. Iowa Utilities Bd.*, 525 U. S. 366, 377–378 (1999).

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These provisions give the Commission the authority to promulgate binding legal rules; the Commission issued the order under review in the exercise of that authority; and no one questions that the order is within the Commission's jurisdiction. See *Household Credit Services, Inc. v. Pfenig*, 541 U. S. 232, 238–239 (2004); *United States v. Mead Corp.*, 533 U. S. 218, 231–234 (2001); *Christensen v. Harris County*, 529 U. S. 576, 586–588 (2000). Hence, as we have in the past, we apply the *Chevron* framework to the Commission's interpretation of the Communications Act. See *National Cable & Telecommunications Assn., Inc. v. Gulf Power Co.*, 534 U. S. 327, 333–339 (2002); *Verizon*, 535 U. S., at 501–502.

Some of the respondents dispute this conclusion, on the ground that the Commission's interpretation is inconsistent with its past practice. We reject this argument. Agency inconsistency is not a basis for declining to analyze the agency's interpretation under the *Chevron* framework. Unexplained inconsistency is, at most, a reason for holding an interpretation to be an arbitrary and capricious change from agency practice under the Administrative Procedure Act. See *Motor Vehicle Mfrs. Assn. of United States, Inc. v. State Farm Mut. Automobile Ins. Co.*, 463 U. S. 29, 46–57 (1983). For if the agency adequately explains the reasons for a reversal of policy, "change is not invalidating, since the whole point of *Chevron* is to leave the discretion provided by the ambiguities of a statute with the implementing agency." *Smiley v. Citibank (South Dakota), N. A.*, 517 U. S. 735, 742 (1996); see also *Rust v. Sullivan*, 500 U. S. 173, 186–187 (1991); *Barnhart v. Walton*, 535 U. S. 212, 226 (2002) (SCALIA, J., concurring in part and concurring in judgment). "An initial agency interpretation is not instantly carved in stone. On the contrary, the agency . . . must consider varying interpretations and the wisdom of its policy on a continuing basis," *Chevron*, *supra*, at 863–864, for example, in response to changed factual circum-

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stances, or a change in administrations, see *State Farm*, *supra*, at 59 (REHNQUIST, J., concurring in part and dissenting in part). That is no doubt why in *Chevron* itself, this Court deferred to an agency interpretation that was a recent reversal of agency policy. See 467 U. S., at 857–858. We therefore have no difficulty concluding that *Chevron* applies.

B

The Court of Appeals declined to apply *Chevron* because it thought the Commission's interpretation of the Communications Act foreclosed by the conflicting construction of the Act it had adopted in *Portland*, *supra*. See 345 F. 3d, at 1127–1132. It based that holding on the assumption that *Portland's* construction overrode the Commission's, regardless of whether *Portland* had held the statute to be unambiguous. 345 F. 3d, at 1131. That reasoning was incorrect.

A court's prior judicial construction of a statute trumps an agency construction otherwise entitled to *Chevron* deference only if the prior court decision holds that its construction follows from the unambiguous terms of the statute and thus leaves no room for agency discretion. This principle follows from *Chevron* itself. *Chevron* established a "presumption that Congress, when it left ambiguity in a statute meant for implementation by an agency, understood that the ambiguity would be resolved, first and foremost, by the agency, and desired the agency (rather than the courts) to possess whatever degree of discretion the ambiguity allows." *Smiley*, *supra*, at 740–741. Yet allowing a judicial precedent to foreclose an agency from interpreting an ambiguous statute, as the Court of Appeals assumed it could, would allow a court's interpretation to override an agency's. *Chevron's* premise is that it is for agencies, not courts, to fill statutory gaps. See 467 U. S., at 843–844, and n. 11. The better rule is to hold

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judicial interpretations contained in precedents to the same demanding *Chevron* step one standard that applies if the court is reviewing the agency's construction on a blank slate: Only a judicial precedent holding that the statute unambiguously forecloses the agency's interpretation, and therefore contains no gap for the agency to fill, displaces a conflicting agency construction.

A contrary rule would produce anomalous results. It would mean that whether an agency's interpretation of an ambiguous statute is entitled to *Chevron* deference would turn on the order in which the interpretations issue: If the court's construction came first, its construction would prevail, whereas if the agency's came first, the agency's construction would command *Chevron* deference. Yet whether Congress has delegated to an agency the authority to interpret a statute does not depend on the order in which the judicial and administrative constructions occur. The Court of Appeals' rule, moreover, would "lead to the ossification of large portions of our statutory law," *Mead*, *supra*, at 247 (SCALIA, J., dissenting), by precluding agencies from revising unwise judicial constructions of ambiguous statutes. Neither *Chevron* nor the doctrine of *stare decisis* requires these haphazard results.

The dissent answers that allowing an agency to override what a court believes to be the best interpretation of a statute makes "judicial decisions subject to reversal by Executive officers." *Post*, at 13 (opinion of SCALIA, J.). It does not. Since *Chevron* teaches that a court's opinion as to the best reading of an ambiguous statute an agency is charged with administering is not authoritative, the agency's decision to construe that statute differently from a court does not say that the court's holding was legally wrong. Instead, the agency may, consistent with the court's holding, choose a different construction, since the agency remains the authoritative interpreter (within the limits of reason) of such statutes. In all other respects, the

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court's prior ruling remains binding law (for example, as to agency interpretations to which *Chevron* is inapplicable). The precedent has not been "reversed" by the agency, any more than a federal court's interpretation of a State's law can be said to have been "reversed" by a state court that adopts a conflicting (yet authoritative) interpretation of state law.

The Court of Appeals derived a contrary rule from a mistaken reading of this Court's decisions. It read *Neal v. United States*, 516 U. S. 284 (1996), to establish that a prior judicial construction of a statute categorically controls an agency's contrary construction. 345 F.3d, at 1131-1132; see also *post*, at 12, n. 11 (SCALIA, J., dissenting). *Neal* established no such proposition. *Neal* declined to defer to a construction adopted by the United States Sentencing Commission that conflicted with one the Court previously had adopted in *Chapman v. United States*, 500 U. S. 453 (1991). *Neal*, *supra*, at 290-295. *Chapman*, however, had held the relevant statute to be unambiguous. See 500 U. S., at 463 (declining to apply the rule of lenity given the statute's clear language). Thus, *Neal* established only that a precedent holding a statute to be unambiguous forecloses a contrary agency construction. That limited holding accorded with this Court's prior decisions, which had held that a court's interpretation of a statute trumps an agency's under the doctrine of *stare decisis* only if the prior court holding "determined a statute's clear meaning." *Maislin Industries, U. S., Inc. v. Primary Steel, Inc.*, 497 U. S. 116, 131 (1990) (emphasis added); see also *Lechmere, Inc. v. NLRB*, 502 U. S. 527, 536-537 (1992). Those decisions allow a court's prior interpretation of a statute to override an agency's interpretation only if the relevant court decision held the statute unambiguous.

Against this background, the Court of Appeals erred in refusing to apply *Chevron* to the Commission's interpreta-

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tion of the definition of "telecommunications service," 47 U.S.C. §153(46). Its prior decision in *Portland* held only that the *best* reading of §153(46) was that cable modem service was a "telecommunications service," not that it was the *only permissible* reading of the statute. See 216 F. 3d, at 877–880. Nothing in *Portland* held that the Communications Act unambiguously required treating cable Internet providers as telecommunications carriers. Instead, the court noted that it was "not presented with a case involving potential deference to an administrative agency's statutory construction pursuant to the *Chevron* doctrine," *id.*, at 876; and the court invoked no other rule of construction (such as the rule of lenity) requiring it to conclude that the statute was unambiguous to reach its judgment. Before a judicial construction of a statute, whether contained in a precedent or not, may trump an agency's, the court must hold that the statute unambiguously requires the court's construction. *Portland* did not do so.

As the dissent points out, it is not logically necessary for us to reach the question whether the Court of Appeals misapplied *Chevron* for us to decide whether the Commission acted lawfully. See *post*, at 16–17 (opinion of SCALIA, J.). Nevertheless, it is no "great mystery" why we are reaching the point here. *Ibid.* There is genuine confusion in the lower courts over the interaction between the *Chevron* doctrine and *stare decisis* principles, as the petitioners informed us at the certiorari stage of this litigation. See Pet. for Cert. of Federal Communications Commission et al. in No. 04–281, pp. 19–23; Pet. for Cert. of National Cable & Telecomm. Assn. et al. in No. 04–277, pp. 22–29. The point has been briefed. See Brief for Federal Petitioners 38–44; Brief for Cable-Industry Petitioners 30–36. And not reaching the point could undermine the purpose of our grant of certiorari: to settle authoritatively whether the Commission's *Declaratory Ruling* is lawful. Were we

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to uphold the *Declaratory Ruling* without reaching the *Chevron* point, the Court of Appeals could once again strike down the Commission's rule based on its *Portland* decision. *Portland* (at least arguably) could compel the Court of Appeals once again to reverse the Commission despite our decision, since our conclusion that it is *reasonable* to read the Communications Act to classify cable modem service solely as an "information service" leaves untouched *Portland's* holding that the Commission's interpretation is not the *best* reading of the statute. We have before decided similar questions that were not, strictly speaking, necessary to our disposition. See, e.g., *Agostini v. Felton*, 521 U.S. 203, 237 (1997) (requiring the Courts of Appeals to adhere to our directly controlling precedents, even those that rest on reasons rejected in other decisions); *Roper v. Simmons*, 543 U.S. ___, ___ (2005) (slip op., at 23–24) (SCALIA, J., dissenting) (criticizing this Court for not reaching the question whether the Missouri Supreme Court erred by failing to follow directly controlling Supreme Court precedent, though that conclusion was not necessary to the Court's decision). It is prudent for us to do so once again today.

IV

We next address whether the Commission's construction of the definition of "telecommunications service," 47 U.S.C. §153(46), is a permissible reading of the Communications Act under the *Chevron* framework. *Chevron* established a familiar two-step procedure for evaluating whether an agency's interpretation of a statute is lawful. At the first step, we ask whether the statute's plain terms "directly address[es] the precise question at issue." 467 U.S., at 843. If the statute is ambiguous on the point, we defer at step two to the agency's interpretation so long as the construction is "a reasonable policy choice for the agency to make." *Id.*, at 845. The Commission's interpre-

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tation is permissible at both steps.

A

We first set forth our understanding of the interpretation of the Communications Act that the Commission embraced. The issue before the Commission was whether cable companies providing cable modem service are providing a "telecommunications service" in addition to an "information service."

The Commission first concluded that cable modem service is an "information service," a conclusion unchallenged here. The Act defines "information service" as "the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications . . ." §153(20). Cable modem service is an information service, the Commission reasoned, because it provides consumers with a comprehensive capability for manipulating information using the Internet via high-speed telecommunications. That service enables users, for example, to browse the World Wide Web, to transfer files from file archives available on the Internet via the "File Transfer Protocol," and to access e-mail and Usenet newsgroups. *Declaratory Ruling* 4821, ¶37; *Universal Service Report* 11537, ¶76. Like other forms of Internet service, cable modem service also gives users access to the Domain Name System (DNS). DNS, among other things, matches the Web page addresses that end users type into their browsers (or "click" on) with the Internet Protocol (IP) addresses¹ of the servers containing the Web pages the users wish to access. *Declaratory Ruling* 4821–4822, ¶37. All of these features, the Commission concluded, were part of the information service that cable companies provide consumers. *Id.*, at

¹ IP addresses identify computers on the Internet, enabling data packets transmitted from other computers to reach them. See *Universal Service Report* 11531, ¶62; Huber 985.

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4821–4823, ¶¶36–38; see also *Universal Service Report* 11536–11539, ¶¶75–79.

At the same time, the Commission concluded that cable modem service was not "telecommunications service." "Telecommunications service" is "the offering of telecommunications for a fee directly to the public." 47 U. S. C. §153(46). "Telecommunications," in turn, is defined as "the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." §153(43). The Commission conceded that, like all information-service providers, cable companies use "telecommunications" to provide consumers with Internet service; cable companies provide such service via the high-speed wire that transmits signals to and from an end user's computer. *Declaratory Ruling* 4823, ¶40. For the Commission, however, the question whether cable broadband Internet providers "offer" telecommunications involved more than whether telecommunications was one necessary component of cable modem service. Instead, whether that service also includes a telecommunications "offering" "tur[ned] on the nature of the functions the end user is offered." *Id.*, at 4822, ¶38 (emphasis added), for the statutory definition of "telecommunications service" does not "res[ist] on the particular types of facilities used," *id.*, at 4821, ¶35; see §153(46) (definition of "telecommunications service" applies "regardless of the facilities used").

Seen from the consumer's point of view, the Commission concluded, cable modem service is not a telecommunications offering because the consumer uses the high-speed wire always in connection with the information-processing capabilities provided by Internet access, and because the transmission is a necessary component of Internet access: "As provided to the end user the telecommunications is part and parcel of cable modem service and is integral to its other capabilities." *Declaratory Ruling* 4823, ¶39. The

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wire is used, in other words, to access the World Wide Web, newsgroups, and so forth, rather than "transparently" to transmit and receive ordinary-language messages without computer processing or storage of the message. See *supra*, at 4 (noting the *Computer II* notion of "transparent" transmission). The integrated character of this offering led the Commission to conclude that cable modem service is not a "stand-alone," transparent offering of telecommunications. *Declaratory Ruling* 4823-4825, ¶¶41-43.

B

This construction passes *Chevron's* first step. Respondents argue that it does not, on the ground that cable companies providing Internet service necessarily "offe[r]" the underlying telecommunications used to transmit that service. The word "offering" as used in §153(46), however, does not unambiguously require that result. Instead, "offering" can reasonably be read to mean a "stand-alone" offering of telecommunications, *i.e.*, an offered service that, from the user's perspective, transmits messages unadulterated by computer processing. That conclusion follows not only from the ordinary meaning of the word "offering," but also from the regulatory history of the Communications Act.

1

Cable companies in the broadband Internet service business "offe[r]" consumers an information service in the form of Internet access and they do so "via telecommunications," §153(20), but it does not inexorably follow as a matter of ordinary language that they also "offe[r]" consumers the high-speed data transmission (telecommunications) that is an input used to provide this service. §153(46). We have held that where a statute's plain terms admit of two or more reasonable ordinary usages, the

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Commission's choice of one of them is entitled to deference. See *Verizon*, 535 U.S., at 498 (deferring to the Commission's interpretation of the term "cost" by reference to an alternative linguistic usage defined by what "[a] merchant who is asked about 'the cost of providing the goods'" might "reasonably" say); *National Railroad Passenger Corporation v. Boston & Maine Corp.*, 503 U.S. 407, 418 (1992) (agency construction entitled to deference where there were "alternative dictionary definitions of the word" at issue). The term "offe[r]" as used in the definition of telecommunications service, 47 U.S.C. §153(46), is ambiguous in this way.

It is common usage to describe what a company "offers" to a consumer as what the consumer perceives to be the integrated finished product, even to the exclusion of discrete components that compose the product, as the dissent concedes. See *post*, at 3 (opinion of SCALIA, J.). One might well say that a car dealership "offers" cars, but does not "offer" the integrated major inputs that make purchasing the car valuable, such as the engine or the chassis. It would, in fact, be odd to describe a car dealership as "offering" consumers the car's components in addition to the car itself. Even if it is linguistically permissible to say that the car dealership "offers" engines when it offers cars, that shows, at most, that the term "offer," when applied to a commercial transaction, is ambiguous about whether it describes only the offered finished product, or the product's discrete components as well. It does not show that no other usage is permitted.

The question, then, is whether the transmission component of cable modem service is sufficiently integrated with the finished service to make it reasonable to describe the two as a single, integrated offering. See *ibid.* We think that they are sufficiently integrated, because "[a] consumer uses the high-speed wire always in connection with the information-processing capabilities provided by Inter-

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net access, and because the transmission is a necessary component of Internet access." *Supra*, at 16. In the telecommunications context, it is at least reasonable to describe companies as not "offering" to consumers each discrete input that is necessary to providing, and is always used in connection with, a finished service. We think it no misuse of language, for example, to say that cable companies providing Internet service do not "offer" consumers DNS, even though DNS is essential to providing Internet access. *Declaratory Ruling* 4810, n. 74, 4822–4823, ¶38. Likewise, a telephone company "offers" consumers a transparent transmission path that conveys an ordinary-language message, not necessarily the data transmission facilities that also "transmi[t] . . . information of the user's choosing," §153(43), or other physical elements of the facilities used to provide telephone service, like the trunks and switches, or the copper in the wires. What cable companies providing cable modem service and telephone companies providing telephone service "offer" is Internet service and telephone service respectively—the finished services, though they do so using (or "via") the discrete components composing the end product, including data transmission. Such functionally integrated components need not be described as distinct "offerings."

In response, the dissent argues that the high-speed transmission component necessary to providing cable modem service is necessarily "offered" with Internet service because cable modem service is like the offering of pizza delivery service together with pizza, and the offering of puppies together with dog leashes. *Post*, at 3–4 (opinion of SCALIA, J.). The dissent's appeal to these analogies only underscores that the term "offer" is ambiguous in the way that we have described. The entire question is whether the products here are functionally integrated (like the components of a car) or functionally separate (like pets and leashes). That question turns not on the language of

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the Act, but on the factual particulars of how Internet technology works and how it is provided, questions *Chevron* leaves to the Commission to resolve in the first instance. As the Commission has candidly recognized, "the question may not always be straightforward whether, on the one hand, an entity is providing a single information service with communications and computing components, or, on the other hand, is providing two distinct services, one of which is a telecommunications service." *Universal Service Report* 11530, ¶60. Because the term "offer" can sometimes refer to a single, finished product and sometimes to the "individual components in a package being offered" (depending on whether the components "still possess sufficient identity to be described as separate objects," *post*, at 3), the statute fails unambiguously to classify the telecommunications component of cable modem service as a distinct offering. This leaves federal telecommunications policy in this technical and complex area to be set by the Commission, not by warring analogies.

We also do not share the dissent's certainty that cable modem service is so obviously like pizza delivery service and the combination of dog leashes and dogs that the Commission could not reasonably have thought otherwise. *Post*, at 3–4. For example, unlike the transmission component of Internet service, delivery service and dog leashes are not integral components of the finished products (pizzas and pet dogs). One can pick up a pizza rather than having it delivered, and one can own a dog without buying a leash. By contrast, the Commission reasonably concluded, a consumer cannot purchase Internet service without also purchasing a connection to the Internet and the transmission always occurs in connection with information processing. In any event, we doubt that a statute that, for example, subjected offerors of "delivery" service (such as Federal Express and United Parcel Service) to

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common-carrier regulation would unambiguously require pizza-delivery companies to offer their delivery services on a common carrier basis.

2

The Commission's traditional distinction between basic and enhanced service, see *supra*, at 4–5, also supports the conclusion that the Communications Act is ambiguous about whether cable companies “offer” telecommunications with cable modem service. Congress passed the definitions in the Communications Act against the background of this regulatory history, and we may assume that the parallel terms “telecommunications service” and “information service” substantially incorporated their meaning, as the Commission has held. See, e.g., *In re Federal-State Joint Board on Universal Service*, 12 FCC Red. 8776, 9179–9180, ¶788 (1997) (noting that the “definition of enhanced services is substantially similar to the definition of information services” and that “all services previously considered ‘enhanced services’ are ‘information services’”); *Commissioner v. Keystone Consol. Industries, Inc.*, 508 U. S. 152, 159 (1993) (noting presumption that Congress is aware of “settled judicial and administrative interpretation[s]” of terms when it enacts a statute). The regulatory history in at least two respects confirms that the term “telecommunications service” is ambiguous.

First, in the *Computer II Order* that established the terms “basic” and “enhanced” services, the Commission defined those terms functionally, based on how the consumer interacts with the provided information, just as the Commission did in the order below. See *supra*, at 4–5. As we have explained, Internet service is not “transparent in terms of its interaction with customer-supplied information.” *Computer II Order* 420, ¶96; the transmission occurs in connection with information processing. It was therefore consistent with the statute’s terms for the Commis-

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sion to assume that the parallel term “telecommunications service” in 47 U. S. C. §153(46) likewise describes a “pure” or “transparent” communications path not necessarily separately present, from the end user’s perspective, in an integrated information-service offering.

The Commission’s application of the basic/enhanced service distinction to non-facilities-based ISPs also supports this conclusion. The Commission has long held that “all those who provide some form of transmission services are not necessarily common carriers.” *Computer II Order* 431, ¶122; see also *id.*, at 435, ¶132 (“acknowledg[ing] the existence of a communications component” in enhanced-service offerings). For example, the Commission did not subject to common-carrier regulation those service providers that offered enhanced services over telecommunications facilities, but that did not themselves own the underlying facilities—so-called “non-facilities-based” providers. See *Universal Service Report* 11530, ¶60. Examples of these services included database services in which a customer used telecommunications to access information, such as Dow Jones News and Lexis, as well as “value added networks,” which lease wires from common carriers and provide transmission as well as protocol-processing service over those wires. See *In re Amendment to Sections 64.702 of the Commission’s Rules and Regulations (Third Computer Inquiry)*, 3 FCC Red. 1150, 1153, n. 23 (1988); *supra*, at 4 (explaining protocol conversion). These services “combin[ed] communications and computing components,” yet the Commission held that they should “always be deemed enhanced” and therefore not subject to common-carrier regulation. *Universal Service Report* 11530, ¶60. Following this traditional distinction, the Commission in the *Universal Service Report* classified ISPs that leased rather than owned their transmission facilities as pure information-service providers. *Id.*, at 11540, ¶81.

Respondents’ statutory arguments conflict with this

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regulatory history. They claim that the Communications Act unambiguously classifies as telecommunications carriers all entities that use telecommunications inputs to provide information service. As respondent MCI concedes, this argument would subject to mandatory common-carrier regulation all information-service providers that use telecommunications as an input to provide information service to the public. Brief for Respondent MCI, Inc. 30. For example, it would subject to common-carrier regulation non-facilities-based ISPs that own no transmission facilities. See *Universal Service Report* 11532–11533, ¶66. Those ISPs provide consumers with transmission facilities used to connect to the Internet, see *supra*, at 2, and so, under respondents' argument, necessarily "offer" telecommunications to consumers. Respondents' position that all such entities are necessarily "offering telecommunications" therefore entails mandatory common-carrier regulation of entities that the Commission never classified as "offerors" of basic transmission service, and therefore common carriers, under the *Computer II* regime.² See *Universal Service Report* 11540, ¶81 (noting past Commission policy); *Computer and Communications Industry Assn. v. FCC*, 693 F. 2d 198, 209 (CA DC 1982) (noting and upholding Commission's *Computer II* "finding that enhanced services . . . are not common carrier services within the scope of Title II"). We doubt that the parallel term "telecommunications service" unambiguously worked

²The dissent attempts to escape this consequence of respondents' position by way of an elaborate analogy between ISPs and pizzerias. *Post*, at 7–8 (opinion of SCALIA, J.). This analogy is flawed. A pizzeria "delivers" nothing, but ISPs plainly provide transmission service directly to the public in connection with Internet service. For example, with dial-up service, ISPs process the electronic signal that travels over local telephone wires, and transmit it to the Internet. See *supra*, at 2; Huber 988. The dissent therefore cannot deny that its position logically would require applying presumptively mandatory Title II regulation to all ISPs.

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this abrupt shift in Commission policy.

Respondents' analogy between cable companies that provide cable modem service and facilities-based enhanced-service providers—that is, enhanced-service providers who own the transmission facilities used to provide those services—fares no better. Respondents stress that under the *Computer II* rules the Commission regulated such providers more heavily than non-facilities-based providers. The Commission required, for example, local telephone companies that provided enhanced services to offer their wires on a common-carrier basis to competing enhanced-service providers. See, e.g., *In re Amendment of Sections 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry)*, 104 F. C. C. 2d 958, 964, ¶4 (1986) (hereinafter *Computer III Order*). Respondents argue that the Communications Act unambiguously requires the same treatment for cable companies because cable companies also own the facilities they use to provide cable modem service (and therefore information service).

We disagree. We think it improbable that the Communications Act unambiguously freezes in time the *Computer II* treatment of facilities-based information-service providers. The Act's definition of "telecommunications service" says nothing about imposing more stringent regulatory duties on facilities-based information-service providers. The definition hinges solely on whether the entity "offer[s] telecommunications for a fee directly to the public." 47 U. S. C. §153(46), though the Act elsewhere subjects facilities-based carriers to stricter regulation, see §251(c) (imposing various duties on facilities-based local telephone companies). In the *Computer II* rules, the Commission subjected facilities-based providers to common-carrier duties not because of the nature of the "offering" made by those carriers, but rather because of the concern that local telephone companies would abuse the monopoly power they possessed by virtue of the "bottleneck" local telephone

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facilities they owned. See *Computer II Order* 474–475, ¶¶229, 231; *Computer III Order* 968–969, ¶12; *Verizon*, 535 U. S., at 489–490 (describing the naturally monopolistic physical structure of a local telephone exchange). The differential treatment of facilities-based carriers was therefore a function not of the definitions of “enhanced-service” and “basic service,” but instead of a choice by the Commission to regulate more stringently, in its discretion, certain entities that provided enhanced service. The Act’s definitions, however, parallel the definitions of enhanced and basic service, not the facilities-based grounds on which that policy choice was based, and the Commission remains free to impose special regulatory duties on facilities-based ISPs under its Title I ancillary jurisdiction. In fact, it has invited comment on whether it can and should do so. See *supra*, at 7.

In sum, if the Act fails unambiguously to classify non-facilities-based information-service providers that use telecommunications inputs to provide an information service as “offer[ors]” of “telecommunications,” then it also fails unambiguously to classify facilities-based information-service providers as telecommunications-service offerors; the relevant definitions do not distinguish facilities-based and non-facilities-based carriers. That silence suggests, instead, that the Commission has the discretion to fill the consequent statutory gap.

C

We also conclude that the Commission’s construction was “a reasonable policy choice for the [Commission] to make” at *Chevron*’s second step. 467 U. S., at 845.

Respondents argue that the Commission’s construction is unreasonable because it allows any communications provider to “evade” common-carrier regulation by the expedient of bundling information service with telecommunications. Respondents argue that under the Commis-

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sion’s construction a telephone company could, for example, offer an information service like voice mail together with telephone service, thereby avoiding common-carrier regulation of its telephone service.

We need not decide whether a construction that resulted in these consequences would be unreasonable because we do not believe that these results follow from the construction the Commission adopted. As we understand the *Declaratory Ruling*, the Commission did not say that any telecommunications service that is priced or bundled with an information service is automatically unregulated under Title II. The Commission said that a telecommunications input used to provide an information service that is not “separable from the data-processing capabilities of the service” and is instead “part and parcel of [the information service] and is integral to [the information service’s] other capabilities” is not a telecommunications offering. *Declaratory Ruling* 4823, ¶39; see *supra*, at 16–17.

This construction does not leave all information service offerings exempt from mandatory Title II regulation. “It is plain,” for example, that a local telephone company “cannot escape Title II regulation of its residential local exchange service simply by packaging that service with voice mail.” *Universal Service Report* 11530, ¶60. That is because a telephone company that packages voice mail with telephone service offers a transparent transmission path—telephone service—that transmits information independent of the information-storage capabilities provided by voice mail. For instance, when a person makes a telephone call, his ability to convey and receive information using the call is only trivially affected by the additional voice-mail capability. Equally, were a telephone company to add a time-of-day announcement that played every time the user picked up his telephone, the “transparent” information transmitted in the ensuing call would be only trivially dependent on the information service the an-

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nouncement provides. By contrast, the high-speed transmission used to provide cable modem service is a functionally integrated component of that service because it transmits data only in connection with the further processing of information and is necessary to provide Internet service. The Commission's construction therefore was more limited than respondents assume.

Respondents answer that cable modem service does, in fact, provide "transparent" transmission from the consumer's perspective, but this argument, too, is mistaken. Respondents characterize the "information-service" offering of Internet access as consisting only of access to a cable company's e-mail service, its Web page, and the ability it provides consumers to create a personal Web page. When a consumer goes beyond those offerings and accesses content provided by parties other than the cable company, respondents argue, the consumer uses "pure transmission" no less than a consumer who purchases phone service together with voice mail.

This argument, we believe, conflicts with the Commission's understanding of the nature of cable modem service, an understanding we find to be reasonable. When an end user accesses a third-party's Web site, the Commission concluded, he is equally using the information service provided by the cable company that offers him Internet access as when he accesses the company's own Web site, its e-mail service, or his personal Web page. For example, as the Commission found below, part of the information service cable companies provide is access to DNS service. See *supra*, at 15–16. A user cannot reach a third-party's Web site without DNS, which (among other things) matches the Web site address the end user types into his browser (or "clicks" on with his mouse) with the IP address of the Web page's host server. See P. Albitz & C. Liu, DNS and BIND 10 (4th ed. 2001) (For an Internet user, "DNS is a must. . . . [N]early all of the Internet's network services

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use DNS. That includes the World Wide Web, electronic mail, remote terminal access, and file transfer"). It is at least reasonable to think of DNS as a "capability for . . . acquiring . . . retrieving, utilizing, or making available" Web site addresses and therefore part of the information service cable companies provide. 47 U. S. C. §153(20).³ Similarly, the Internet service provided by cable companies facilitates access to third-party Web pages by offering consumers the ability to store, or "cache," popular content on local computer servers. See *Declaratory Ruling* 4810, ¶17, and n. 76. Caching obviates the need for the end user to download anew information from third-party Web sites each time the consumer attempts to access them, thereby increasing the speed of information retrieval. In other words, subscribers can reach third-party Web sites via "the World Wide Web, and browse their contents, [only] because their service provider offers the 'capability for . . . acquiring, [storing] . . . retrieving [and] utilizing . . . information.'" *Universal Service Report* 11538, ¶76 (quoting 47 U. S. C. §153(20)). "The service that Internet access providers offer to members of the public is Internet access," *Universal Service Report* 11539, ¶79, not a transparent ability (from the end user's perspective) to transmit information. We therefore conclude that the Commission's

³The dissent claims that access to DNS does not count as use of the information-processing capabilities of Internet service because DNS is "scarcely more than routing information, which is expressly excluded from the definition of 'information service.'" *Post*, at 9, and n. 6 (opinion of SCALIA, J.). But the definition of information service does not exclude "routing information." Instead, it excludes "any use of any such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service." 47 U. S. C. §153(20). The dissent's argument therefore begs the question because it assumes that Internet service is a "telecommunications system" or "service" that DNS manages (a point on which, contrary to the dissent's assertion, *post*, at 9, n. 6, we need take no view for purposes of this response).

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construction was reasonable.

V

Respondent MCI, Inc., urges that the Commission's treatment of cable modem service is inconsistent with its treatment of DSL service, see *supra*, at 3 (describing DSL service), and therefore is an arbitrary and capricious deviation from agency policy. See 5 U.S.C. §706(2)(A). MCI points out that when local telephone companies began to offer Internet access through DSL technology in addition to telephone service, the Commission applied its *Computer II* facilities-based classification to them and required them to make the telephone lines used to transmit DSL service available to competing ISPs on nondiscriminatory, common-carrier terms. See *supra*, at 24 (describing *Computer II* facilities-based classification of enhanced-service providers); *In re Deployment of Wireline Services Offering Advanced Telecommunications Capabilities*, 13 FCC Rcd. 24011, 24030-24031, ¶¶36-37 (1998) (hereinafter *Wireline Order*) (classifying DSL service as a telecommunications service). MCI claims that the Commission's decision not to regulate cable companies similarly under Title II is inconsistent with its DSL policy.

We conclude, however, that the Commission provided a reasoned explanation for treating cable modem service differently from DSL service. As we have already noted, see *supra*, at 9-10, the Commission is free within the limits of reasoned interpretation to change course if it adequately justifies the change.⁴ It has done so here. The

⁴ Respondents vigorously argue that the Commission's purported inconsistent treatment is a reason for holding the Commission's construction impermissible under *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837 (1984). Any inconsistency bears on whether the Commission has given a reasoned explanation for its current position, not on whether its interpretation is consistent with the statute.

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traditional reason for its *Computer II* common-carrier treatment of facilities-based carriers (including DSL carriers), as the Commission explained, was "that the telephone network [was] the primary, if not exclusive, means through which information service providers can gain access to their customers." *Declaratory Ruling* 4825, ¶44 (emphasis in original; internal quotation marks omitted). The Commission applied the same treatment to DSL service based on that history, rather than on an analysis of contemporaneous market conditions. See *Wireline Order* 24031, ¶37 (noting DSL carriers' "continuing obligation" to offer their transmission facilities to competing ISPs on nondiscriminatory terms).

The Commission in the order under review, by contrast, concluded that changed market conditions warrant different treatment of facilities-based cable companies providing Internet access. Unlike at the time of *Computer II*, substitute forms of Internet transmission exist today: "[R]esidential high-speed access to the Internet is evolving over multiple electronic platforms, including wireline, cable, terrestrial wireless and satellite." *Declaratory Ruling* 4802, ¶6; see also *U.S. Telecom Assn. v. FCC*, 290 F.3d 415, 428 (CA DC 2002) (noting Commission findings of "robust competition . . . in the broadband market"). The Commission concluded that "broadband services should exist in a minimal regulatory environment that promotes investment and innovation in a competitive market." *Declaratory Ruling* 4802, ¶5. This, the Commission reasoned, warranted treating cable companies unlike the facilities-based enhanced-service providers of the past. *Id.*, at 4825, ¶44. We find nothing arbitrary about the Commission's providing a fresh analysis of the problem as applied to the cable industry, which it has never subjected to these rules. This is adequate rational justification for the Commission's conclusions.

Respondents argue, in effect, that the Commission's

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justification for exempting cable modem service providers from common-carrier regulation applies with similar force to DSL providers. We need not address that argument. The Commission's decision appears to be a first step in an effort to reshape the way the Commission regulates information-service providers; that may be why it has tentatively concluded that DSL service provided by facilities-based telephone companies should also be classified solely as an information service. See *In re Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, 17 FCC Rcd. 3019, 3030, ¶20 (2002). The Commission need not immediately apply the policy reasoning in the *Declaratory Ruling* to all types of information-service providers. It apparently has decided to revisit its longstanding *Computer II* classification of facilities-based information-service providers incrementally. Any inconsistency between the order under review and the Commission's treatment of DSL service can be adequately addressed when the Commission fully reconsiders its treatment of DSL service and when it decides whether, pursuant to its ancillary Title I jurisdiction, to require cable companies to allow independent ISPs access to their facilities. See *supra*, at 7, this page. We express no view on those matters. In particular, we express no view on how the Commission should, or lawfully may, classify DSL service.

* * *

The questions the Commission resolved in the order under review involve a "subject matter [that] is technical, complex, and dynamic." *Gulf Power*, 534 U. S., at 339. The Commission is in a far better position to address these questions than we are. Nothing in the Communications Act or the Administrative Procedure Act makes unlawful the Commission's use of its expert policy judgment to resolve these difficult questions. The judgment of the

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Court of Appeals is reversed, and the cases are remanded for further proceedings consistent with this opinion.

It is so ordered.

STEVENS, J., concurring

SUPREME COURT OF THE UNITED STATES

Nos. 04-277 and 04-281

NATIONAL CABLE & TELECOMMUNICATIONS
ASSOCIATION, ET AL., PETITIONERS
v.
04-277 BRAND X INTERNET SERVICES ET AL.

FEDERAL COMMUNICATIONS COMMISSION AND
UNITED STATES, PETITIONERS
v.
04-281 BRAND X INTERNET SERVICES ET AL.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF
APPEALS FOR THE NINTH CIRCUIT

[June 27, 2005]

JUSTICE STEVENS, concurring.

While I join the Court's opinion in full, I add this caveat concerning Part III-B, which correctly explains why a court of appeals' interpretation of an ambiguous provision in a regulatory statute does not foreclose a contrary reading by the agency. That explanation would not necessarily be applicable to a decision by this Court that would presumably remove any pre-existing ambiguity.

BREYER, J., concurring

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ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF
APPEALS FOR THE NINTH CIRCUIT

[June 27, 2005]

JUSTICE BREYER, concurring.

I join the Court's opinion because I believe that the Federal Communications Commission's decision falls within the scope of its statutorily delegated authority—though perhaps just barely. I write separately because I believe it important to point out that JUSTICE SCALIA, in my view, has wrongly characterized the Court's opinion in *United States v. Mead Corp.*, 533 U. S. 218 (2001). He states that the Court held in *Mead* that “some unspecified degree of formal process” before the agency “was required” for courts to accord the agency's decision deference under *Chevron U. S. A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U. S. 837 (1984). *Post*, at 12 (dissenting opinion); see also *ibid.* (formal process is “at least the only safe harbor”).

JUSTICE SCALIA has correctly characterized the way in which he, *in dissent*, characterized the Court's *Mead* opin-

ion. 533 U. S., at 245–246. But the Court said the opposite. An agency action qualifies for *Chevron* deference when Congress has explicitly or implicitly delegated to the agency the authority to “fill” a statutory “gap,” including an interpretive gap created through an ambiguity in the language of a statute’s provisions. *Chevron, supra*, at 843–844; *Mead, supra*, at 226–227. The Court said in *Mead* that such delegation “may be shown in a variety of ways, as by an agency’s power to engage in adjudication or notice-and-comment rulemaking, or by some other indication of a comparable congressional intent.” 533 U. S., at 227 (emphasis added). The Court explicitly stated that the absence of notice-and-comment rulemaking did “not decide the case,” for the Court has “sometimes found reasons for *Chevron* deference even when no such administrative formality was required and none was afforded.” *Id.*, at 231. And the Court repeated that it “has recognized a variety of indicators that Congress would expect *Chevron* deference.” *Id.*, at 237 (emphasis added).

It is not surprising that the Court would hold that the existence of a formal rulemaking proceeding is neither a necessary nor a sufficient condition for according *Chevron* deference to an agency’s interpretation of a statute. It is not a necessary condition because an agency might arrive at an authoritative interpretation of a congressional enactment in other ways, including ways that JUSTICE SCALIA mentions. See, e.g., *Mead, supra*, at 231. It is not a sufficient condition because Congress may have intended *not* to leave the matter of a particular interpretation up to the agency, irrespective of the procedure the agency uses to arrive at that interpretation, say, where an unusually basic legal question is at issue. Cf. *General Dynamics Land Systems, Inc. v. Cline*, 540 U. S. 581, 600 (2004) (rejecting agency’s answer to question whether age discrimination law forbids discrimination against the relatively young).

BREYER, J., concurring

Thus, while I believe JUSTICE SCALIA is right in emphasizing that *Chevron* deference may be appropriate in the absence of formal agency proceedings, *Mead* should not give him cause for concern.

SCALIA, J., dissenting

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ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF
APPEALS FOR THE NINTH CIRCUIT

[June 27, 2005]

JUSTICE SCALIA, with whom JUSTICE SOUTER and
JUSTICE GINSBURG join as to Part I, dissenting.

The Federal Communications Commission (FCC or Commission) has once again attempted to concoct "a whole new regime of regulation (or of free-market competition)" under the guise of statutory construction. *MCI Telecommunications Corp. v. American Telephone & Telegraph Co.*, 512 U. S. 218, 234 (1994). Actually, in these cases, it might be more accurate to say the Commission has attempted to establish a whole new regime of non-regulation, which will make for more or less free-market competition, depending upon whose experts are believed. The important fact, however, is that the Commission has chosen to achieve this through an implausible reading of the statute, and has thus exceeded the authority given it by Congress.

SCALIA, J., dissenting

I

The first sentence of the FCC ruling under review reads as follows: "Cable modem service provides high-speed access to the Internet, *as well as* many applications or functions that can be used with that access, over cable system facilities." *In re Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities*, 17 FCC Red. 4798, 4799, ¶1 (2002) (hereinafter *Declaratory Ruling*) (emphasis added, footnote omitted). Does this mean that cable companies "offer" high-speed access to the Internet? Surprisingly not, if the Commission and the Court are to be believed.

It happens that cable-modem service is popular precisely because of the high-speed access it provides, and that, once connected with the Internet, cable-modem subscribers often use Internet applications and functions from providers other than the cable company. Nevertheless, for purposes of classifying what the cable company does, the Commission (with the Court's approval) puts all the emphasis on the rest of the package (the additional "applications or functions"). It does so by claiming that the cable company does not "offe[r]" its customers high-speed Internet access because it offers that access only in conjunction with particular applications and functions, rather than "separate[ly]," as a "stand-alone offering." *Id.*, at 4802, ¶7, 4823, ¶40.

The focus on the term "offer" appropriately derives from the statutory definitions at issue in these cases. Under the Telecommunications Act of 1996, 110 Stat. 56, "information service" involves the capacity to generate, store, interact with, or otherwise manipulate "information via telecommunications." 47 U. S. C. §153(20). In turn, "telecommunications" is defined as "the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." §153(43).

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Finally, “telecommunications service” is defined as “the offering of telecommunications for a fee directly to the public . . . regardless of the facilities used.” §153(46). The question here is whether cable-modem-service providers “offe[r] . . . telecommunications for a fee directly to the public.” If so, they are subject to Title II regulation as common carriers, like their chief competitors who provide Internet access through other technologies.

The Court concludes that the word “offer” is ambiguous in the sense that it has “alternative dictionary definitions” that might be relevant. *Ante*, at 18 (quoting *National Railroad Passenger Corporation v. Boston & Maine Corp.*, 503 U. S. 407, 418 (1992)). It seems to me, however, that the analytic problem pertains not really to the meaning of “offer,” but to the identity of what is offered. The relevant question is whether the individual components in a package being offered still possess sufficient identity to be described as separate objects of the offer, or whether they have been so changed by their combination with the other components that it is no longer reasonable to describe them in that way.

Thus, I agree (to adapt the Court’s example, *ante*, at 18) that it would be odd to say that a car dealer is in the business of selling steel or carpets because the cars he sells include both steel frames and carpeting. Nor does the water company sell hydrogen, nor the pet store water (though dogs and cats are largely water at the molecular level). But what is sometimes true is not, as the Court seems to assume, *always* true. There are instances in which it is ridiculous to deny that one part of a joint offering is being offered merely because it is not offered on a “stand-alone” basis. *Ante*, at 17.

If, for example, I call up a pizzeria and ask whether they offer delivery, both common sense and common “usage,” *ante*, at 18, would prevent them from answering: “No, we do not offer delivery—but if you order a pizza from us,

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we’ll bake it for you and then bring it to your house.” The logical response to this would be something on the order of, “so, you *do* offer delivery.” But our pizza-man may continue to deny the obvious and explain, paraphrasing the FCC and the Court: “No, even though we bring the pizza to your house, we are not actually ‘offering’ you delivery, because the delivery that we provide to our end users is ‘part and parcel’ of our pizzeria-pizza-at-home service and is ‘integral to its other capabilities.’” Cf. *Declaratory Ruling* 4823, ¶39; *ante*, at 16, 26.¹ Any reasonable customer would conclude at that point that his interlocutor was either crazy or following some too-clever-by-half legal advice.

In short, for the inputs of a finished service to qualify as the objects of an “offer” (as that term is reasonably understood), it is perhaps a sufficient, *but surely not a necessary*, condition that the seller offer separately “each discrete input that is necessary to providing . . . a finished service,” *ante*, at 19. The pet store may have a policy of selling puppies only with leashes, but any customer will say that it *does* offer puppies—because a leashed puppy is still a puppy, even though it is not offered on a “stand-alone” basis.

Despite the Court’s mighty labors to prove otherwise, *ante*, at 17–29, the telecommunications component of cable-modem service retains such ample independent identity that it must be regarded as being on offer—especially when seen from the perspective of the consumer or the end user, which the Court purports to find determinative, *ante*, at 18, 22, 27, 28. The Commission’s ruling began by noting that cable-modem service provides *both*

¹The myth that the pizzeria does not offer delivery becomes even more difficult to maintain when the pizzeria advertises quick delivery as one of its advantages over competitors. That, of course, is the case with cable broadband.

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"high-speed access to the Internet" and other "applications and functions," *Declaratory Ruling* 4799, ¶1, because that is exactly how any reasonable consumer would perceive it: as consisting of two separate things.

The consumer's view of the matter is best assessed by asking what other products cable-modem service substitutes for in the marketplace. Broadband Internet service provided by cable companies is one of the three most common forms of Internet service, the other two being dial-up access and broadband Digital Subscriber Line (DSL) service. *Ante*, at 2–3. In each of the other two, the physical transmission pathway to the Internet is sold—indeed, is *legally required* to be sold—separately from the Internet functionality. With dial-up access, the physical pathway comes from the telephone company and the Internet service provider (ISP) provides the functionality.

"In the case of Internet access, the end user utilizes two different and distinct services. One is the transmission pathway, a telecommunications service that the end user purchases from the telephone company. The second is the Internet access service, which is an enhanced service provided by an ISP. . . . Th[e] functions [provided by the ISP] are separate from the transmission pathway over which that data travels. The pathway is a regulated telecommunications service; the enhanced service offered over it is not." Oxman, *The FCC and the Unregulation of the Internet*, p. 13 (FCC, Office of Plans and Policy, Working Paper No. 31, July 1999), available at http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp31.pdf (as visited June 24, 2005, and available in the Clerk of Court's case file).²

²See also *In re Federal-State Joint Board on Universal Service*, 13 FCC Rcd. 11501, 11571–11572, ¶145 (1998) (end users "obtain telecommunications service from local exchange carriers, and then use

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As the Court acknowledges, *ante*, at 29, DSL service has been similar to dial-up service in the respect that the physical connection to the Internet must be offered separately from Internet functionality.³ Thus, customers shopping for dial-up or DSL service will not be able to use the Internet unless they get both someone to provide them with a physical connection and someone to provide them with applications and functions such as e-mail and Web access. It is therefore inevitable that customers will regard the competing cable-modem service as giving them *both* computing functionality *and* the physical pipe by which that functionality comes to their computer—both the pizza and the delivery service that nondelivery pizzerias require to be purchased from the cab company.⁴

Since the delivery service provided by cable (the broadband connection between the customer's computer and the cable company's computer-processing facilities) is downstream from the computer-processing facilities, there is no question that it merely serves as a conduit for the information services that have already been "assembled" by the

information services provided by their Internet service provider and [Web site operators] in order to access [the Web]."

³In the DSL context, the physical connection is generally resold to the consumer by an ISP that has taken advantage of the telephone company's offer. The consumer knows very well, however, that the physical connection is a necessary component for Internet access which, just as in the dial-up context, is not provided by the ISP.

⁴The Court contends that this analogy is inapposite because one need not have a pizza delivered, *ante*, at 20, whereas one must purchase the cable connection in order to use cable's ISP functions. But the ISP functions provided by the cable company *can* be used without cable delivery—by accessing them from an Internet connection other than cable. The merger of the physical connection and Internet functions in cable's offerings has nothing to do with the "inextricably intertwined," *ante*, at 6, nature of the two (like a car and its carpet), but is an artificial product of the cable company's marketing decision not to offer the two separately, so that the Commission could (by the *Declaratory Ruling* under review here) exempt it from common-carrier status.

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cable company in its capacity as ISP. This is relevant because of the statutory distinction between an "information service" and "telecommunications." The former involves the capability of getting, processing, and manipulating information. §153(20). The latter, by contrast, involves no "change in the form or content of the information as sent and received." §153(43). When cable-company-assembled information enters the cable for delivery to the subscriber, the information service is already complete. The information has been (as the statute requires) generated, acquired, stored, transformed, processed, retrieved, utilized, or made available. All that remains is for the information in its final, unaltered form, to be delivered (via telecommunications) to the subscriber.

This reveals the insubstantiality of the fear invoked by both the Commission and the Court: the fear of what will happen to ISPs that do not provide the physical pathway to Internet access, yet still use telecommunications to acquire the pieces necessary to assemble the information that they pass back to their customers. According to this *reductio*, *ante*, at 22–24, if cable-modem-service providers are deemed to provide "telecommunications service," then so must *all* ISPs because they all "use" telecommunications in providing Internet functionality (by connecting to other parts of the Internet, including Internet backbone providers, for example). In terms of the pizzeria analogy, this is equivalent to saying that, if the pizzeria "offers" delivery, *all* restaurants "offer" delivery, because the ingredients of the food they serve their customers have come from other places; no matter how their customers get the food (whether by eating it at the restaurant, or by coming to pick it up themselves), they still consume a product for which delivery was a necessary "input." This is nonsense. Concluding that delivery of the finished pizza constitutes an "offer" of delivery does not require the conclusion that the serving of prepared food includes an

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"offer" of delivery. And that analogy does not even do the point justice, since "telecommunications service" is defined as "the offering of telecommunications for a fee directly to the public," 47 U. S. C. §153(46) (emphasis added). The ISPs' use of telecommunications in their processing of information is not offered directly to the public.

The "regulatory history" on which the Court depends so much, *ante*, at 21–25, provides another reason why common-carrier regulation of all ISPs is not a worry. Under its *Computer Inquiry* rules, which foreshadowed the definitions of "information" and "telecommunications" services, *ante*, at 4–5, the Commission forbore from regulating as common carriers "value-added networks"—non-facilities-based providers who leased basic services from common carriers and bundled them with enhanced services; it said that *they*, unlike facilities-based providers, would be deemed to provide only enhanced services, *ante*, at 22.⁵ That same result can be achieved today under the Commission's statutory authority to forbear from imposing

⁵The Commission says forbearance cannot explain why value added networks were not regulated as basic-service providers because it was not given the power to forbear until 1996. Reply Brief for Federal Petitioners 3–4, n. 1. It is true that when the Commission ruled on value added networks, the statute did not explicitly provide for forbearance any more than it provided for the categories of basic and enhanced services that the *Computer Inquiry* rules established, and through which the forbearance was applied. The D. C. Circuit, however, had long since recognized the Commission's discretionary power to "forbear from Title II regulation." *Computer & Communications Industry Assn. v. FCC*, 693 F. 2d 198, 212 (1982).

The Commission also says its *Computer Inquiry* rules should not apply to cable because they were developed in the context of telephone lines. Brief for Federal Petitioners 35–36, see also *ante*, at 21–25. But to the extent that the statute imported the *Computer Inquiry* approach, there is no basis for applying it differently to cable than to telephone lines, since the definition of "telecommunications service" applies "regardless of the facilities used." 47 U. S. C. §153(46).

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most Title II regulations. 47 U. S. C. §160. In fact, the statutory criteria for forbearance—which include what is “just and reasonable,” “necessary for the protection of consumers,” and “consistent with the public interest,” §§160(a)(1), (2), (3)—correspond well with the kinds of policy reasons the Commission has invoked to justify its peculiar construction of “telecommunications service” to exclude cable-modem service.

The Court also puts great stock in its conclusion that cable-modem subscribers cannot avoid using information services provided by the cable company in its ISP capacity, even when they only click-through to other ISPs. *Ante*, at 27–29. For, even if a cable-modem subscriber uses e-mail from another ISP, designates some page not provided by the cable company as his home page, and takes advantage of none of the other standard applications and functions provided by the cable company, he will still be using the cable company’s Domain Name System (DNS) server and, when he goes to popular Web pages, perhaps versions of them that are stored in the cable company’s cache. This argument suffers from at least two problems. First, in the context of telephone services, the Court recognizes a *de minimis* exception to contamination of a telecommunications service by an information service. *Ante*, at 26–27. A similar exception would seem to apply to the functions in question here. DNS, in particular, is scarcely more than routing information, which is expressly excluded from the definition of “information service.” 47 U. S. C. §153(20).⁶

⁶The Court says that invoking this explicit exception from the definition of information services, which applies only to the “management, control, or operation of a telecommunications system or the management of a telecommunications service,” 47 U. S. C. §153(20), begs the question whether cable-modem service includes a telecommunications service, *ante*, at 28, n. 3. I think not, and cite the exception only to demonstrate that the incidental functions do not prevent cable from including a telecommunications service if it otherwise qualifies. It is

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Second, it is apparently possible to sell a telecommunications service separately from, although in conjunction with, ISP-like services; that is precisely what happens in the DSL context, and the Commission does not contest that it *could* be done in the context of cable. The only impediment appears to be the Commission’s failure to require from cable companies the unbundling that it required of facilities-based providers under its *Computer Inquiry*.

Finally, I must note that, notwithstanding the Commission’s self-congratulatory paean to its deregulatory largesse, *e.g.*, Brief for Federal Petitioners 29–32, it concluded the *Declaratory Ruling* by asking, as the Court paraphrases, “whether under its Title I jurisdiction [the Commission] should require cable companies to offer other ISPs access to their facilities on common-carrier terms.” *Ante*, at 7; see also Reply Brief for Federal Petitioners 9; Tr. of Oral Arg. 17. In other words, what the Commission hath given, the Commission may well take away—unless it doesn’t. This is a wonderful illustration of how an experienced agency can (with some assistance from credulous courts) turn statutory constraints into bureaucratic discretions. The main source of the Commission’s regulatory authority over common carriers is Title II, but the Commission has rendered that inapplicable in this instance by concluding that the definition of “telecommunications service” is ambiguous and does not (in its current view) apply to cable-modem service. It contemplates, however, altering that (unnecessary) outcome, not by changing the law (*i.e.*, its construction of the Title II definitions), but by reserving the right to change the facts. Under its undefined and sparingly used “ancillary” powers, the Commission might conclude that it can order cable

rather the Court that begs the question, saying that the exception cannot apply because cable is not a telecommunications service.

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companies to "unbundle" the telecommunications component of cable-modem service.⁷ And presto, Title II will then apply to them, because they will finally be "offering" telecommunications service! Of course, the Commission will still have the statutory power to forbear from regulating them under §160 (which it has already tentatively concluded it would do, *Declaratory Ruling* 4847-4848, ¶¶94-95). Such Möbius-strip reasoning mocks the principle that the statute constrains the agency in any meaningful way.

After all is said and done, after all the regulatory cant has been translated, and the smoke of agency expertise blown away, it remains perfectly clear that someone who sells cable-modem service is "offering" telecommunications. For that simple reason set forth in the statute, I would affirm the Court of Appeals.

II

In Part III-B of its opinion, the Court continues the administrative-law improvisation project it began four years ago in *United States v. Mead Corp.*, 533 U. S. 218 (2001). To the extent it set forth a comprehensible rule,⁸ *Mead* drastically limited the categories of agency action that would qualify for deference under *Chevron U. S. A. Inc. v. Natural Resources Defense Council, Inc.*, 467 U. S.

⁷ Under the Commission's assumption that cable-modem-service providers are not providing "telecommunications services," there is reason to doubt whether it can use its Title I powers to impose common carrier-like requirements, since 47 U. S. C. §153(44) specifically provides that a "telecommunications carrier shall be treated as a common carrier under this chapter *only to the extent* that it is engaged in providing telecommunications services" (emphasis added), and "this chapter" includes Titles I and II.

⁸ For a description of the confusion *Mead* has produced in the D. C. Circuit alone, see Vermeule, *Mead in the Trenches*, 71 Geo. Wash. L. Rev. 347, 361 (2003) (concluding that "the Court has inadvertently sent the lower courts stumbling into a no-man's land").

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837 (1984). For example, the position taken by an agency before the Supreme Court, with full approval of the agency head, would not qualify. Rather, some unspecified degree of formal process was required—or was at least the only safe harbor. See *Mead, supra*, at 245-246 (SCALIA, J., dissenting).⁹

This meant that many more issues appropriate for agency determination would reach the courts without benefit of an agency position entitled to *Chevron* deference, requiring the courts to rule on these issues *de novo*.¹⁰ As I pointed out in dissent, this in turn meant (under the law as it was understood until today)¹¹ that many statu-

⁹ JUSTICE BREYER attempts to clarify *Mead* by repeating its formulations that the Court has "sometimes found reasons" to give *Chevron* deference in a (still-unspecified) "variety of ways" or because of a (still-unspecified) "variety of indicators," *ante*, at 2 (concurring opinion) (internal quotation marks and emphasis omitted). He also notes that deference is sometimes inappropriate for reasons unrelated to the agency's process. Surprising those who thought the Court's decision not to defer to the agency in *General Dynamics Land Systems, Inc. v. Cline*, 540 U. S. 581 (2004), depended on its conclusion that there was "no serious question . . . about purely textual ambiguity" in the statute, *id.*, at 600, JUSTICE BREYER seemingly attributes that decision to a still-underdeveloped exception to *Chevron* deference—one for "unusually basic legal question[s]," *ante*, at 2. The Court today (thankfully) does not follow this approach. It bases its decision on what it sees as statutory ambiguity, *ante*, at 25, without asking whether the classification of cable-modem service is an "unusually basic legal question."

¹⁰ It is true that, even under the broad basis for deference that I propose (viz., any agency position that plainly has the approval of the agency head, see *United States v. Mead Corp.*, 533 U. S. 218, 256-257 (2001) (SCALIA, J., dissenting)), some interpretive matters will be decided *de novo*, without deference to agency views. This would be a rare occurrence, however, at the Supreme Court level—at least with respect to matters of any significance to the agency. Seeking to achieve 100% agency control of ambiguous provisions through the complicated method the Court proposes is not worth the incremental benefit.

¹¹ The Court's unanimous holding in *Neal v. United States*, 516 U. S. 284 (1996), plainly rejected the notion that any form of deference could cause the Court to revisit a prior statutory construction holding. "Once

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tory ambiguities that might be resolved in varying fashions by successive agency administrations, would be resolved finally, conclusively, and forever, by federal judges—producing an “ossification of large portions of our statutory law,” 533 U.S., at 247. The Court today moves to solve this problem of its own creation by inventing yet another breathtaking novelty: judicial decisions subject to reversal by Executive officers.

Imagine the following sequence of events: FCC action is challenged as ultra vires under the governing statute; the litigation reaches all the way to the Supreme Court of the United States. The Solicitor General sets forth the FCC’s official position (approved by the Commission) regarding interpretation of the statute. Applying *Mead*, however, the Court denies the agency position *Chevron* deference, finds that the *best* interpretation of the statute contradicts the agency’s position, and holds the challenged agency action unlawful. The agency promptly conducts a rule-making, and adopts a rule that comports with its earlier position—in effect disagreeing with the Supreme Court concerning the best interpretation of the statute. Accord-

we have determined a statute’s meaning, we adhere to our ruling under the doctrine of *stare decisis*, and we assess an agency’s later interpretation of the statute against that settled law.” *Id.*, at 295. The Court attempts to reinterpret this plain language by dissecting the cases *Neal* cited, noting that they referred to previous determinations of “a statute’s clear meaning.” *Lechmere, Inc. v. NLRB*, 502 U.S. 527, 537 (1992) (quoting *Maislin Industries, U.S., Inc. v. Primary Steel, Inc.*, 497 U.S. 116, 131 (1990)). But those cases reveal that today’s focus on the term “clear” is revisionist. The oldest case in the chain using that word, *Maislin Industries*, did not rely on a prior decision that held the statute to be clear, but on a run-of-the-mill statutory interpretation contained in a 1908 decision. *Id.*, at 130–131. When *Maislin Industries* referred to the Court’s prior determination of “a statute’s clear meaning,” it was referring to the fact that the prior decision had made the statute clear, and was not conducting a retrospective inquiry into whether the prior decision had declared the statute itself to be clear on its own terms.

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ing to today’s opinion, the agency is thereupon free to take the action that the Supreme Court found unlawful.

This is not only bizarre. It is probably unconstitutional. As we held in *Chicago & Southern Air Lines, Inc. v. Waterman S. S. Corp.*, 333 U.S. 103 (1948), Article III courts do not sit to render decisions that can be reversed or ignored by Executive officers. In that case, the Court of Appeals had determined it had jurisdiction to review an order of the Civil Aeronautics Board awarding an overseas air route. By statute such orders were subject to Presidential approval and the order in question had in fact been approved by the President. *Id.*, at 110–111. In order to avoid any conflict with the President’s foreign-affairs powers, the Court of Appeals concluded that it would review the board’s action “as a regulatory agent of Congress,” and the results of that review would remain subject to approval or disapproval by the President. *Id.*, at 112–113. As I noted in my *Mead* dissent, 533 U.S., at 248, the Court bristled at the suggestion: “Judgments within the powers vested in courts by the Judiciary Article of the Constitution may not lawfully be revised, overturned or refused faith and credit by another Department of Government.” *Waterman, supra*, at 113. That is what today’s decision effectively allows. Even when the agency itself is party to the case in which the Court construes a statute, the agency will be able to disregard that construction and seek *Chevron* deference for its contrary construction the next time around.¹²

¹²The Court contends that no reversal of judicial holdings is involved, because “a court’s opinion as to the best reading of an ambiguous statute . . . is not authoritative,” *ante*, at 11. That fails to appreciate the difference between a *de novo* construction of a statute and a decision whether to defer to an agency’s position, which does not even “purport to give the statute a judicial interpretation.” *Mead, supra*, at 248 (SCALIA, J., dissenting). Once a court has decided upon its *de novo* construction of the statute, there no longer is a “different construction”

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Of course, like *Mead* itself, today's novelty in belated remediation of *Mead* creates many uncertainties to bedevil the lower courts. A court's interpretation is conclusive, the Court says, only if it holds that interpretation to be "the *only permissible* reading of the statute," and not if it merely holds it to be "the *best* reading." *Ante*, at 13. Does this mean that in future statutory-construction cases involving agency-administered statutes courts must specify (presumably in dictum) which of the two they are holding? And what of the many cases decided in the past, before this dictum's requirement was established? Apparently, silence on the point means that the court's decision is subject to agency reversal: "Before a judicial construction of a statute, whether contained in a precedent or not, may trump an agency's, the court must hold that the statute unambiguously requires the court's construction."¹³ *Ibid.* (I have not made, and as far as I know the Court has not made, any calculation of how many hundreds of past statutory decisions are now agency-reversible because of failure to include an "unambiguous" finding. I suspect the number is very large.) How much extra work will it entail for each court confronted with an agency-administered statute to determine whether it has reached, not only the right ("best") result, but "the only permissible" result? Is the standard for "unambiguous" under the Court's new agency-reversal rule the same as the standard for "unambiguous" under step one of *Chev-*

that is "consistent with the court's holding," *ante*, at 11, and available for adoption by the agency.

¹³Suggestive of the same chaotic undermining of all prior judicial decisions that do not explicitly renounce ambiguity is the Court's explanation of why agency departure from a prior judicial decision does not amount to overruling: "[T]he agency may, consistent with the court's holding, choose a different construction, since the agency remains the authoritative interpreter (within the limits of reason) of [ambiguous] statutes [it is charged with administering]" *Ante*, at 11.

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ron? (If so, of course, every case that reaches step two of *Chevron* will be agency-reversible.) Does the "unambiguous" dictum produce *stare decisis* effect even when a court is *affirming*, rather than *reversing*, agency action—so that in the future the agency *must adhere* to that affirmed interpretation? If so, does the victorious agency have the right to appeal a Court of Appeals judgment in its favor, on the ground that the text in question is in fact *not* (as the Court of Appeals held) unambiguous, so the agency should be able to change its view in the future?

It is indeed a wonderful new world that the Court creates, one full of promise for administrative-law professors in need of tenure articles and, of course, for litigators.¹⁴ I would adhere to what has been the rule in the past: When a court interprets a statute without *Chevron* deference to agency views, its interpretation (whether or not asserted to rest upon an unambiguous text) is the law. I might add that it is a great mystery why any of this is relevant here. Whatever the *stare decisis* effect of *AT&T Corp. v. Portland*, 216 F.3d 871 (CA9 2000), in the Ninth Circuit, it surely does not govern this Court's decision. And—despite the Court's peculiar, self-abnegating suggestion to the

¹⁴Further de-ossification may already be on the way, as the Court has hinted that an agency construction unworthy of *Chevron* deference may be able to trump one of our statutory-construction holdings. In *Edelman v. Lynchburg College*, 535 U.S. 106, 114 (2002), the Court found "no need to resolve any question of deference" because the Equal Employment Opportunity Commission's rule was "the position we would adopt even if . . . we were interpreting the statute from scratch." It nevertheless refused to say whether the agency's position was "the only one permissible." *Id.*, at 114, n. 8 (quotation marks omitted). JUSTICE O'CONNOR appropriately "doubt[ed]" that it is possible to reserve "the question whether a regulation is entitled to *Chevron* deference 'while simultaneously maintaining . . . that the agency is free to change its interpretation' in the future." *Id.*, at 122 (opinion concurring in judgment). In response, the Court cryptically said only that "not all deference is deference under *Chevron*." *Id.*, at 114, n. 8.

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contrary, *ante*, at 14—the Ninth Circuit would already be obliged to abandon *Portland's* holding in the face of *this Court's* decision that the Commission's construction of “telecommunications service” is entitled to deference and is reasonable. It is a sadness that the Court should go so far out of its way to make bad law.

I respectfully dissent.

Image (PDF)

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467 U.S. 837, 104 S.Ct. 2778, 81 L.Ed.2d 694, 21 ERC 1049, 14 Env'tl. L. Rep. 20,507

Supreme Court of the United States

CHEVRON, U.S.A., INC., Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.

AMERICAN IRON AND STEEL INSTITUTE, et al., Petitioners,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.

William D. RUCKELSHAUS, Administrator, Environmental Protection Agency,

Petitioner,

v.

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al. [FN*]

FN* State Report Title: Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.

Nos. 82-1005, 82-1247 and 82-1591.

Argued Feb. 29, 1984.

Decided June 25, 1984.

Rehearing Denied Aug. 16, 1984.

See 468 U.S. 1227, 105 S.Ct. 28, 29.

Petition was filed for review of order of the Environmental Protection Agency. The Court of Appeals, 685 F.2d 718, vacated regulations, and certiorari was granted. The Supreme Court, Justice Stevens, held that Environmental Protection Agency regulation allowing states to treat all pollution-emitting devices within same industrial grouping as though they were encased within single "bubble" was based on permissible construction of term "stationary source" in Clean Air Act Amendments.

Reversed.

West Headnotes

[1] KeyCite Notes



170B Federal Courts

170BVII Supreme Court

170BVII(A) In General

170Bk445 k. Appellate Jurisdiction and Procedure in General. Most Cited Cases

Supreme Court reviews judgments, not opinions.

[2] KeyCite Notes



361 Statutes

361VI Construction and Operation

361VI(A) General Rules of Construction

- 361k213 Extrinsic Aids to Construction
- 361k219 Executive Construction
- 361k219(2) k. Existence of Ambiguity. Most Cited Cases



361 Statutes KeyCite Notes

- 361VI Construction and Operation
- 361VI(A) General Rules of Construction
- 361k213 Extrinsic Aids to Construction
- 361k219 Executive Construction
- 361k219(4) k. Erroneous Construction; Conflict with Statute. Most Cited

Cases

When court reviews agency's construction of statute which it administers, court is confronted with two questions: whether Congress has directly spoken on precise question at issue; if statute is silent or ambiguous with respect to specific issue, question for court is whether agency's answer is based on permissible construction of statute.



[3] KeyCite Notes

361 Statutes

- 361VI Construction and Operation
- 361VI(A) General Rules of Construction
- 361k213 Extrinsic Aids to Construction
- 361k219 Executive Construction
- 361k219(4) k. Erroneous Construction; Conflict with Statute. Most Cited

Cases

Judiciary is final authority on issues of statutory construction and must reject administrative constructions which are contrary to clear congressional intent.



[4] KeyCite Notes

361 Statutes

- 361VI Construction and Operation
- 361VI(A) General Rules of Construction
- 361k213 Extrinsic Aids to Construction
- 361k219 Executive Construction
- 361k219(1) k. In General. Most Cited Cases

Court need not conclude that agency's construction of statute which it administered was only one it permissibly could have adopted to uphold construction, or even reading the court would have reached if question initially had arisen in judicial proceeding.



[5] KeyCite Notes

361 Statutes

- 361VI Construction and Operation
- 361VI(A) General Rules of Construction
- 361k213 Extrinsic Aids to Construction
- 361k219 Executive Construction

361k219(1) k. In General. Most Cited Cases

Where legislative delegation to agency on particular question is implicit rather than explicit, court may not substitute its own construction of statutory provision for reasonable interpretation made by administrator of agency.



[6] KeyCite Notes

361 Statutes

- 361VI Construction and Operation
 - 361VI(A) General Rules of Construction
 - 361k213 Extrinsic Aids to Construction
 - 361k219 Executive Construction
 - 361k219(1) k. In General. Most Cited Cases

Considerable weight should be accorded to executive department's construction of statutory scheme it is entrusted to administer.



[7] KeyCite Notes

149E Environmental Law

- 149EVI Air Pollution
 - 149Ek266 Particular Sources of Pollution
 - 149Ek268 k. Stationary Sources in General. Most Cited Cases
(Formerly 199k25.6(3.1), 199k25.6(3) Health and Environment)

Environmental Protection Agency regulation allowing states to treat all pollution-emitting devices within same industrial grouping as though they were encased within single "bubble" was based on permissible construction of term "stationary source" in Clean Air Act Amendments. Clean Air Act, §§ 111(a)(3), 172(b)(6), 302(j), as amended, 42 U.S.C.A. §§ 7411(a)(3), 7502(b)(6), 7602(j).

Syllabus [FN1]

FN1. The syllabus constitutes no part of the opinion of the Court but has been prepared by the Reporter of Decisions for the convenience of the reader. See United States v. Detroit Lumber Co., 200 U.S. 321, 337, 26 S.Ct. 282, 287, 50 L.Ed. 499.

The Clean Air Act Amendments of 1977 impose certain requirements on States **2779 that have not achieved the national air quality standards established by the Environmental Protection Agency (EPA) pursuant to earlier legislation, including the requirement that such "nonattainment" States establish a permit program regulating "new or modified major stationary sources" of air pollution. Generally, a permit may not be issued for such sources unless stringent conditions are met. EPA regulations promulgated in 1981 to implement the permit requirement allow a State to adopt a plantwide definition of the term "stationary source," under which an existing plant that contains several pollution-emitting devices may install or modify one piece of equipment without meeting the permit conditions if the alteration will not increase the total emissions from the plant, thus allowing a State to treat all of the pollution-emitting devices within the same industrial grouping as though they were encased within a single "bubble." Respondents filed a petition for review in the Court of Appeals, which set aside the regulations embodying the "bubble concept" as contrary to law. Although recognizing that the amended Clean Air Act does not explicitly define what Congress envisioned as a

"stationary source" to which the permit program should apply, and that the issue was not squarely addressed in the legislative history, the court concluded that, in view of the purpose of the nonattainment program to improve rather than merely maintain air quality, a plantwide definition was "inappropriate," while stating it was mandatory in programs designed to maintain existing air quality.

Held: The EPA's plantwide definition is a permissible construction of the statutory term "stationary source." Pp. 2781-2793.

(a) With regard to judicial review of an agency's construction of the statute which it administers, if Congress has not directly spoken to the precise question at issue, the question for the court is whether the *838 agency's answer is based on a permissible construction of the statute. Pp. 2781-2783.

(b) Examination of the legislation and its history supports the Court of Appeals' conclusion that Congress did not have a specific intention as to the applicability of the "bubble concept" in these cases. Pp. 2783-2786.

(c) The legislative history of the portion of the 1977 Amendments dealing with nonattainment areas plainly discloses that in the permit program Congress sought to accommodate the conflict between the economic interest in permitting capital improvements to continue and the environmental interest in improving air quality. Pp. 2786-2787.

(d) Prior to the 1977 Amendments, the EPA had used a plantwide definition of the term "source," but in 1980 the EPA ultimately adopted a regulation that, in essence, applied the basic reasoning of the Court of Appeals here, precluding use of the "bubble concept" in nonattainment States' programs designed to enhance air quality. However, when a new administration took office 1981, the EPA, in promulgating the regulations involved here, reevaluated the various arguments that had been advanced in connection with the proper definition of the term "source" and concluded that the term should be given the plantwide definition in nonattainment areas. Pp. 2787-2790.

(e) Parsing the general terms in the text of the amended Clean Air Act-- particularly the provisions of §§ 302(j) and 111(a)(3) pertaining to the definition of "source"--does not reveal any actual intent of Congress as to the issue in these cases. To the extent any congressional "intent" can be discerned from the statutory language, it would appear that the listing of overlapping, illustrative terms was intended to enlarge, rather than to confine, the scope of the EPA's power to regulate particular sources in order to effectuate the policies of the Clean Air Act. Similarly, the legislative history is consistent with the **2780 view that the EPA should have broad discretion in implementing the policies of the 1977 Amendments. The plantwide definition is fully consistent with the policy of allowing reasonable economic growth, and the EPA has advanced a reasonable explanation for its conclusion that the regulations serve environmental objectives as well. The fact that the EPA has from time to time changed its interpretation of the term "source" does not lead to the conclusion that no deference should be accorded the EPA's interpretation of the statute. An agency, to engage in informed rulemaking, must consider varying interpretations and the wisdom of its policy on a continuing basis. Policy arguments concerning the "bubble concept" should be addressed to legislators or administrators, not to judges. The EPA's interpretation of the statute here represents a reasonable accommodation of manifestly competing interests and is entitled to deference. Pp. 2790-2793.

222 U.S.App.D.C. 268, 685 F.2d 718 (1982), reversed.

Deputy Solicitor General Bator argued the cause for petitioners in all cases. With him on the briefs for petitioner in No. 82-1591 were *Solicitor General Lee, Acting Assistant Attorney General Habicht, Deputy Assistant Attorney General Walker, Mark I. Levy, Anne S. Almy, William F. Pedersen, and Charles S. Carter. Michael H. Salinsky and Kevin M. Fong* filed briefs for petitioner in No. 82-1005. *Robert A. Emmett, David Ferber, Stark Ritchie, Theodore L. Garrett, Patricia A. Barald, Louis E. Tosi, William L. Patberg, Charles F. Lettow, and Barton C. Green* filed briefs for petitioners in No. 82-1247.

*839 *David D. Doniger* argued the cause and filed a brief for respondents.†>>>

† Briefs of *amici curiae* urging reversal were filed for the American Gas Association by

John A. Myler; for the Mid-America Legal Foundation by *John M. Cannon*, *Susan W. Wanat*, and *Ann P. Sheldon*; and for the Pacific Legal Foundation by *Ronald A. Zumbrun* and *Robin L. Rivett*.

A brief of *amici curiae* urging affirmance was filed for the Commonwealth of Pennsylvania et al. by *LeRoy S. Zimmerman*, Attorney General of Pennsylvania, *Thomas Y. Au*, *Duane Woodard*, Attorney General of Colorado, *Richard L. Griffith*, Assistant Attorney General, *Joseph I. Lieberman*, Attorney General of Connecticut, *Robert A. Whitehead, Jr.*, Assistant Attorney General, *James S. Tierney*, Attorney General of Maine, *Robert Abrams*, Attorney General of New York, *Marcia J. Cleveland* and *Mary L. Lyndon*, Assistant Attorneys General, *Irwin I. Kimmelman*, Attorney General of New Jersey, *John J. Easton, Jr.*, Attorney General of Vermont, *Merideth Wright*, Assistant Attorney General, *Bronson C. La Follette*, Attorney General of Wisconsin, and *Maryann Sumi*, Assistant Attorney General.

James D. English, *Mary-Win O'Brien*, and *Bernard Kleiman* filed a brief for the United Steelworkers of America, AFL-CIO-CLC, as *amicus curiae*.

Justice STEVENS delivered the opinion of the Court.

In the Clean Air Act Amendments of 1977, Pub.L. 95-95, 91 Stat. 685, Congress enacted certain requirements applicable *840 to States that had not achieved the national air quality standards established by the Environmental Protection Agency (EPA) pursuant to earlier legislation. The amended Clean Air Act required these "nonattainment" States to establish a permit program regulating "new or modified major stationary sources" of air pollution. Generally, a permit may not be issued for a new or modified major stationary source unless several stringent conditions are met. [FN1] The EPA regulation promulgated to implement this permit requirement allows a State to adopt a plantwide definition of the term "stationary source." [FN2] Under this definition, an existing plant that contains several pollution-emitting devices may install or modify one piece of equipment without meeting the permit conditions if the alteration will not increase the total emissions from the plant. The question presented by these cases is whether EPA's decision to allow States to treat all of the pollution-emitting devices within the same industrial grouping as though they were encased within a single "bubble" is based on a reasonable construction of the statutory term "stationary source."

FN1. Section 172(b)(6), 42 U.S.C. § 7502(b)(6), provides:

"The plan provisions required by subsection (a) shall--

.....

"(6) require permits for the construction and operation of new or modified major stationary sources in accordance with section 173 (relating to permit requirements)." 91 Stat. 747.

FN2. "(i) 'Stationary source' means any building, structure, facility, or installation which emits or may emit any air pollutant subject to regulation under the Act.

"(ii) 'Building, structure, facility, or installation' means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control) except the activities of any vessel." 40 CFR §§ 51.18(j)(1)(i) and (ii) (1983).

The EPA regulations containing the plantwide definition of the term stationary source were promulgated on October *841 14, 1981. 46 Fed.Reg. 50766. Respondents [FN3] filed a timely petition for review in the United States Court of Appeals for the District of Columbia Circuit pursuant to 42 U.S.C. § 7607(b)(1). [FN4] The Court of Appeals **2781 set aside the regulations. *National Resources Defense Council, Inc. v. Gorsuch*, 222 U.S.App.D.C. 268, 685 F.2d 718 (1982).

FN3. *National Resources Defense Council, Inc., Citizens for a Better Environment, Inc., and North Western Ohio Lung Association, Inc.*


FN4. Petitioners, *Chevron U.S.A. Inc., American Iron and Steel Institute, American Petroleum Institute, Chemical Manufacturers Association, Inc., General Motors Corp., and Rubber Manufacturers Association* were granted leave to intervene and argue in support of the regulation.

The court observed that the relevant part of the amended Clean Air Act "does not explicitly define what Congress envisioned as a 'stationary source, to which the permit program ... should apply,'" and further stated that the precise issue was not "squarely addressed in the legislative history." *Id.*, at 273, 685 F.2d, at 723. In light of its conclusion that the legislative history bearing on the question was "at best contradictory," it reasoned that "the purposes of the nonattainment program should guide our decision here." *Id.*, at 276, n. 39, 685 F.2d, at 726, n. 39. [FN5] Based on two of its precedents concerning the applicability of the bubble concept to certain Clean Air Act programs, [FN6] the court stated that the bubble concept was "mandatory" in programs designed merely to maintain existing air quality, but held that it was "inappropriate" in programs enacted to improve air quality. *Id.*, at 276, 685 F.2d, at 726. Since the purpose of the permit *842 program--its "raison d'être," in the court's view--was to improve air quality, the court held that the bubble concept was inapplicable in these cases under its prior precedents. *Ibid.* It therefore set aside the regulations embodying the bubble concept as contrary to law. We granted certiorari to review that judgment, 461 U.S. 956, 103 S.Ct. 2427, 77 L.Ed.2d 1314 (1983), and we now reverse.

FN5. The court remarked in this regard:

"We regret, of course, that Congress did not advert specifically to the bubble concept's application to various Clean Air Act programs, and note that a further clarifying statutory directive would facilitate the work of the agency and of the court in their endeavors to serve the legislators' will." 222 U.S.App.D.C., at 276, n. 39, 685 F.2d, at 726, n. 39.

FN6. *Alabama Power Co. v. Costle*, 204 U.S.App.D.C. 51, 636 F.2d 323 (1979); *ASARCO Inc. v. EPA*, 188 U.S.App.D.C. 77, 578 F.2d 319 (1978).

[1]  The basic legal error of the Court of Appeals was to adopt a static judicial definition of the term "stationary source" when it had decided that Congress itself had not commanded that definition. Respondents do not defend the legal reasoning of the Court of Appeals. [FN7] Nevertheless, since this Court reviews judgments, not opinions, [FN8] we must determine whether the Court of Appeals' legal error resulted in an erroneous judgment on the validity of the regulations.

FN7. Respondents argued below that EPA's plantwide definition of

"stationary source" is contrary to the terms, legislative history, and purposes of the amended Clean Air Act. The court below rejected respondents' arguments based on the language and legislative history of the Act. It did agree with respondents contention that the regulations were inconsistent with the purposes of the Act, but did not adopt the construction of the statute advanced by respondents here. Respondents rely on the arguments rejected by the Court of Appeals in support of the judgment, and may rely on any ground that finds support in the record. See Ryerson v. United States, 312 U.S. 405, 408, 61 S.Ct. 656, 658, 85 L.Ed. 917 (1941); LeTulle v. Scofield, 308 U.S. 415, 421, 60 S.Ct. 313, 316, 84 L.Ed. 355 (1940); Langnes v. Green, 282 U.S. 531, 533-539, 51 S.Ct. 243, 244-246, 75 L.Ed. 520 (1931).

FN8. E.g., Black v. Cutter Laboratories, 351 U.S. 292, 297, 76 S.Ct. 824, 827, 100 L.Ed. 1188 (1956); J.E. Riley Investment Co. v. Commissioner, 311 U.S. 55, 59, 61 S.Ct. 95, 97, 85 L.Ed. 36 (1940); Williams v. Norris, 12 Wheat. 117, 120, 6 L.Ed. 571 (1827); McClung v. Silliman, 6 Wheat. 598, 603, 5 L.Ed. 340 (1821).

II


[2] [3] [4] When a court reviews an agency's construction of the statute which it administers, it is confronted with two questions. First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court, *843 as well as the agency, must give effect to the unambiguously expressed intent of Congress. [FN9] If, however, **2782 the court determines Congress has not directly addressed the precise question at issue, the court does not simply impose its own construction on the statute, [FN10] as would be necessary in the absence of an administrative interpretation. Rather, if the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissible construction of the statute. [FN11]

FN9. The judiciary is the final authority on issues of statutory construction and must reject administrative constructions which are contrary to clear congressional intent. See, e.g., FEC v. Democratic Senatorial Campaign Committee, 454 U.S. 27, 32, 102 S.Ct. 38, 42, 70 L.Ed.2d 23 (1981); SEC v. Sloan, 436 U.S. 103, 117-118, 98 S.Ct. 1702, 1711-1712, 56 L.Ed.2d 148 (1978); FMC v. Seatrain Lines, Inc., 411 U.S. 726, 745-746, 93 S.Ct. 1773, 1784-1785, 36 L.Ed.2d 620 (1973); Volkswagenwerk v. FMC, 390 U.S. 261, 272, 88 S.Ct. 929, 935, 19 L.Ed.2d 1090 (1968); NLRB v. Brown, 380 U.S. 278, 291, 85 S.Ct. 980, 988, 13 L.Ed.2d 839 (1965); FTC v. Colgate-Palmolive Co., 380 U.S. 374, 385, 85 S.Ct. 1035, 1042, 13 L.Ed.2d 904 (1965); Social Security Board v. Nierotko, 327 U.S. 358, 369, 66 S.Ct. 637, 643, 90 L.Ed. 718 (1946); Burnet v. Chicago Portrait Co., 285 U.S. 1, 16, 52 S.Ct. 275, 281, 76 L.Ed. 587 (1932); Webster v. Luther, 163 U.S. 331, 342, 16 S.Ct. 963, 967, 41 L.Ed. 179 (1896). If a court, employing traditional tools of statutory construction, ascertains that Congress had an intention on the precise question at issue, that intention is the law and must be given effect.

FN10. See generally, R. Pound, The Spirit of the Common Law 174-175 (1921).


FN11. The court need not conclude that the agency construction was the only one it permissibly could have adopted to uphold the construction, or even the reading the court would have reached if the question initially had arisen in a judicial proceeding. FEC v.

Democratic Senatorial Campaign Committee, 454 U.S., at 39, 102 S.Ct., at 46; Zenith Radio Corp. v. United States, 437 U.S. 443, 450, 98 S.Ct. 2441, 2445, 57 L.Ed.2d 337 (1978); Train v. Natural Resources Defense Council, Inc., 421 U.S. 60, 75, 95 S.Ct. 1470, 1479, 43 L.Ed.2d 731 (1975); Udall v. Tallman, 380 U.S. 1, 16, 85 S.Ct. 792, 801, 13 L.Ed.2d 616 (1965); Unemployment Compensation Comm'n v. Aragon, 329 U.S. 143, 153, 67 S.Ct. 245, 250, 91 L.Ed. 136 (1946); McLaren v. Fleischer, 256 U.S. 477, 480-481, 41 S.Ct. 577, 577-578, 65 L.Ed. 1052 (1921).

[5]  "The power of an administrative agency to administer a congressionally created ... program necessarily requires the formulation of policy and the making of rules to fill any gap left, implicitly or explicitly, by Congress." Morton v. Ruiz, 415 U.S. 199, 231, 94 S.Ct. 1055, 1072, 39 L.Ed.2d 270 (1974). If Congress has explicitly left a gap for the agency to fill, there is an express delegation *844 of authority to the agency to elucidate a specific provision of the statute by regulation. Such legislative regulations are given controlling weight unless they are arbitrary, capricious, or manifestly contrary to the statute. [FN12] Sometimes the legislative delegation to an agency on a particular question is implicit rather than explicit. In such a case, a court may not substitute its own construction of a statutory provision for a reasonable interpretation made by the administrator of an agency. [FN13]

FN12. See, e.g., United States v. Morton, 467 U.S. 822, 834, 104 S.Ct. 2769, 2776, 81 L.Ed.2d 680 (1984) Schweiker v. Gray Panthers, 453 U.S. 34, 44, 101 S.Ct. 2633, 2640, 69 L.Ed.2d 460 (1981); Batterton v. Francis, 432 U.S. 416, 424-426, 97 S.Ct. 2399, 2404-2406, 53 L.Ed.2d 448 (1977); American Telephone & Telegraph Co. v. United States, 299 U.S. 232, 235-237, 57 S.Ct. 170, 172-173, 81 L.Ed. 142 (1936).

FN13. E.g., INS v. Jong Ha Wang, 450 U.S. 139, 144, 101 S.Ct. 1027, 1031, 67 L.Ed.2d 123 (1981); Train v. Natural Resources Defense Council, Inc., 421 U.S., at 87, 95 S.Ct., at 1485.

[6]  We have long recognized that considerable weight should be accorded to an executive department's construction of a statutory scheme it is entrusted to administer, [FN14] and the principle of deference to administrative interpretations.

FN14. Aluminum Co. of America v. Central Lincoln Peoples' Util. Dist., 467 U.S. 380, 389, 104 S.Ct. 2472, 2479-2480, 81 L.Ed.2d 301 (1984); Blum v. Bacon, 457 U.S. 132, 141, 102 S.Ct. 2355, 2361, 72 L.Ed.2d 728 (1982); Union Electric Co. v. EPA, 427 U.S. 246, 256, 96 S.Ct. 2518, 2525, 49 L.Ed.2d 474 (1976); Investment Company Institute v. Camp, 401 U.S. 617, 626-627, 91 S.Ct. 1091, 1097, 28 L.Ed.2d 367 (1971); Unemployment Compensation Comm'n v. Aragon, 329 U.S., at 153-154, 67 S.Ct., at 250-251; NLRB v. Hearst Publications, Inc., 322 U.S. 111, 131, 64 S.Ct. 851, 860, 88 L.Ed. 1170 (1944); McLaren v. Fleischer, 256 U.S., at 480-481, 41 S.Ct., at 577-578; Webster v. Luther, 163 U.S., at 342, 16 S.Ct., at 967; Brown v. United States, 113 U.S. 568, 570-571, 5 S.Ct. 648, 649-650, 28 L.Ed. 1079 (1885); United States v. Moore, 95 U.S. 760, 763, 24 L.Ed. 588 (1878); Edwards' Lessee v. Darby, 12 Wheat. 206, 210, 6 L.Ed. 603 (1827).

"has been consistently followed by this Court whenever decision as to the meaning or reach of a statute has involved reconciling conflicting policies, and a full **2783 understanding of the force of the statutory policy in the given situation has depended upon more than ordinary knowledge respecting the matters subjected to agency regulations. See, e.g., National Broadcasting Co. v. United States, 319 U.S. 190 [63 S.Ct. 997, 87 L.Ed. 1344]; Labor Board v. Hearst Publications, Inc., 322 U.S. 111 [64 S.Ct. 851, 88 L.Ed. 1170]; *845 Republic Aviation Corp. v. Labor Board, 324 U.S. 793 [65 S.Ct. 982, 89 L.Ed. 1372]; Securities & Exchange Comm'n v. Chenery Corp., [332] 322 U.S. 194 [67 S.Ct. 1575, 91 L.Ed. 1995]; Labor Board v. Seven-Up Bottling Co., 344 U.S. 344 [73 S.Ct. 287, 97 L.Ed. 377].

"... If this choice represents a reasonable accommodation of conflicting policies that were committed to the agency's care by the statute, we should not disturb it unless it appears from the statute or its legislative history that the accommodation is not one that Congress would have sanctioned." United States v. Shimer, 367 U.S. 374, 382, 383, 81 S.Ct. 1554, 1560, 1561, 6 L.Ed.2d 908 (1961).

Accord Capital Cities Cable, Inc. v. Crisp, 467 U.S. 691, 699-700, 104 S.Ct. 2694, 2700-2701, 81 L.Ed.2d 580 (1984).

In light of these well-settled principles it is clear that the Court of Appeals misconceived the nature of its role in reviewing the regulations at issue. Once it determined, after its own examination of the legislation, that Congress did not actually have an intent regarding the applicability of the bubble concept to the permit program, the question before it was not whether in its view the concept is "inappropriate" in the general context of a program designed to improve air quality, but whether the Administrator's view that it is appropriate in the context of this particular program is a reasonable one. Based on the examination of the legislation and its history which follows, we agree with the Court of Appeals that Congress did not have a specific intention on the applicability of the bubble concept in these cases, and conclude that the EPA's use of that concept here is a reasonable policy choice for the agency to make.

III

In the 1950's and the 1960's Congress enacted a series of statutes designed to encourage and to assist the States in curtailing air pollution. See generally Train v. Natural Resources Defense Council, Inc., 421 U.S. 60, 63-64, 95 S.Ct. 1470, 1474-1475, 43 L.Ed.2d 731 (1975). The Clean Air Amendments of 1970, Pub.L. 91-604, 84 Stat. 1676, "sharply increased federal authority and responsibility *846 in the continuing effort to combat air pollution," 421 U.S., at 64, 95 S.Ct., at 1474, but continued to assign "primary responsibility for assuring air quality" to the several States, 84 Stat. 1678. Section 109 of the 1970 Amendments directed the EPA to promulgate National Ambient Air Quality Standards (NAAQS's) [FN15] and § 110 directed the States to develop plans (SIP's) to implement the standards within specified deadlines. In addition, § 111 provided that major new sources of pollution would be required to conform to technology-based performance standards; the EPA was directed to publish a list of categories of sources of pollution and to establish new source performance standards (NSPS) for each. Section 111(e) prohibited the operation of any new source in violation of a performance standard.

FN15. Primary standards were defined as those whose attainment and maintenance were necessary to protect the public health, and secondary standards were intended to specify a level of air quality that would protect the public welfare.

Section 111(a) defined the terms that are to be used in setting and enforcing standards of performance for new stationary sources. It provided:

"For purposes of this section:

.....

"(3) The term 'stationary source' means any building, structure, facility, or installation which emits or may emit any air pollutant." 84 Stat. 1683.

****2784** In the 1970 Amendments that definition was not only applicable to the NSPS program required by § 111, but also was made applicable to a requirement of § 110 that each state implementation plan contain a procedure for reviewing the location of any proposed new source and preventing its construction if it would preclude the attainment or maintenance of national air quality standards. [FN16]

FN16. See §§ 110(a)(2)(D) and 110(a)(4).

In due course, the EPA promulgated NAAQS's, approved SIP's, and adopted detailed regulations governing NSPS's ***847** for various categories of equipment. In one of its programs, the EPA used a plantwide definition of the term "stationary source." In 1974, it issued NSPS's for the nonferrous smelting industry that provided that the standards would not apply to the modification of major smelting units if their increased emissions were offset by reductions in other portions of the same plant. [FN17]

FN17. The Court of Appeals ultimately held that this plantwide approach was prohibited by the 1970 Act, see ASARCO Inc., 188 U.S.App.D.C., at 83-84, 578 F.2d, at 325-327. This decision was rendered after enactment of the 1977 Amendments, and hence the standard was in effect when Congress enacted the 1977 Amendments.

Nonattainment

The 1970 legislation provided for the attainment of primary NAAQS's by 1975. In many areas of the country, particularly the most industrialized States, the statutory goals were not attained. [FN18] In 1976, the 94th Congress was confronted with this fundamental problem, as well as many others respecting pollution control. As always in this area, the legislative struggle was basically between interests seeking strict schemes to reduce pollution rapidly to eliminate its social costs and interests advancing the economic concern that strict schemes would retard industrial development with attendant social costs. The 94th Congress, confronting these competing interests, was unable to agree on what response was in the public interest: legislative proposals to deal with nonattainment failed to command the necessary consensus. [FN19]

FN18. See Report of the National Commission on Air Quality, *To Breathe Clean Air*, 3.3-20 through 3.3-33 (1981).

FN19. Comprehensive bills did pass both Chambers of Congress; the Conference Report was rejected in the Senate. 122 Cong.Rec. 34375-34403, 34405-34418 (1976).

In light of this situation, the EPA published an Emissions Offset Interpretative Ruling in December 1976, see 41 Fed.Reg. 55524, to "fill the gap," as respondents put it, until Congress acted. The Ruling stated that it was intended to ***848** address "the issue of whether and to what extent national air quality standards established under the Clean Air Act may restrict or prohibit growth of major new or expanded stationary air pollution sources." *Id.*, at 55524-55525. In general, the Ruling provided that "a major new source may locate in an area with air quality worse than a national standard only if stringent conditions can be met." *Id.*, at 55525. The Ruling gave primary emphasis to the rapid attainment of the statute's environmental goals. [FN20] Consistent with that emphasis, the construction of every new source in nonattainment areas had to meet the "lowest achievable emission rate" under the current state of the art for that type of facility. See *Ibid.* The 1976 Ruling did not, however, explicitly adopt or reject the "bubble concept." [FN21]

FN20. For example, it stated:

"Particularly with regard to the primary NAAQS's, Congress and the Courts have made clear that economic considerations must be subordinated to NAAQS achievement and maintenance. While the ruling allows for some growth in areas violating a NAAQS if the net effect is to insure further progress toward NAAQS achievement, the Act does not allow economic growth to be accommodated at the expense of the public health." 41 Fed.Reg. 55527 (1976).

FN21. In January 1979, the EPA noted that the 1976 Ruling was ambiguous concerning this issue:

"A number of commenters indicated the need for a more explicit definition of 'source.' Some readers found that it was unclear under the 1976 Ruling whether a plant with a number of different processes and emission points would be considered a single source. The changes set forth below define a source as 'any structure, building, facility, equipment, installation, or operation (or combination thereof) which is located on one or more contiguous or adjacent properties and which is owned or operated by the same person (or by persons under common control.' This definition precludes a large plant from being separated into individual production lines for purposes of determining applicability of the offset requirements." 44 Fed.Reg. 3276.

****2785 IV**

The Clean Air Act Amendments of 1977 are a lengthy, detailed, technical, complex, and comprehensive response to a major social issue. A small portion of the statute--91 Stat. *849 745-751 (Part D of Title I of the amended Act, 42 U.S.C. §§ 7501-7508)--expressly deals with nonattainment areas. The focal point of this controversy is one phrase in that portion of the Amendments. [FN22]

FN22. Specifically, the controversy in these cases involves the meaning of the term "major stationary sources" in § 172(b)(6) of the Act, 42 U.S.C. § 7502(b)(6). The meaning of the term "proposed source" in § 173(2) of the Act, 42 U.S.C. § 7503(2), is not at issue.

Basically, the statute required each State in a nonattainment area to prepare and obtain approval of a new SIP by July 1, 1979. In the interim those States were required to comply with the EPA's interpretative Ruling of December 21, 1976. 91 Stat. 745. The deadline for attainment of the primary NAAQS's was extended until December 31, 1982, and in some cases until December 31, 1987, but the SIP's were required to contain a number of provisions designed to achieve the goals as expeditiously as possible. [FN23]

FN23. Thus, among other requirements, § 172(b) provided that the SIP's shall--

"(3) require, in the interim, reasonable further progress (as defined in section 171(1)) including such reduction in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology;

"(4) include a comprehensive, accurate, current inventory of actual emissions from all sources (as provided by rule of the Administrator) of each such pollutant for each such area which is revised and resubmitted as frequently as may be necessary to assure that the requirements of paragraph (3) are met and to assess the need for additional

reductions to assure attainment of each standard by the date required under paragraph (1);

"(5) expressly identify and quantify the emissions, if any, of any such pollutant which will be allowed to result from the construction and operation of major new or modified stationary sources for each such area; ...

.....

"(8) contain emission limitations, schedules of compliance and such other measures as may be necessary to meet the requirements of this section." 91 Stat. 747.

Section 171(1) provided:

"(1) The term 'reasonable further progress' means annual incremental reductions in emissions of the applicable air pollutant (including substantial reductions in the early years following approval or promulgation of plan provisions under this part and section 110(a)(2)(I) and regular reductions thereafter) which are sufficient in the judgment of the Administrator, to provide for attainment of the applicable national ambient air quality standard by the date required in section 172(a)." Id., at 746.

***850** Most significantly for our purposes, the statute provided that each plan shall "(6) require permits for the construction and operation of new or modified major stationary sources in accordance with section 173...." Id., 747.

Before issuing a permit, § 173 requires (1) the state agency to determine that there will be sufficient emissions reductions in the region to offset the emissions from the new source and also to allow for reasonable further progress toward attainment, or that the increased emissions will not exceed an allowance for growth established pursuant to § 172(b)(5); (2) the applicant to certify that his other sources in the State are in compliance with the SIP, (3) the agency to determine that the applicable SIP is otherwise being implemented, and (4) the proposed source to comply with the lowest achievable emission rate (LAER). [FN24]

FN24. Section 171(3) provides:

"(3) The term 'lowest achievable emission rate' means for any source, that rate of emissions which reflects--

"(A) the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or

"(B) the most stringent emission limitation which is achieved in practice by such class or category of source, whichever is more stringent. "In no event shall the application of this term permit a proposed new or modified source to emit any pollutant in excess of the amount allowable under applicable new source standards of performance."

The LAER requirement is defined in terms that make it even more stringent than the applicable new source performance standard developed under § 111 of the Act, as amended by the 1970 statute.

****2786 *851** The 1977 Amendments contain no specific reference to the "bubble concept." Nor do they contain a specific definition of the term "stationary source,"

though they did not disturb the definition of "stationary source" contained in § 111(a)(3), applicable by the terms of the Act to the NSPS program. Section 302(j), however, defines the term "major stationary source" as follows:

"(j) Except as otherwise expressly provided, the terms 'major stationary source' and 'major emitting facility' mean any stationary facility or source of air pollutants which directly emits, or has the potential to emit, one hundred tons per year or more of any air pollutant (including any major emitting facility or source of fugitive emissions of any such pollutant, as determined by rule by the Administrator)." 91 Stat. 770.

V

The legislative history of the portion of the 1977 Amendments dealing with nonattainment areas does not contain any specific comment on the "bubble concept" or the question whether a plantwide definition of a stationary source is permissible under the permit program. It does, however, plainly disclose that in the permit program Congress sought to accommodate the conflict between the economic interest in permitting capital improvements to continue and the environmental interest in improving air quality. Indeed, the House Committee Report identified the economic interest as one of the "two main purposes" of this section of the bill. It stated:

"Section 117 of the bill, adopted during full committee markup establishes a new section 127 of the Clean Air Act. The section has two main purposes: (1) to allow reasonable economic growth to continue in an area while making reasonable further progress to assure attainment of the standards by a fixed date; and (2) to allow *852 States greater flexibility for the former purpose than EPA's present interpretative regulations afford.

"The new provision allows States with nonattainment areas to pursue one of two options. First, the State may proceed under EPA's present 'tradeoff' or 'offset' ruling. The Administrator is authorized, moreover, to modify or amend that ruling in accordance with the intent and purposes of this section.

"The State's second option would be to revise its implementation plan in accordance with this new provision." H.R.Rep. No. 95-294, p. 211 (1977), U.S.Code Cong. & Admin.News 1977, pp. 1077, 1290. [FN25]

FN25. During the floor debates Congressman Waxman remarked that the legislation struck

"a proper balance between environmental controls and economic growth in the dirty air areas of America.... There is no other single issue which more clearly poses the conflict between pollution control and new jobs. We have determined that neither need be compromised....

"This is a fair and balanced approach, which will not undermine our economic vitality, or impede achievement of our ultimate environmental objectives." 123 Cong.Rec. 27076 (1977).

The second "main purpose" of the provision--allowing the States "greater flexibility" than the EPA's interpretative Ruling--as well as the reference to the EPA's authority to amend its Ruling in accordance with the intent of the section, is entirely consistent with the view that Congress did not intend to freeze the definition of "source" contained in the existing regulation into a rigid statutory requirement.

The portion of the Senate Committee Report dealing with nonattainment areas states generally that it was intended to "supersede the EPA administrative approach," and that expansion should be permitted if a State could "demonstrate that these facilities can be accommodated within its overall plan to provide for attainment of air quality standards." S.Rep. No. 95-127, **2787 p. 55 (1977). The Senate Report notes the value of "case-by-case review of each new or modified major source of pollution that seeks to locate in a region exceeding an ambient standard," explaining that such a review "requires

matching reductions from existing sources against *853 emissions expected from the new source in order to assure that introduction of the new source will not prevent attainment of the applicable standard by the statutory deadline." Ibid. This description of a case-by-case approach to plant additions, which emphasizes the net consequences of the construction or modification of a new source, as well as its impact on the overall achievement of the national standards, was not, however, addressed to the precise issue raised by these cases.

Senator Muskie made the following remarks:

"I should note that the test for determining whether a new or modified source is subject to the EPA interpretative regulation [the Offset Ruling]--and to the permit requirements of the revised implementation plans under the conference bill--is whether the source will emit a pollutant into an area which is exceeding a national ambient air quality standard for that pollutant--or precursor. Thus, a new source is still subject to such requirements as 'lowest achievable emission rate' even if it is constructed as a replacement for an older facility resulting in a net reduction from previous emission levels.

"A source--including an existing facility ordered to convert to coal--is subject to all the nonattainment requirements as a modified source if it makes any physical change which increases the amount of any air pollutant for which the standards in the area are exceeded." 123 Cong.Rec. 26847 (1977).

VI

As previously noted, prior to the 1977 Amendments, the EPA had adhered to a plantwide definition of the term "source" under a NSPS program. After adoption of the 1977 Amendments, proposals for a plantwide definition were considered in at least three formal proceedings.

In January 1979, the EPA considered the question whether the same restriction on new construction in nonattainment areas that had been included in its December 1976 Ruling *854 should be required in the revised SIP's that were scheduled to go into effect in July 1979. After noting that the 1976 Ruling was ambiguous on the question "whether a plant with a number of different processes and emission points would be considered a single source," 44 Fed.Reg. 3276 (1979), the EPA, in effect, provided a bifurcated answer to that question. In those areas that did not have a revised SIP in effect by July 1979, the EPA rejected the plantwide definition; on the other hand, it expressly concluded that the plantwide approach would be permissible in certain circumstances if authorized by an approved SIP. It stated:

"Where a state implementation plan is revised and implemented to satisfy the requirements of Part D, including the reasonable further progress requirement, the plan requirements for major modifications may exempt modifications of existing facilities that are accompanied by intrasource offsets so that there is no net increase in emissions. The agency endorses such exemptions, which would provide greater flexibility to sources to effectively manage their air emissions at least cost." Ibid. [FN26]

FN26. In the same Ruling, the EPA added:

"The above exemption is permitted under the SIP because, to be approved under Part D, plan revisions due by January 1979 must contain adopted measures assuring that reasonable further progress will be made. Furthermore, in most circumstances, the measures adopted by January 1979 must be sufficient to actually provide for attainment of the standards by the dates required under the Act, and in all circumstances measures adopted by 1982 must provide for attainment. See Section 172 of the Act and 43 FR 21673-21677 (May 19, 1978). Also, Congress intended under Section 173 of the Act that States would have some latitude to depart from the strict requirements of this Ruling when the State plan is revised and is being carried out in accordance with Part D. Under a Part D plan, therefore, there is less need to subject a modification of an existing facility to LAER and other stringent requirements if the modification is accompanied by sufficient intrasource offsets so that there is no net increase in emissions." 44 Fed.Reg. 3277 (1979).

****2788 *855** In April, and again in September 1979, the EPA published additional comments in which it indicated that revised SIP's could adopt the plantwide definition of source in nonattainment areas in certain circumstances. See *id.*, at 20372, 20379, 51924, 51951, 51958. On the latter occasion, the EPA made a formal rulemaking proposal that would have permitted the use of the "bubble concept" for new installations within a plant as well as for modifications of existing units. It explained:

" 'Bubble' Exemption: The use of offsets inside the same source is called the 'bubble.'

EPA proposes use of the definition of 'source' (see above) to limit the use of the bubble under nonattainment requirements in the following respects:

"i. Part D SIPs that include all requirements needed to assure reasonable further progress and attainment by the deadline under section 172 and that are being carried out need not restrict the use of a plantwide bubble, the same as under the PSD proposal.

"ii. Part D SIPs that do not meet the requirements specified must limit use of the bubble by including a definition of 'installation' as an identifiable piece of process equipment."

[FN27]

FN27. *Id.*, at 51926. Later in that Ruling, the EPA added:

"However, EPA believes that complete Part D SIPs, which contain adopted and enforceable requirements sufficient to assure attainment, may apply the approach proposed above for PSD, with plant-wide review but no review of individual pieces of equipment. Use of only a plant-wide definition of source will permit plant-wide offsets for avoiding NSR of new or modified pieces of equipment. However, this is only appropriate once a SIP is adopted that will assure the reductions in existing emissions necessary for attainment. See 44 FR 3276 col. 3 (January 16, 1979). If the level of emissions allowed in the SIP is low enough to assure reasonable further progress and attainment, new construction or modifications with enough offset credit to prevent an emission increase should not jeopardize attainment." *Id.*, at 51933.

***856** Significantly, the EPA expressly noted that the word "source" might be given a plantwide definition for some purposes and a narrower definition for other purposes. It wrote:

"Source means any building structure, facility, or installation which emits or may emit any regulated pollutant. 'Building, structure, facility or installation' means plant in PSD areas and in nonattainment areas except where the growth prohibitions would apply or where no adequate SIP exists or is being carried out." *Id.*, at 51925. [FN28]

FN28. In its explanation of why the use of the "bubble concept" was especially appropriate in preventing significant deterioration (PSD) in clean air areas, the EPA stated: "In addition, application of the bubble on a plant-wide basis encourages voluntary upgrading of equipment, and growth in productive capacity." *Id.*, at 51932.

The EPA's summary of its proposed Ruling discloses a flexible rather than rigid definition of the term "source" to implement various policies and programs:

"In summary, EPA is proposing two different ways to define source for different kinds of NSR programs:

"(1) For PSD and complete Part D SIPs, review would apply only to plants, with an unrestricted plant-wide bubble.

"(2) For the offset ruling, restrictions on construction, and incomplete Part D SIPs, review would apply to both plants and individual pieces of process equipment, causing the plant-wide bubble not to apply for new and modified major pieces of equipment.

"In addition, for the restrictions on construction, EPA is proposing to define 'major

modification' so as to prohibit the bubble entirely. Finally, an alternative discussed but not favored is to have only pieces of process equipment reviewed, resulting in no plant-wide bubble and allowing minor pieces of equipment to escape **2789 NSR *857 regardless of whether they are within a major plant." Id., at 51934.

In August 1980, however, the EPA adopted a regulation that, in essence, applied the basic reasoning of the Court of Appeals in these cases. The EPA took particular note of the two then-recent Court of Appeals decisions, which had created the bright-line rule that the "bubble concept" should be employed in a program designed to maintain air quality but not in one designed to enhance air quality. Relying heavily on those cases, [FN29] EPA adopted a dual definition of "source" for nonattainment areas that required a permit whenever a change in either the entire plant, or one of its components, would result in a significant increase in emissions even if the increase was completely offset by reductions elsewhere in the plant. The EPA expressed the opinion that this interpretation was "more consistent with congressional intent" than the plantwide definition because it "would bring in more sources or modifications for review," 45 Fed.Reg. 52697 (1980), but its primary legal analysis was predicated on the two Court of Appeals decisions.

FN29. "The dual definition also is consistent with Alabama Power and ASARCO. Alabama Power held that EPA had broad discretion to define the constituent terms of 'source' so as best to effectuate the purposes of the statute. Different definitions of 'source' can therefore be used for different sections of the statute....

"Moreover, Alabama Power and ASARCO taken together suggest that there is a distinction between Clean Air Act programs designed to enhance air quality and those designed only to maintain air quality....

.....

"Promulgation of the dual definition follows the mandate of Alabama Power, which held that, while EPA could not define 'source' as a combination of sources, EPA had broad discretion to define 'building,' 'structure,' 'facility,' and 'installation' so as to best accomplish the purposes of the Act." 45 Fed.Reg. 52697 (1980).

In 1981 a new administration took office and initiated a "Government-wide reexamination of regulatory burdens and complexities." 46 Fed.Reg. 16281. In the context of that *858 review, the EPA reevaluated the various arguments that had been advanced in connection with the proper definition of the term "source" and concluded that the term should be given the same definition in both nonattainment areas and PSD areas.

In explaining its conclusion, the EPA first noted that the definitional issue was not squarely addressed in either the statute or its legislative history and therefore that the issue involved an agency "judgment as how to best carry out the Act." Ibid. It then set forth several reasons for concluding that the plantwide definition was more appropriate. It pointed out that the dual definition "can act as a disincentive to new investment and modernization by discouraging modifications to existing facilities" and "can actually retard progress in air pollution control by discouraging replacement of older, dirtier processes or pieces of equipment with new, cleaner ones." Ibid. Moreover, the new definition "would simplify EPA's rules by using the same definition of 'source' for PSD, nonattainment new source review and the construction moratorium. This reduces confusion and inconsistency." Ibid. Finally, the agency explained that additional requirements that remained in place would accomplish the fundamental purposes of achieving attainment with NAAQS's as expeditiously as possible. [FN30] These conclusions were **2790 expressed *859 in a proposed rulemaking in August 1981 that was formally promulgated in October. See id., at 50766.


FN30. It stated:

"5. States will remain subject to the requirement that for all nonattainment areas they demonstrate attainment of NAAQS as expeditiously as practicable and show reasonable further progress toward such attainment. Thus, the proposed change in the mandatory scope of nonattainment new source review should not interfere with the fundamental purpose of Part D of the Act.

"6. New Source Performance Standards (NSPS) will continue to apply to many new or modified facilities and will assure use of the most up-to-date pollution control techniques regardless of the applicability of nonattainment area new source review.

"7. In order to avoid nonattainment area new source review, a major plant undergoing modification must show that it will not experience a significant net increase in emissions. Where overall emissions increase significantly, review will continue to be required." 46 Fed.Reg. 16281 (1981).

VII

[7]  In this Court respondents expressly reject the basic rationale of the Court of Appeals' decision. That court viewed the statutory definition of the term "source" as sufficiently flexible to cover either a plantwide definition, a narrower definition covering each unit within a plant, or a dual definition that could apply to both the entire "bubble" and its components. It interpreted the policies of the statute, however, to mandate the plantwide definition in programs designed to maintain clean air and to forbid it in programs designed to improve air quality. Respondents place a fundamentally different construction on the statute. They contend that the text of the Act requires the EPA to use a dual definition--if either a component of a plant, or the plant as a whole, emits over 100 tons of pollutant, it is a major stationary source. They thus contend that the EPA rules adopted in 1980, insofar as they apply to the maintenance of the quality of clean air, as well as the 1981 rules which apply to nonattainment areas, violate the statute. [FN31]

FN31. "What EPA may not do, however, is define all four terms to mean only plants. In the 1980 PSD rules, EPA did just that. EPA compounded the mistake in the 1981 rules here under review, in which it abandoned the dual definition." Brief for Respondents 29, n. 56.

Statutory Language

The definition of the term "stationary source" in § 111(a)(3) refers to "any building, structure, facility, or installation" which emits air pollution. See *supra*, at 2784. This definition is applicable only to the NSPS program by the express terms of the statute; the text of the statute does not make this definition ~~*860~~ applicable to the permit program. Petitioners therefore maintain that there is no statutory language even relevant to ascertaining the meaning of stationary source in the permit program aside from § 302(j), which defines the term "major stationary source." See *supra*, at 2786. We disagree with petitioners on this point.

The definition in § 302(j) tells us what the word "major" means--a source must emit at least 100 tons of pollution to qualify--but it sheds virtually no light on the meaning of the term "stationary source." It does equate a source with a facility--a "major emitting facility" and a "major stationary source" are synonymous under § 302(j). The ordinary meaning of the term "facility" is some collection of integrated elements which has been designed and constructed to achieve some purpose. Moreover, it is certainly no affront to common English usage to take a reference to a major facility or a major source to

connote an entire plant as opposed to its constituent parts. Basically, however, the language of § 302(j) simply does not compel any given interpretation of the term "source."

Respondents recognize that, and hence point to § 111(a)(3). Although the definition in that section is not literally applicable to the permit program, it sheds as much light on the meaning of the word "source" as anything in the statute. [FN32] As respondents point out, use of the words "building, structure, facility, or installation," as the definition of source, could be read to impose the permit conditions on an individual building that is a part of a plant. [FN33] A "word may have a character of its own not to be submerged by its association." *861 *Russell Motor Car Co. v. United States*, 261 U.S. 514, 519, 43 S.Ct. 428, 429, 67 L.Ed. 778 (1923). On the other hand, the meaning of a word must be ascertained in the context of achieving particular objectives, and the words associated with it may **2791 indicate that the true meaning of the series is to convey a common idea. The language may reasonably be interpreted to impose the requirement on any discrete, but integrated, operation which pollutes. This gives meaning to all of the terms--a single building, not part of a larger operation, would be covered if it emits more than 100 tons of pollution, as would any facility, structure, or installation. Indeed, the language itself implies a "bubble concept" of sorts: each enumerated item would seem to be treated as if it were encased in a bubble. While respondents insist that each of these terms must be given a discrete meaning, they also argue that § 111(a)(3) defines "source" as that term is used in § 302(j). The latter section, however, equates a source with a facility, whereas the former defines "source" as a facility, among other items.

FN32. We note that the EPA in fact adopted the language of that definition in its regulations under the permit program. 40 CFR §§ 51.18(j)(1)(i), (ii) (1983).

FN33. Since the regulations give the States the option to define an individual unit as a source, see 40 CFR § 51.18(j)(1) (1983), petitioners do not dispute that the terms can be read as respondents suggest.

We are not persuaded that parsing of general terms in the text of the statute will reveal an actual intent of Congress. [FN34] *862 We know full well that this language is not dispositive; the terms are overlapping and the language is not precisely directed to the question of the applicability of a given term in the context of a larger operation. To the extent any congressional "intent" can be discerned from this language, it would appear that the listing of overlapping, illustrative terms was intended to enlarge, rather than to confine, the scope of the agency's power to regulate particular sources in order to effectuate the policies of the Act.

FN34. The argument based on the text of § 173, which defines the permit requirements for nonattainment areas, is a classic example of circular reasoning. One of the permit requirements is that "the proposed source is required to comply with the lowest achievable emission rate" (LAER). Although a State may submit a revised SIP that provides for the waiver of another requirement--the "offset condition"--the SIP may not provide for a waiver of the LAER condition for any proposed source. Respondents argue that the plantwide definition of the term "source" makes it unnecessary for newly constructed units within the plant to satisfy the LAER requirement if their emissions are offset by the reductions achieved by the retirement of older equipment. Thus, according to respondents, the plantwide definition allows what the statute explicitly prohibits--the waiver of the LAER requirement for the newly constructed units. But this argument proves nothing because the statute does not prohibit the waiver unless the proposed new unit is indeed subject to the permit program. If it is not, the statute does not impose the LAER requirement at all and there is no need to reach any waiver

question. In other words, § 173 of the statute merely deals with the consequences of the definition of the term "source" and does not define the term.

Legislative History

In addition, respondents argue that the legislative history and policies of the Act foreclose the plantwide definition, and that the EPA's interpretation is not entitled to deference because it represents a sharp break with prior interpretations of the Act. Based on our examination of the legislative history, we agree with the Court of Appeals that it is unilluminating. The general remarks pointed to by respondents "were obviously not made with this narrow issue in mind and they cannot be said to demonstrate a Congressional desire...." *Jewell Ridge Coal Corp. v. Mine Workers*, 325 U.S. 161, 168-169, 65 S.Ct. 1063, 1067-1068, 89 L.Ed. 1534 (1945). Respondents' argument based on the legislative history relies heavily on Senator Muskie's observation that a new source is subject to the LAER requirement. [FN35] But the full statement is ambiguous and like the text of § 173 itself, this comment does not tell us what a new source is, much less that it is to have an inflexible definition. We find that the legislative history as a whole is silent on the precise issue before us. It is, however, consistent with the view that the EPA should have broad discretion in implementing the policies of the 1977 Amendments.

[FN35]. See *supra*, at 2787. We note that Senator Muskie was not critical of the EPA's use of the "bubble concept" in one NSPS program prior to the 1977 amendments. See *ibid*.

*863 More importantly, that history plainly identifies the policy concerns that motivated the enactment; the plantwide definition is fully consistent with one of those concerns--
**2792 the allowance of reasonable economic growth-- and, whether or not we believe it most effectively implements the other, we must recognize that the EPA has advanced a reasonable explanation for its conclusion that the regulations serve the environmental objectives as well. See *supra*, at 2789-2790, and n. 29; see also *supra*, at 2788, n. 27. Indeed, its reasoning is supported by the public record developed in the rulemaking process, [FN36] as well as by certain private studies. [FN37]

[FN36]. See, for example, the statement of the New York State Department of Environmental Conservation, pointing out that denying a source owner flexibility in selecting options made it "simpler and cheaper to operate old, more polluting sources than to trade up...." App. 128-129.

[FN37]. "Economists have proposed that economic incentives be substituted for the cumbersome administrative-legal framework. The objective is to make the profit and cost incentives that work so well in the marketplace work for pollution control.... [The 'bubble' or 'netting' concept] is a first attempt in this direction. By giving a plant manager flexibility to find the places and processes within a plant that control emissions most cheaply, pollution control can be achieved more quickly and cheaply." L. Lave & G. Omenn, *Cleaning Air: Reforming the Clean Air Act* 28 (1981) (footnote omitted).

Our review of the EPA's varying interpretations of the word "source"--both before and after the 1977 Amendments--convinces us that the agency primarily responsible for administering this important legislation has consistently interpreted it flexibly--not in a sterile textual vacuum, but in the context of implementing policy decisions in a technical and complex arena. The fact that the agency has from time to time changed its interpretation of the term "source" does not, as respondents argue, lead us to conclude that no deference should be accorded the agency's interpretation of the statute. An

initial agency interpretation is not instantly carved in stone. On the contrary, the agency, to engage in informed rulemaking, must consider varying interpretations *864 and the wisdom of its policy on a continuing basis. Moreover, the fact that the agency has adopted different definitions in different contexts adds force to the argument that the definition itself is flexible, particularly since Congress has never indicated any disapproval of a flexible reading of the statute.

Significantly, it was not the agency in 1980, but rather the Court of Appeals that read the statute inflexibly to command a plantwide definition for programs designed to maintain clean air and to forbid such a definition for programs designed to improve air quality. The distinction the court drew may well be a sensible one, but our labored review of the problem has surely disclosed that it is not a distinction that Congress ever articulated itself, or one that the EPA found in the statute before the courts began to review the legislative work product. We conclude that it was the Court of Appeals, rather than Congress or any of the decisionmakers who are authorized by Congress to administer this legislation, that was primarily responsible for the 1980 position taken by the agency.

Policy

The arguments over policy that are advanced in the parties' briefs create the impression that respondents are now waging in a judicial forum a specific policy battle which they ultimately lost in the agency and in the 32 jurisdictions opting for the "bubble concept," but one which was never waged in the Congress. Such policy arguments are more properly addressed to legislators or administrators, not to judges. [FN38]

FN38. Respondents point out if a brand new factory that will emit over 100 tons of pollutants is constructed in a nonattainment area, that plant must obtain a permit pursuant to § 172(b)(6) and in order to do so, it must satisfy the § 173 conditions, including the LAER requirement. Respondents argue if an old plant containing several large emitting units is to be modernized by the replacement of one or more units emitting over 100 tons of pollutant with a new unit emitting less--but still more than 100 tons--the result should be no different simply because "it happens to be built not at a new site, but within a pre-existing plant." Brief for Respondents 4.

*865 In these cases, the Administrator's interpretation represents a reasonable accommodation of manifestly competing in **2793 terests and is entitled to deference: the regulatory scheme is technical and complex, [FN39] the agency considered the matter in a detailed and reasoned fashion, [FN40] and the decision involves reconciling conflicting policies. [FN41] Congress intended to accommodate both interests, but did not do so itself on the level of specificity presented by these cases. Perhaps that body consciously desired the Administrator to strike the balance at this level, thinking that those with great expertise and charged with responsibility for administering the provision would be in a better position to do so; perhaps it simply did not consider the question at this level; and perhaps Congress was unable to forge a coalition on either side of the question, and those on each side decided to take their chances with the scheme devised by the agency. For judicial purposes, it matters not which of these things occurred.

FN39. See e.g., Aluminum Co. of America v. Central Lincoln Peoples' Util. Dist., 467 U.S., at 390, 104 S.Ct., at 2480 (1984).

FN40. See SEC v. Sloan, 436 U.S., at 117, 98 S.Ct., at 1711; Adamo Wrecking Co. v. United States, 434 U.S. 275, 287, n. 5, 98 S.Ct. 566, 574, n. 5, 54 L.Ed.2d 538 (1978); Skidmore v. Swift & Co., 323 U.S. 134, 140, 65 S.Ct. 161, 164, 89 L.Ed. 124 (1944).

FN41. See Capital Cities Cable, Inc. v. Crisp, 467 U.S. at 699- 700, 104 S.Ct. at 2700-2701; United States v. Shimer, 367 U.S. 374, 382, 81 S.Ct. 1554, 1560, 6 L.Ed.2d 908 (1961).

Judges are not experts in the field, and are not part of either political branch of the Government. Courts must, in some cases, reconcile competing political interests, but not on the basis of the judges' personal policy preferences. In contrast, an agency to which Congress has delegated policy-making responsibilities may, within the limits of that delegation, properly rely upon the incumbent administration's views of wise policy to inform its judgments. While agencies are not directly accountable to the people, the Chief Executive is, and it is entirely appropriate for this political branch of the Government to make such policy choices--resolving the competing interests which Congress itself either inadvertently did not resolve, or intentionally left to be resolved by the *866 agency charged with the administration of the statute in light of everyday realities.

When a challenge to an agency construction of a statutory provision, fairly conceptualized, really centers on the wisdom of the agency's policy, rather than whether it is a reasonable choice within a gap left open by Congress, the challenge must fail. In such a case, federal judges--who have no constituency-- have a duty to respect legitimate policy choices made by those who do. The responsibilities for assessing the wisdom of such policy choices and resolving the struggle between competing views of the public interest are not judicial ones: "Our Constitution vests such responsibilities in the political branches." TVA v. Hill, 437 U.S. 153, 195, 98 S.Ct. 2279, 2302, 57 L.Ed.2d 117 (1978).

We hold that the EPA's definition of the term "source" is a permissible construction of the statute which seeks to accommodate progress in reducing air pollution with economic growth. "The Regulations which the Administrator has adopted provide what the agency could allowably view as ... [an] effective reconciliation of these twofold ends...." United States v. Shimer, 367 U.S., at 383, 81 S.Ct., at 1560.

The judgment of the Court of Appeals is reversed.
It is so ordered.

Justice MARSHALL and Justice REHNQUIST took no part in the consideration or decision of these cases.

Justice O'CONNOR took no part in the decision of these cases.
U.S., 1984

Chevron, U.S.A., Inc. v. Natural Resources Defense Council, Inc.

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Top 10

Attn: Mr. Tom Whitehead
From: Supriya Sarnikar

Communications Policy and the Law

Telecommunications and broadcasting

policy and the "law" have been relatively loosely coupled over the years and in any event are hardly coterminous. (We will have to deal with what distinction can usefully be drawn between "policy" and "law".)

The general theme will be ^{the} analysis of how major ^{legislative} laws, court decisions, and FCC rulings in telecommunications and broadcasting did or did not fit with the underlying economic, technical, and political issues of the industry at the time. The purpose will be to identify important instances where the law has appropriately dealt with major policy issues, or where it has missed the mark or evaded the issue, and how those events have impacted, positively or negatively, the course of the industry and the services available to consumers. This involves ~~mix~~ ^{an analysis} of law, policy analysis, and economic history, ~~which~~ will need to be made rigorous, with the primary focus on the law.

There will be one class a week for 14 weeks, with a guest lecturer approximately every other week. It is expected that each student will write a term paper.

Tentative topic areas, a week or two each, are:

- Geller • 1934 Communications Act
- Goldberg • { Satellite & Common Carrier Competition
- { Computer Inquiry, Internet
- Baker • { AT&T Antitrust
- Sidab • { Modified Final Judgment
- W. Yang? • { 1996 Communications Act & sequelae
- Edwards? • {
- Hartfield • Broadcasting Spectrum, Cable TV, Digital TV
- Scalia • Fairness Doctrine, Equal Time, First Amendment
- Lamb • ~~Digital TV~~
- Alonso • Copyright, IP
- Toulinen? • Public broadcasting
- Wunder? •
- White? •

optional paper

✓

✓

✓

5 short
1 term.

2:00 Thursdays.

2-2:50 lecture

3-4:50 discussion

5 x topics
3-5 pp

- 1 } org, assign readings, intro, purpose
- 2 } ^{lecture}
- 3 } Topic A₁: ~~lecture~~, discussion, ~~paper due Tuesday~~
- 4 } Topic A₂: ^{quest} ~~lecture~~, Q+A, .

suggested
topics for term papers.

13 presentations of term papers & discuss

14 " "

term paper due ~~at~~ Tues.?

Creation
Consolidation
Competition
Innovation/Ubiquity
Epilogue

et/par

wired	wireless
broadcast	private
innovation	standards
unregulated	regulated
novelty	invisibility
cost	price

resources: spectrum, right of way, switches
politics: public airwaves, uses of monopoly

The Shift from Monopoly to Competition in Telecommunications and Broadcasting

Remarks by Clay T. Whitehead at GMU 3/23/04

At the change of administrations in 1969, many big issues were taking shape:

- The Johnson administration had largely ignored telecommunications and broadcasting
- Serious new firms were serious about competing with AT&T
- Data communications was growing rapidly, but ATT was overwhelmingly committed to analog
- International conflicts were growing over the US role in international communications
- New technologies like satellites, cellular, and digital networks were blocked
- The newly-formed CPB was seeking to become the fourth network funded by the US govt
- Cable TV becoming a real industry reaching a significant % of TVHH
- Copyright battles among the networks, local stations, cable TV, and Hollywood had grown more heated
- Pent-up spectrum conflicts between commercial and Federal government uses were coming to a head
- There were calls to reorganize the Executive Branch to deal with multiplying communications issues
- And, there were obvious hostilities between the Nixon political camp and the 3 TV networks

Against this tableau of issues, we were faced by the industry as it was:

- Telecommunications was the fastest growing industry in the country, but was monopolized by AT&T, which already took up 25% or more of corporate debt nationwide.

- The three TV networks controlled 90-95% of television viewing.
- A presumption of monopoly had become entrenched in industry and regulatory structure over the course of decades.
- Outside the United States, essentially all of telecommunications and all broadcasting was owned by governments.

Why was the old structure so enduring and so entrenched?

- It gave regulators leverage to impose public interest obligations on both telecom and broadcasting.
- There was a powerful symbiosis between AT&T and the government; DoD and the CIA were highly dependent on AT&T and were opposed to the entry new, unfamiliar firms.
- The FCC was interested in telecommunications competition mainly to provide a benchmark for gauging AT&T prices, not as a serious alternative to AT&T or to the established regulatory regime.
- Spectrum assignments for television channels meant that a fourth TV network could reach less than half the country.
- AT&T microwave connections were too expensive for a TV network that could not cover a large percentage of the country's TV households.
- Copyright rules favoring Hollywood and the networks blocked the expansion of new cable channels.
- Antitrust interest was focused on AT&T's manufacturing monopoly, not its monopoly over the provision of telecommunications services.
- Regulators and Congress dealt with issues incrementally, but the issues were no longer incremental.

So where do we go from there?

- OTP came to a set of conclusions that we pushed with industry, FCC, and Congress.
- Competition and open entry had to become the new paradigm in both telecom and TV because technology and service needs were moving faster than the established industry participants and regulators could (or wanted to) adapt.
- Satellite technology had to be introduced into the U.S. domestic market on an open-entry, unregulated basis or there was no hope of serious competition in telecom broadly.
- The monopoly of the 3 TV networks had to be broken to give viewers more choice and to reduce the need and excuse for the government to enact content controls and all the political meddling that invited.
- Expanded choice in TV viewing would be better achieved by large numbers of new TV channels than by the expensive creation of a big new fourth TV network funded by the government.
- Cable TV was the only way a large number of TV channels could be gotten into the home.

- Satellites were the only way to provide affordable distribution of new TV channels to cable systems nationwide, and copyright rules had to be changed to permit the new channels to emerge.
- The heart of the ATT monopoly was its monopoly over telecom services [Vail], not manufacturing.
- Antitrust is a sledgehammer, not well suited to rapidly evolving technology-intensive industries, but the ATT/FCC/DoD/Congressional monopoly mindset was so dominant and so entrenched that nothing short of a sledgehammer seemed likely to work.
- Once we persuaded Justice to support the breakup of the Bell System as a remedy, not just splitting off manufacturing, we supported the filing of the antitrust suit.
- So, that became our agenda at OTP, which we pushed vigorously with industry, the FCC, and the Congress. We had some successes, a few 2x4s upside our head, and not all of our agenda was adopted. But we did have some success in beginning the change from the long-entrenched paradigm of monopoly and incremental change toward one of open entry, competition, and innovation in both telecommunications and broadcasting.

After my run at policy

- (And a year at Harvard to get my head together), I got interested in creating some of the competition we had preached.
- I started Hughes Communications where we created the first non-common carrier satellite service and aggregated a number of new cable networks to distribute their channels to all the cable systems across the country. HC later bought and now is known as PanAmSat.
- I started the first direct-to-home satellite television broadcast service, now called SES Astra. Astra bypassed the government-owned TV stations in Europe to bring large numbers of commercial channels to homes and provide real choice in television viewing.
- Now, having seen telecommunications and television from the inside, in both policy-making and in business, and having some distance now from the heat of the battles, I plan to do some reflection, research, and writing on some aspects of electronic communications that I think are particularly interesting as that field proliferates.
- Some of those topics include:
 - The difficulties and uncertainties faced by those in the early creation of those industries, the cleverness of some and the unwittingness of others in their consolidation, and the awkward coexistence we have now forced on innovation and regulation
 - How the chaos and competition in the creation of these industries got funneled into such extreme concentration and regulation; why the monopoly structure of industry and regulation persisted as long as it did; how we have emerged from that concentration back toward competition and innovation.

- How the many threads of many current issues can be traced from the creative chaos of the beginning of electronic communications through the monopolistic consolidation, the reintroduction of competition, and the creative chaos of the industry today.
 - Notwithstanding how complex the technology, economics, law, business strategies, and market structure have become, many common threads from the past persist today:
 - Who sets the standards for interconnecting networks, who pays the costs, who gets the revenue?
 - Separation of cost and pricing by business and regulation
 - Privacy expectations and responsibilities
 - The need for standards vs the need for innovation
 - The pressure for regulation before we see how technology will evolve and be used.
 - The tension in regulation between what is “needed”, “wanted”, or just inherited.
 - The constant erosion of technical, economic, and regulatory distinctions
 - ~ As between broadcasting, cable TV, pay-per-view, and streaming video
 - ~ Or telegraph, telephone, cellular, e-mail, instant messaging, and voice over the internet
 - ~ Or books, newspapers, magazines, web pages, and blogs under the First Amendment
 - How technology, economics, markets, law, business strategies, and public perceptions intertwine to determine what communications capabilities become real businesses, how they get regulated, how they impact us as consumers and our politics, and what that portends for the future.
- So many of you here know so much about the diverse aspects of this fascinating field of electronic communications, and I look forward to exchanging ideas and perspectives with you.

Telecom

- AT&T need for capital & ownership of regional companies in exchange for capital infusions
 - State regulation
 - Applicability of previous regulatory models to telephone?
 - Acceptance/push to local and toll monopoly
 - Vail
 - Emergence of commonality among state regulations
 - Fading and re-dominance of AT&T vis-a-vis the independents
 - ~~Decline of WU and telegraphy~~
 - Vail/AT&T focus on the "system":
 - control vs profit
 - technology, interstate LD as unifying elements
 - Meaningful antitrust?
 - Patents, control, system, WEA, Movietone — *control of core business*
 - WWI impact
 - Patents, standardization
- WW2*

Wireless

- Invention, novelty, awe vs business viability
- Marconi maritime business, telegraphy, telephony
- ~~Why the shift to continuous wave? Telephony? Power? Spectrum?~~
- Crystal detector, receiver circuits, vacuum tube
- Government vs private sector ownership
- Recognition of spectrum as resource – first interference, then scarcity
- ~~International ~~interdependence~~ because of spectrum, conferences, etc~~
- When did the quality of reception get to a useable level? Why?

Broadcasting

- Wireless initially seen as point-to-point telegraph/telephone

- Early broadcasts were technical experiments, not attempts to broadcast to a listening audience.
- Amateurs, improving technology, wide availability, limited enforceability of patents, ...
- 1920: broadcast “materialized”
- 1921: broadcasting “crystallized”
- 1922: broadcasting “took off”
- Conrad, Horne, Davis, KDKA
- Westinghouse, RCA, AT&T, other construction of stations
- Brand name sales, advertising ^{of} radios?
- AT&T broadcasting strategy
 - Patents, WEAf, other stations, plans
 - Feeds, networks
- Sarnoff finds his way
- NBC, CBS
- Consumer electronics manufacturing, patents
- Evolution & economics of programming
 - Vaudeville, phonograph, movies
 - Purpose, acceptability
 - Economics, timing
- Revenue models
 - None, radio set sales
 - Sponsorship, advertising
 - Government ownership model (1919,1920)
- Regulation & legislation
 - Radio conferences, Hoover
 - 1927, 1934
- NBC/CBS vs AT&T ?
 - Predecessor to TV development
- Spectrum
 - Broadcasting vs telecom
 - Power, frequencies, time of day, interference

- Public/press recognition
- 1920-1922 boom

- f

8907 5097
820 - 9008

Course lectures
Ed Bleier?

Radio Broadcast -mog 1923: earlier?

Licenses renewable
origin - substantive - political
localism
Ashbaker 1945 comparative hearings

Fairness, PTAR, etc
Red Lion

Cross ownership

Spectrum

Smyth Haysel debate on pricing to allocate spectrum
1952 see Gurnberg p 48 n

Davis amendment 1928 (repealed 1938, Gurnberg 145)

Table of ~~allocations~~ assignments 1952 FCC

radio: see Gurnberg pp 163-164 +

TV

See FCC priorities in ~~the~~ TV ch assignment / Gurnberg 146
recipe for outlet power!

Michael Vider / ^{Southwestern Cable} SC 1968 ^{CATV} freeze

Course Questions

Web site? What is on it?

~~THAT~~ TWEN.

Course description.

~~Software?~~

Format?

Seminar

Guest lecturers – course or school or GMU?

Credits?

What makes it interesting?

Topics, papers, term papers?

5 or 6 topics @ 2 wks
2-4 general.

(reading) – ^{Q&A} lecturer – discussion – (paper) [↓] discussion
~~class~~ class 1 class 2

Kobayashi

Communications Policy & the Law
Related GMU Law Courses & Descriptions

ADVANCED COMMUNICATIONS AND INFORMATION TECHNOLOGY SEMINAR
(Law 470) -- 2 Credit hours

This seminar builds on materials covered in other courses offered in the law school curriculum. The seminar will provide students who have basic familiarity with the field the opportunity to explore issues in depth and to examine new subjects that are typically beyond the scope of introductory survey courses in Antitrust, Communications and Information Technology Law. This seminar will enable students to consider leading policy debates and to evaluate what the legal and regulatory framework of the future should be. These common themes will serve to tie together the seminar's rapid coverage of many different topics ranging from Broadcasting to Satellites to Internet Businesses, from Antitrust to Universal Service Policies, from U.S. Domestic Communications Law to rapidly changing International Regulation, and the emergence of new U.S. and International Privacy Rules governing Electronic Commerce.

ADVANCED COMMUNICATIONS LAW (Law 408) -- 2 Credit hours

This communications law seminar will focus on several areas in communications law that are currently unsettled, and will provide students an opportunity to explore in an in-depth manner potential legislative, regulatory, and market-oriented policies for these areas.

COMMUNICATIONS LAW (Law 181) -- 3 Credit hours

A treatment of basic telecommunications law, policy, and regulation.

COMMUNICATIONS, INTERNET AND MASS MEDIA LAW SEMINAR (Law 428) -- 3 Credit hours

This seminar will provide students an opportunity to explore in an in-depth manner the intersection of communications, Internet and mass media law. Each week we will discuss recent developments in these areas from the perspective of case law, FCC regulation, federal and state legislation, and other policy proposals. Topics to be covered include: local telephony, wireless and broadband competition; the transition to digital television; mass media competition and deregulation; increasing regulation of the Internet; spectrum reform; and the impact of new technologies on traditional communications law. No prerequisites are required for this course. A research paper and in-class oral presentation will be required in lieu of a written examination.

COMPETITION POLICY, INFORMATION AND TECHNOLOGY (Law 485) -- 2 Credit hours

Examines the influence of domestic competition policy on information systems, high-tech development, and the market for innovation. Relevant bodies of law include the law of unfair competition, the law of misappropriation, trade secrecy law, copyright and trademark law,

antitrust law, and various sources of regulatory rulemaking such as the Securities & Exchange Commission, the Federal Trade Commission, the Department of Justice, and the Federal Communications Commission. Emphasis will be placed on the economics of the race to first possession, network effects, path dependency, and the economics of information.

ELECTRONIC MASS MEDIA REGULATION (Law 161) -- 2 Credit hours

This course will examine the regulation of electronic mass media by the Federal Communications Commission (FCC), the Congress and the courts, with a particular focus on the broadcasting and cable industries and the effect of the Internet, digitalization and other new technologies on those industries. The course will focus on the history of the broadcast and cable industries as well as the various regulations, First Amendment cases, and policies applicable to these industries. Current topics such as indecency over the airwaves, political ads, media concentration, and the development of digital and satellite television will be covered. Students will be graded based on class participation and three take-home essays due over the course of the semester.

LAW AND ORDER IN CYBERSPACE (Law 199) -- 2 Credit hours

This course explores the developing legal and policy framework applicable to the use of advanced communications and information technology. The course will identify and consider the leading economic, social and political implications of domestic and international electronic networking of voice, video and data. The course is not about technological developments per se, but rather it concerns the array of legal and policy issues raised by new communications and information technology. The foundation for this course will be a rapid review of the history of electronic communications regulation in the United States in this century and the transformation of that legal system which is already rapidly well underway. The ultimate objective of the course is twofold: (1) to evaluate the appropriate role of government in this arena, and (2) to consider different jurisprudential models for structuring law and order in cyberspace. This course is not a comprehensive primer on lack letter internet law for practitioners, and although it is necessary to consider international aspects of global networks, including recent WTO and WIPO international agreements, and European privacy directives, the course will lean heavily on United States experiences.

LAW AND PUBLIC POLICY SEMINAR (Law 440) -- 2 Credit hours

A survey of the complex inter-relationships between public policy and the law. The course will examine topical global, national, and regional issues from both a decision-making and legal perspective, and provide the student unique insights in the process of translating the national will into legislation and executive orders.

LAW OF ELECTRONIC COMMERCE (Law 217) -- 2 Credit hours

Advanced commercial law course focusing on the law governing advertising and marketing, with an emphasis on the regulation of online sales communications. The course includes a survey of the two primary federal advertising laws, the Federal Trade Commission Act and the Lanham

Act, and analyzes how these statutes -- each of which was written generations ago -- apply to advertising on the Internet. The course also focuses on emerging developments in e-commerce law that are of particular concern to advertisers, including the regulation of online privacy practices and unsolicited commercial e-mail. Additionally, the course includes study of trademark and copyright issues applicable to online advertising, including the use of metatags and the potential liability for linking and framing.

LAW OF ELECTRONIC COMMERCE (Law 217) -- 2 Credit hours

Advanced commercial law course focusing on the impact of revolutions in telecommunication and data processing for commercial and traditional contract law. Issues include enforceability, standardization, EDI, EFT, negotiability, bills of lading, and electronic letters of credit policy considerations. Course includes a two-day field trip to New York to visit the Federal Reserve Bank of New York, N.Y. Clearing House, Money Center Funds Transfer Unit, leading attorneys, and trade associations.

THE DIGITAL REVOLUTION: LEGAL AND ECONOMIC IMPLICATIONS (Law 488)
-- 2 Credit hours

This course focuses on the implications of the digital revolution for government and governing, with an emphasis on legal issues, in three major sections. First, the course provides an historical overview of the relationship between economic and social institutions, on the one hand, and government and legal institutions on the other, with a focus on the relationship between the industrial revolution and the growth of what John Kenneth Galbraith called the industrial state. Next it turns to the nature of the digital revolution, the differences between the digital age and the industrial age and the implications for systems of law and governance. From this perspective, the course addresses specific current topics in the law of cyberspace, including privacy, restrictions on speech and economic regulation of telecommunications and the Internet.

SYLLABUS
(Subject to Change)

Readings are from the textbook, Telecommunications Law and Policy (TLP), Benjamin, Lichtman, & Shelanski, Carolina Academic Press, 2001; the TLP Supplement [**SUPP**], or the "Additional Supplemental Readings" [**ASR**], as indicated below.

[Need to insert essay requirements]

Class Date**Subject****August:**

- | | |
|----|--|
| 24 | Week 1: Overview of Communications Policy and Law; Introduction to Broadcast and Spectrum Regulation. |
| 31 | Week 2: Guest Lecturer [Suggest Dale Hatfield] |

Readings for Weeks 1 & 2:

TLP: Preface (pp. xxi-xxiii); Regulatory Overview (pp. 3-8); Broadcast & Spectrum Regulation, History, & Technology (pp. 9-34); Why Regulate Broadcast? (pp. 35-56); How We Regulate Broadcast (pp. 57-64); The Transition from Hearings to Auctions (pp. 146-155)

September

- | | |
|----|---|
| 7 | Week 3: Broadcast Public Trustee & Content Requirements |
| 14 | Week 4: Guest Lecturer [Floyd Abrams, Brian Lamb, Richard Wiley, Justice Scalia] |

Readings for Weeks 3 & 4:

TLP: The Rise and Fall of the Fairness Doctrine (pp. 157-190); Indecency standards for Broadcasting, Cable, Telephony, and the Internet (pp. 204-215; 220-239; 588-601, 839-844, & 848-865);

SUPP: pp. 42-49

September

- 21 **Week 5: Digital Television & the Digital Flag**
- 28 **Week 6: Guest Lecturer [Someone who can discuss the digital television revolution]**

Readings for Weeks 5 & 6:

TLP:

Digital Television (pp. 332-341 & 351-367)

SUPP: pp. 144-153

ASR:

Digital Flag Case (DC Cir.)

GAO Report, November 2002, GAO-03-7, "Additional Efforts Could Help Advance Digital Television Transition," pp. 1-40.

October

- 5 **Week 7: Cable Television and the Broadcast/Cable Relationship**
- 12 **Week 8: Guest Lecturer [Disney person; Richard Wiley]**

Readings for Weeks 7 & 8:

TLP:

Cable Basics & Early History (pp. 369-390), Who Should Regulate (pp. 399-411); Compelled Public Access (pp. 429-438); Broadcast/Cable Relationship (pp. 441-498)

SUPP: pp. 165-169

October

- 19 **Week 9: Introduction to Telephone Regulation: History, Technology, Economics and Regulation**
- 26 **Week 10: Guest Lecturer [Henry Geller, Henry Goldberg, Greg Sidal, Don Baker]**

Readings for Weeks 9 & 10:

TLP:

Telephone System Basics, Telephony as a Monopoly Service, and Precursors to Divestiture (pp. 603-639); *Breakup of the Bell Monopoly* (pp. 641-679);
Post-Divestiture Issues (pp. 681-693; 712-714)

November

2 **Week 11: The Telecommunications Act of 1996: Local Competition, BOC Entry into Long Distance, Universal Service, and Access Reform**

9 **Week 12: Guest Lecturer [Richard Wiley]**

Readings for Weeks 11 & 12: *[Provide excerpts of relevant cases and FCC orders]*

November

16 **Week 13: The Internet and its Effect on Communications Regulation and Policy: Broadband, VoIP, Peer to Peer File-Swapping**

23 **No Class – Thanksgiving Break**

30 **Week 14: (Last Class) Guest Lecturer [Someone who can discuss how the Internet and digitalization is blowing everything out of the water, making the 1996 Act and its distinctions obsolete.]**

Readings for Weeks 13 & 14:

TLP:

Development of the Internet (pp. 825-839); *Broadband Services* (pp. 867-880, 901-915)

SUPP: pp. 329-336

ASR:

"The FCC and the Unregulation of the Internet," FCC, Office of Plans and Policy (OPP) Working Paper No. 31, July 1999.

Recording Industry Association of America v. Verizon Internet Services, 351 F.3d 1229 (DC Cir. 2003) or *Grokster* case.

Telecommunications Policy and the Law

The course is tentatively titled "Telecommunications Policy and the Law". The idea is that telecommunications (including broadcasting) policy and the "law" have been relatively loosely coupled over the years and in any event are hardly coterminous. (We will have to deal with what distinction can usefully be drawn between "policy" and "law".)

The general theme will be analysis of how major laws, court decisions, and FCC rulings in telecommunications and broadcasting did or did not fit with the underlying economic, technical, and political issues of the industry at the time. The purpose will be to identify important instances where the law has appropriately dealt with major policy issues, or where it has missed the mark or evaded the issue, and how those events have impacted, positively or negatively, the course of the industry and the services available to consumers. This involves a mix of law, policy analysis, and economic history, which will need to be made rigorous, with the primary focus on the law.

There will be one class a week for 14 weeks, with a guest lecturer approximately every other week. It is expected that each student will write a term paper.

Tentative topic areas, a week or two each, are:

1934 Communications Act
Satellite & Common Carrier Competition
Computer Inquiry, Internet
AT&T Antitrust
Modified Final Judgment
1996 Communications Act & sequelae
Broadcasting Spectrum, Cable TV
Fairness Doctrine, Equal Time, First Amendment
Digital TV
Copyright, IP

These might be compressed or some might be deleted since it is more important to get a few important topics right than covering the waterfront. It will be important to pick one or two key decisions for each issue.

Telecommunications Policy and the Law
Class Topics

Topic

1934 Communications Act
Satellite and Common Carrier Competition
Computer Inquiry, Internet
AT&T Antitrust
Modified Final Judgment
1996 Communications Act & Aftermath
Broadcasting Spectrum, Cable
Fairness Doctrine, Equal Time
Digital TV
Copyright, IP

Other:

Guest Lecturer

Antonin Scalia
Henry Goldberg, Ken Cox

Donald Baker
Henry Geller
Greg Sidak
Dale Hatfield
Floyd Abrams, Brian Lamb
Richard Wiley
David Sentelle?

Tentative Topics

1934 Communications Act
Origins of Competition
Computer Inquiry, Internet
AT&T Antitrust
Modified Final Judgment
1996 Communications Act
Broadcasting Spectrum, Cable
Fairness Doctrine, Equal Time
Digital TV
Copyright, IP

First Amendment?
UNE-P, etc?

Possible Guest Lecturers

Antonin Scalia
Henry Goldberg
Ken Cox
Donald Baker
Henry Geller
Greg Sidak
Dale Hatfield
Brian Lamb
Richard Wiley
David Sentelle
Floyd Abrams

THE WALL FELL DOWN, AND THE CONTINENT TOOK OFF

Equity in Europe soared—while the Nikkei's dive pounded Japan and U.S. companies held their own

When Europe made history in 1989, a lot of people made fortunes. That's the primary lesson from BUSINESS WEEK's third annual survey of the Global 1000, which ranks the world's biggest companies by market capitalization and shows whose financial muscles are developing fastest as they head into the 1990s. The list is still top-heavy with Japanese giants, all familiar names from the previous two years. But the companies whose shares zoomed most dramatically reflect a clear vote of confidence in the coming European Decade.

There's more to the trend than the crumbling of the Berlin Wall last November and the approach of European integration in 1992. The Tokyo stock market crash in early January wiped 30% off the Nikkei stock average, sending even Japan's bluest chips tumbling. Nippon Telegraph & Telephone, at the top of the rankings for the third year in a row, lost \$45 billion—more than the

value of all the Austrian and Belgian listings together. Combined with a weaker yen, the crash sent many Japanese companies either down or off the list. Their places were filled by European hotshots poised to settle the Eastern frontier or expand in the new, deregulated Continent of the 1990s.

HARSH LIGHT. Compiled for BUSINESS WEEK by Morgan Stanley Capital International, which tracks 2,200 companies in 21 countries from its base in Geneva, the Global 1000 looks at corporate performance in the harsh light of investor judgment. Country-by-country breakdowns follow the master list, highlighting the best in each market. Additional data on American companies were provided by Standard & Poor's Compustat Services Inc. In a separate table on page 142, you'll find sales and profit rankings for the biggest companies in four major economies where foreign investment is currently restricted or where the equity markets are still immature: South

Korea, Taiwan, Brazil, and Mexico.

Together, the Global 1000 are worth \$6.7 trillion, up 4.7% from 1989. The top 50 alone, dominated by U.S. and Japanese leviathans, account for more than a quarter of the total. Japan lost 12 companies, and the U.S. dropped twice that number. But the American entries came out \$219 billion richer than last year's, while Japan's companies are worth \$348 billion less than those in 1989.

Still, the hottest market action was in Europe, where the culture of equity investment has taken hold and given companies ever-deeper pools of financing. The European giants will tap those funds to restructure operations, plow money into research and development, and invest staggering sums to improve the infrastructure in the West and bring the East into the 20th century. Economists believe the remaking of the Continent will boost European growth rates by 1% to 2% over the next five years.

One country making its debut on the

HOW THE GIANTS STACK UP

SALES

Billions of U. S. dollars

1. MITSUI	\$128.0
2. MARUBENI	123.2
3. MITSUBISHI	121.5
4. GENERAL MOTORS	110.0
5. C. ITOH	104.7
6. SUMITOMO	97.3
7. EXXON*	95.2
8. ROYAL DUTCH/SHELL**	85.4
9. FORD	82.9
10. NISSHO IWAI	75.1
11. IBM	62.7
12. MOBIL*	56.2
13. GENERAL ELECTRIC	54.6
14. SEARS ROEBUCK	53.8
15. TOYOTA MOTOR	52.6

*Includes excise taxes

**Excludes excise taxes

PROFITS

Billions of U. S. dollars

1. IBM	\$5.26
2. GENERAL MOTORS	4.22
3. GENERAL ELECTRIC	3.94
4. FORD	3.84
5. DAIMLER BENZ	3.80
6. EXXON	2.98
7. PHILIP MORRIS	2.95
8. BRITISH PETROLEUM	2.92
9. AT&T	2.70
10. FIAT	2.65
11. BRITISH TELECOM	2.53
12. DOW CHEMICAL	2.48
13. DU PONT	2.48
14. TOYOTA MOTOR	2.27
15. BAT INDUSTRIES	1.96

SHARE-PRICE GAIN

Percent from 1989, U. S. dollars

1. ASTRA	188%
2. OSTERR. LANDERBANK	187
3. NINTENDO	177
4. L. M. ERICSSON	168
5. PREUSSAG	154
6. ERSTE ALLGEMEINE VERS.	148
7. CREDITANSTALT	140
8. NAVIGATION MIXTE	133
9. HOCHTIEF	130
10. PHILIPP HOLZMANN	129
11. HONSHU PAPER	121
12. HATTORI SEIKO	118
13. HAVAS	118
14. CREDIT FONCIER	113
15. LYONNAISE DES EAUX	104

DATA: MORGAN STANLEY CAPITAL INTERNATIONAL INC., BW

Global 1000 tells this year's story in a nutshell. Austria weighed in with two banks and an insurer, whose combined market value skyrocketed 159% from May, 1989, to May, 1990. John Abbink of Deutsche Bank Capital Corp. in New York calls such institutions, which own much of industry in tiny Austria, "almost a pure play on Eastern Europe."

ENRICHING THE WEST. But the epicenter of the East-West action in Europe has been Germany. With a huge housing shortage, a dearth of modern plant and equipment, and a population with hard currency to spend, East Germany will enrich West German industry for years, analysts believe. "I'd certainly hold on to my Volkswagen and Siemens stocks," says Peter Pietsch, senior economist at Commerzbank in Frankfurt. The carmaker sped up the Global 1000 list from No. 276 to No. 124, boosting its share price by 83% and adding nearly \$5 billion in market capitalization. Siemens, destined to install phones in millions of deprived Eastern households, saw its share price ratchet up 56%. And shares of Deutsche Bank, which along with Dresdner Bank has already claimed control of most of East Germany's banking system, rose 75%.

Lesser-known companies ran up even more dramatically, all on expectations of bigger orders and expanded market share in a unified Germany. Shares of Heidelberger Zement, which will pour thousands of tons of concrete to build roads in the East, were up 89%. Construction companies Hochtief and Philipp Holzmann soared onto the list out of nowhere, with share-price gains of 130% and 129%, respectively.

The German market has settled down after its initial euphoria and could have a slow summer, as the social and fiscal realities of unification begin to sink in. But Thomas Neisse, head of equity analysis for Deutsche Bank in Frankfurt, thinks the German stock index (DAX) could gain up to 25% by January, on earnings growth of around 10%.

Investors may find the best of two worlds in France. Its healthy economy is ready to export to the rest of Europe while West Germany is busy supplying its little brother. And risks are lower than in Germany, since the French won't bear the costs of unification as directly. Like Germany, France added 11 compa-

nies to this year's Global 1000, many of them in the machinery, transportation, and power businesses. "I love Compagnie Générale d'Electricité," says Didier P. Bodart of Cresvale International Inc. in New York. Sure enough, the electrical equipment manufacturer vaulted up the rankings from No. 358 in 1988 to No. 123 last year, gaining 73% in value. Its Alstom subsidiary, which with Britain's GEC makes France's high-speed trains, is expected to boom as the rest of Europe lays thousands of miles of new rail.

Other stellar performers included advertising and publishing conglomerate Havas, with a 118% share-price gain (page 114). "Media companies in Europe

before it becomes a major transcontinental player. Nonetheless, foreign institutions are jumping into the Italian market, diluting the power of the traditional business elite. Foreign investors poured money into Italian telecommunications behemoth STET, pushing its shares up 95% on news that it's spending billions to upgrade the country's communications system.

Altogether, Italy added 11 companies to the roster, reflecting a broadening market. And its composite value jumped past Canada's and Switzerland's with a 48% gain. But local analysts are cautious about Italy, which is saddled with public debt and a huge trade deficit. "Italian industry is at a very delicate point," says Gianpaolo Gamba of Milan broker Gamba Azzoni & Associates.

Britain, too, remained something of a wallflower while Europhoria raged elsewhere. Steady depreciation of the pound, soaring interest rates, and fears that the Conservative sun might be in eclipse hobbled performance in the City of London. The London stock exchange was up only 3% from November to April, compared with 10% for the Dow Jones industrial average and 25% for the German DAX. And unlike the French and German markets, Britain's didn't shake any upstarts from the bottom to the top of the Global 1000.

Prime Minister Margaret Thatcher's recent softening toward the exchange rate mechanism of the European Monetary System sparked a stock rally in May. Analysts think the trend will continue as Britain pulls itself out of recession, interest rates fall, and elections approach. In addition, capital investments in industry over the past five years are beginning to pay off. That could nudge manufacturing back into prominence in Britain's economy, long powered by services and consumer spending.

EXPORT-DRIVEN. For 1990, analysts predict, Britain's biggest gainers will be found among its exporters. Says Sudhiri Junakar, who tracks economic trends for the Confederation of British Industry: "Companies that can take advantage of the more buoyant economies overseas will do much better than those in the home market." Takeover action could also revive again—only this time, British companies will be targets rather than

ONE

MARKET GUIDE FOR INVESTORS
National composites of Global 1000 stocks

	Market capitalization Billions of U.S. dollars	P-E ratio	Yield	Return on equity
1. JAPAN	\$2,649.9	69	0.5%	9.2%
2. U. S.	2,288.5	19	3.5	18.0
3. BRITAIN	546.6	13	4.8	19.9
4. WEST GERMANY	270.3	34	3.0	14.1
5. FRANCE	205.7	15	2.9	21.7
6. ITALY	122.4	26	2.1	12.1
7. CANADA	111.0	23	3.7	11.8
8. SWITZERLAND	110.8	22	2.1	11.8
9. NETHERLANDS	90.3	11	5.2	36.3
10. SWEDEN	73.6	23	2.3	17.2

DATA: MORGAN STANLEY CAPITAL INTERNATIONAL INC., BW

are going to grow tremendously over the next couple of years," says Bodart, as they satisfy Eastern Europe's hunger for news and entertainment. And Accor, which runs the midprice Novotel hotel chain, is having a field day in such Eastern capitals as Budapest and Moscow. Accor shares were up a hefty 78%.

Overall, France is so flush that President François Mitterrand has begun acting like a socialist again, and his recent talk of raising capital gains taxes and wages has slowed the formerly skyrocketing Paris Bourse. Analysts think the market has overestimated the risk, however, and could end the year 10% to 15% above its present level.

Penetrating Eastern Europe and getting in shape for 1992 don't add up to a windfall for all of Europe. Italy, for instance, has a lot of work to do at home

THE GLOBAL 1000—THE LEADERS

RANK		Billions of U. S. dollars	MARKET VALUE	RANK		Billions of U. S. dollars	MARKET VALUE
1990	1989			1990	1989		
1	1	NIPPON TELEGRAPH & TELEPHONE	Japan 118.79	51	26	NISSAN MOTOR	Japan 19.93
2	6	INTERNATIONAL BUSINESS MACHINES	U. S. 68.89	52	54	JAPAN AIR LINES	Japan 19.91
3	2	INDUSTRIAL BANK OF JAPAN	Japan 67.61	53	74	GLAXO HOLDINGS	Britain 19.68
4	10	ROYAL DUTCH/SHELL GROUP	Neth./Britain 67.14	54	87	PEPSICO	U. S. 19.48
5	12	GENERAL ELECTRIC	U. S. 62.54	55	115	HANSON TRUST	Britain 19.24
6	8	EXXON	U. S. 60.00	56	57	NIPPON CREDIT BANK	Japan 19.19
7	3	SUMITOMO BANK	Japan 55.81	57	36	BANK OF TOKYO	Japan 19.12
8	4	FUJI BANK	Japan 53.17	58	64	PACIFIC TELESIS	U. S. 19.09
9	11	TOYOTA MOTOR	Japan 50.44	59	114	BOEING	U. S. 19.05
10	24	MITSUI TAIYO KOBE BANK	Japan 49.80	60	143	DEUTSCHE BANK	West Germany 19.03
11	5	DAI-ICHI KANGYO BANK	Japan 49.57	61	78	SONY	Japan 18.78
12	7	MITSUBISHI BANK	Japan 47.17	62	82	ASSICURAZIONI GENERALI	Italy 18.71
13	16	AMERICAN TELEPHONE & TELEGRAPH	U. S. 46.96	63	120	WASTE MANAGEMENT	U. S. 18.63
14	13	SANWA BANK	Japan 45.60	64	30	MITSUBISHI TRUST & BANKING	Japan 18.54
15	9	TOKYO ELECTRIC POWER	Japan 41.68	65	70	MINNESOTA MINING & MFG.	U. S. 18.39
16	19	PHILIP MORRIS	U. S. 39.11	66	92	B. A. T. INDUSTRIES	Britain 17.99
17	17	HITACHI LTD.	Japan 33.04	67	37	CHUBU ELECTRIC POWER	Japan 17.92
18	25	MERCK	U. S. 32.72	68	99	FIAT GROUP	Italy 17.89
19	14	NOMURA SECURITIES	Japan 32.54	69	77	SOUTHWESTERN BELL	U. S. 17.55
20	22	LONG-TERM CREDIT BANK OF JAPAN	Japan 32.44	70	38	SUMITOMO TRUST & BANKING	Japan 17.55
21	85	BRISTOL-MYERS SQUIBB	U. S. 32.13	71	51	FUJITSU	Japan 17.39
22	40	WAL-MART STORES	U. S. 31.89	72	72	NYNEX	U. S. 17.27
23	39	COCA-COLA	U. S. 30.42	73	73	AMERITECH	U. S. 17.24
24	18	MATSUSHITA ELECTRIC INDUSTRIAL	Japan 29.63	74	112	WALT DISNEY	U. S. 17.20
25	33	BRITISH PETROLEUM	Britain 29.55	75	63	DOW CHEMICAL	U. S. 16.76
26	29	GENERAL MOTORS	U. S. 29.45	76	67	MITSUBISHI CORP.	Japan 16.71
27	31	BRITISH TELECOMMUNICATIONS	Britain 29.15	77	97	AMERICAN INTERNATIONAL GROUP	U. S. 16.61
28	15	NIPPON STEEL	Japan 28.17	78	98	ABBOTT LABORATORIES	U. S. 16.57
29	28	DU PONT	U. S. 27.98	79	89	AMERICAN HOME PRODUCTS	U. S. 16.53
30	35	AMOCO	U. S. 27.34	80	46	NKK	Japan 16.19
31	32	BELLSOUTH	U. S. 27.10	81	45	TOKIO MARINE & FIRE	Japan 15.92
32	60	PROCTER & GAMBLE	U. S. 26.78	82	110	TEXACO	U. S. 15.70
33	47	ATLANTIC RICHFIELD	U. S. 26.05	83	76	SEIBU RAILWAY	Japan 15.64
34	43	MOBIL	U. S. 25.67	84	121	BRITISH GAS	Britain 15.56
35	101	ALLIANZ	West Germany 24.98	85	58	ALL NIPPON AIRWAYS	Japan 15.42
36	52	CHEVRON	U. S. 24.94	86	44	TOKYO GAS	Japan 15.14
37	21	KANSAI ELECTRIC POWER	Japan 24.80	87	50	ASAHI GLASS	Japan 15.14
38	23	TOKAI BANK	Japan 23.52	88	49	DAIWA SECURITIES	Japan 14.95
39	27	MITSUBISHI HEAVY INDUSTRIES	Japan 23.49	89	313	NINTENDO	Japan 14.47
40	20	TOSHIBA	Japan 22.91	90	69	DAIWA BANK	Japan 14.23
41	96	NESTLE	Switzerland 22.81	91	193	ASEA ABB BROWN BOVERI	Sweden/Switz. 14.16
42	86	DAIMLER-BENZ	West Germany 22.58	92	105	TOKYU CORP.	Japan 14.12
43	34	FORD MOTOR	U. S. 22.48	93	94	IMPERIAL CHEMICAL INDUSTRIES	Britain 14.02
44	66	UNILEVER	Neth./Britain 22.15	94	174	ROCHE HOLDING	Switzerland 13.99
45	79	ELI LILLY	U. S. 21.82	95	55	MITSUBISHI ELECTRIC	Japan 13.95
46	95	SIEMENS	West Germany 21.29	96	41	MITSUBISHI ESTATE	Japan 13.91
47	68	JOHNSON & JOHNSON	U. S. 21.28	97	111	US WEST	U. S. 13.90
48	61	GTE	U. S. 21.13	98	150	SCHLUMBERGER	U. S. 13.87
49	62	BELL ATLANTIC	U. S. 20.56	99	179	ELF AQUITAINE	France 13.75
50	48	NEC	Japan 20.45	100	53	NIKKO SECURITIES	Japan 13.37

Footnotes on page 115

GLOBAL 1000

aggressors. Their relatively low price-earnings ratios, plus a more stable pound after Britain joins the EMS, are likely to tempt outsiders—especially the cash-rich French giants, says Michael Hughes, chief economist at Barclays de Zoete Wedd Ltd. in London.

What of the Japanese juggernaut? The 10,000-point market drop early this year and a yen worth 7% less than in

June, 1989, haven't hit all of Japan's listed companies equally. Real estate developers, banks, and brokers took a serious beating, partly because they had so far to fall. Higher interest rates and Bank of Japan's moves to stop the land-price spiral will continue punishing these sectors in 1990.

But the big electronics companies recovered well, as the crash inspired a

flight to quality and investors began heading for household names. Signs that U. S. demand may pick up later this year and give exporters a boost are encouraging that trend. NEC Corp. and Sony Corp. were among the handful of big Japanese companies whose shares went north on the Global 1000. Smaller component makers such as Alps Electric Co., up an impressive 21% over last year, are benefiting from anticipated demand for TVs in Eastern Europe.

In only a few Japanese industries did overall share prices resist the market's downward pull. Buoyant consumer spending gave a lift to retailers, including the big Marui Department Store Co. and Ito-Yokado Co. department-store chains. Broadcasting and publishing also escaped damage, as companies poured money into advertising. Next year should be even better for the media: Japanese banks alone, which will soon be allowed to run television ads, are expected to spend \$900 million promoting themselves on the tube.

LEISURE TIME. Finally, Japan's powerful auto and electronics exporters are holding their ground despite the Nikkei's fall. Some analysts expect them to outperform the market in 1990. And Tokyo's plan to spend \$2.8 trillion over the next 10 years on public works will provide a major economic stimulus. Consumer outlays for leisure and recreation are likely to keep spiraling, and the construction sector is likely to hum as more new roads, bridges, and housing are built.

Now that merger madness has cooled in the U.S., the market saw few wild share-price gains or losses. Instead, where American companies still excel is in profitability. IBM, General Motors, General Electric, and Ford Motor lead the profits list. Those are the very companies to watch over the next year, analysts believe, because their multinational presence will make them key players in the new Europe.

That is clearly where the great market battles of the next 10 years will be fought. And the U.S. and Europe could be the principal adversaries. Stephen Nagourney of Shearson Lehman Hutton Inc. thinks Japan will be busy expanding its influence in Asia, with a relatively marginal investment in Eastern Europe. He believes that a resurgence of American manufacturing strength means "the U.S. could give Europe a run for its money" in 1990. For now, however, investors have elected the Europeans most likely to succeed.

By Joan Warner in New York, with Ted Holden in Tokyo, Stewart Toy in Paris, Igor Reichlin in Bonn, Fred Kapner in Milan, and bureau reports

HAVAS: FRANCE'S MEDIA STAR IS RISING IN THE EAST

As capitalism marches to victory around the world, advertising is close on its heels. A principal crusader is French media giant Havas, quickly becoming one of Eastern Europe's top hucksters. It's also raking in ad money from deregulated television in Western Europe. Happy investors bid up Havas' stock price 118% from May, 1989, to May, 1990. Many analysts see more gains ahead.

Havas was part of the socialist camp until three years ago, when the French government sold the majority stake it had held since World War II. Shaking off those shackles has let Havas do deals abroad. Last year, it merged its billboard business in several countries with that of MAI, a British outdoor advertising company. "When we were state-owned, foreign companies wouldn't touch us," says Havas Chairman Pierre Dautier. Havas now makes 20% of its profits outside France, up from 5% in 1987. The share should hit 30% in two years.

FRENCH EDGE. Dautier is moving farther east. In recent months, he has signed exclusive deals to sell advertising time on six TV networks in East Germany, Czechoslovakia, and the Soviet Union. He also hopes to plaster billboards all over Eastern Europe. And being French may be an advantage: Dautier believes that the East German TV networks hired Havas instead of rival bidder Bertelsmann part-

ly to avoid overdependence on West German companies.

Advertising rings up two-thirds of Havas' profits, which jumped 30% last year, to \$172 million on revenues of \$3.3 billion. Analysts expect a repeat performance in 1990. The company has a 43% stake in France's biggest ad agency, Eurocom. Havas also owns trade magazines and 25% of France's hugely profitable pay-TV channel Canal Plus, which will launch Spanish and German channels next year.

Havas' only weak spot is a French travel-agency chain. Dautier thinks European airline deregulation in 1992 will



CHAIRMAN DAUTIER: AD PROFITS JUMPED 30% LAST YEAR

let the unit buy seats more cheaply and raise profit margins. Its recent acquisition of SCAC Voyages has expanded its retail network and should cut costs.

With \$500 million in cash, Havas is also hunting for acquisitions. But Dautier denies rumors that he's eyeing troubled British ad agency Saatchi & Saatchi PLC. "We could afford it," he says, "but we lack the management to turn it around." Why ask for trouble when you're landing the world's biggest new account?

By Stewart Toy in Paris

THE BUSINESS WEEK GLOBAL 1000

COUNTRY BY COUNTRY

GLOSSARY

MARKET VALUE:

Share price on May 31, 1990, multiplied by latest available number of shares outstanding, translated into U. S. dollars at May month-end exchange rates. Market value may include several classes of stock; price and yield data are based on the company's most widely held issue.

SHARE PRICE AND ANNUAL CHANGE:

Closing per-share price on May 31, 1990, in U. S. dollars. Annual percent change from May 31, 1989, to May 31, 1990, both in U. S. dollars and in each company's local currency.

PRICE/BOOK VALUE RATIO:

The ratio of May closing price to latest available net worth per share or common shareholders' equity investment.

PRICE/EARNINGS RATIO:

The ratio of May closing price to latest 12-months' earnings per share.

YIELD:

Latest 12 months' dividends per share as a percent of May closing price.

SALES:

Net sales reported by company, translated at May 31 exchange rates; revenues for banks and other financial institutions are not included because they are not comparable to those of industrial companies.

PROFITS:

Latest after-tax earnings available to common shareholders, translated at May 31 currency exchange rates; profits are from companies' continuing operations before extraordinary items. Sales, profits, and assets are for 1989 fiscal year unless noted; p/e and ROE based on latest 12 months' earnings per share.

RETURN ON EQUITY:

Latest 12-months' earnings per share as percent of most recent book value per share.

INDUSTRY CODE:

For key to the two-digit code, see page 136.

Data for individual companies: Morgan Stanley Capital International, unless otherwise indicated. Country composites and rankings calculated by BUSINESS WEEK. Additional data by Standard & Poor's Compustat Services Inc. if footnoted.

COUNTRY RANK	GLOBAL 1000 RANK	MARKET VALUE U.S. \$ MIL.	PRICE PER SHARE U.S. \$	% CHANGE FROM 1989 (U.S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U.S. \$ MIL.	PROFITS U.S. \$ MIL.	ASSETS U.S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE	
GLOBAL COMPOSITE		6735152	715	29	16	3.3	28	3.4	6426986	343204	18353033	16.3		
AUSTRALIA		56862	5	6	4	1.7	10	5.9	59359	5857	276657	16.8		
COUNTRY COMPOSITE														
1	Broken Hill Proprietary	149	10486	7	14	12	2.0	12	3.8	8072	797	15397	16.1	11
2	CRA	343	5391	9	39	35	1.7	12	4.8	3827	452	6180	14.5	24
3	BTR Nylex	373	4957	2	24	20	3.3	12	3.8	3815	401	4428	26.4	37
4	National Australia Bank	396	4670	5	1	-1	1.0	7	9.4	NA	603	58617	14.2	61
5	Westpac Banking	452	4179	4	-1	-3	0.8	7	9.2	NA	609	83606	11.9	61
6	ANZ Group Holdings	550	3581	4	2	0	1.1	11	8.7	NA	399	65222	10.3	61
7	Elders IXL	627	3152	1	-15	-17	1.0	6	10.5	13586	503	7733	15.3	59
8	Western Mining	645	3068	4	-5	-7	1.8	9	6.5	928	351	2393a	21.0	24
9	Coles Myer	666	2965	6	-11	-13	1.9	10	6.1	10785	299	3790	18.5	54
10	CSR	675	2918	4	16	13	1.6	10	6.5	3477b	313b	3885	17.3	71
11	Pacific Dunlop Olympic	743	2680	4	10	7	3.1	12	3.9	3456	202	3167	26.6	71
12	Boral	870	2310	3	19	16	1.8	9	6.5	2791	232	2621	20.2	21
13	M. I. M. Holdings	893	2254	2	22	19	1.5	10	4.9	1353	185	3498	14.9	24
14	Brambles Industries	925	2173	11	10	8	2.6	14	3.1	1203	131	1438	18.4	52
15	News	964	2078	8	-28	-30	0.5	8	1.0	6066	382	14681	6.7	51
AUSTRIA		8336	821	159	120	5.4	90	0.9	867	94	66111	6.2		
COUNTRY COMPOSITE														
1	Creditanstalt-Bankverein	488	3962	487	140	104	2.4	114	1.3	NA	34	41390a	2.1	61
2	Erste Allgemeine Vers.	887	2269	1874	148	111	11.0	92	0.2	867a	24a	1691a	12.0	63
3	Osterreichische Landesbank	952	2105	102	187	144	2.9	64	1.2	NA	36	23031	4.6	61
BELGIUM		36385	177	9	-8	1.5	13	5.2	31663	3485	137182	14.8		
COUNTRY COMPOSITE														
1	Petrofina	230	7467	345	8	-10	1.8	12	4.6	12755	641	10586	14.9	11
2	Générale de Belgique	330	5570	94	21	1	1.4	10	3.4	NA	577	15958	14.3	71
3	Solvay	579	3428	414	14	-5	1.4	6	3.8	7383	549	6995	22.2	22
4	Tractebel	611	3235	252	12	-7	1.5	13	4.5	NA	253	4401a	11.9	71
5	ACEC-Union Minière	669	2950	119	NA	NA	2.2	5	4.0	5142	544	3824	40.6	24
6	Intercom	713	2781	93	6	-12	1.1	11	8.6	2873	265	6357	10.8	12
7	Royale Belge	757	2643	165	29	7	2.3	27	3.0	1224a	96a	13128a	8.3	63
8	Groupe Bruxelles Lambert	948	2114	115	7	-11	1.7	11	4.6	NA	213	3182a	15.9	71
* Based on nonconsolidated results. ** Based on consolidated earnings-per-share and nonconsolidated book value per share. a) Based on 1988 data. b) Based on 1990 data. c) Merged with Taiyoo Kabe Bank in April 1990. d) Partial year data because of fiscal year change. e) U.S. consolidated data. f) Data for 15 months because of fiscal year change. g) Earnings include Alstom and Alcatel. h) Earnings include provisions for loan losses. i) Earnings include pretax provisions. j) 80% owned by Daimler-Benz. k) Listed since September 1989. l) Acquired Texas Eastern in June 1989. 1) Global ranking calculated for Royal Dutch/Shell Group by combining market value of Netherlands' Royal Dutch Petroleum and Britain's Shell Transport & Trading. 2) Global ranking calculated for SmithKline Beecham by combining market value of SmithKline Beecham PLC A and SmithKline Beecham Unit. 3) Global ranking calculated for Unilever by combining market value of Netherlands' Unilever NV and Britain's Unilever PLC. 4) Global ranking calculated for Eurotunnel by combining market value of Eurotunnel (London) and Eurotunnel (Paris). 5) Global ranking calculated for ABB Asea Brown Boveri by combining market value of Sweden's ASEA and Switzerland's BBC Brown Boveri. Sales, profits, and assets in the individual country tables are for the combined companies; share, price, and market-value data are for separate companies. 6) Data for this company provided by Standard & Poor's Compustat Services Inc. Unless otherwise noted, all other data provided by Morgan Stanley Capital International. LOSS = Negative ratio. NA = Not available. NR = Not ranked. NEG = Negative return.														

* Based on nonconsolidated results. ** Based on consolidated earnings-per-share and nonconsolidated book value per share. a) Based on 1988 data. b) Based on 1990 data. c) Merged with Taiyo Kobe Bank in April 1990. d) Partial year data because of fiscal-year change. e) U.S. consolidated data. f) Data for 15 months because of fiscal year change. g) Earnings include Alstom and Alcatel. h) Earnings include provisions for loan losses. i) Earnings include pretax provisions. j) 80% owned by Daimler-Benz. k) Listed since September 1989. l) Acquired Texas Eastern in June 1989. 1) Global ranking calculated for Royal Dutch/Shell Group by combining market value of Netherlands' Royal Dutch Petroleum and Britain's Shell Transport & Trading. 2) Global ranking calculated for SmithKline Beecham by combining market value of SmithKline Beecham PLC A and SmithKline Beecham Unit. 3) Global ranking calculated for Unilever by combining market value of Netherlands' Unilever NV and Britain's Unilever PLC. 4) Global ranking calculated for Eurotunnel by combining market value of Eurotunnel (London) and Eurotunnel (Paris). 5) Global ranking calculated for ABB Asea Brown Boveri by combining market value of Sweden's ASEA and Switzerland's BBC Brown Boveri. Sales, profits, and assets in the individual country tables are for the combined companies; share, price, and market-value data are for separate companies. 6) Data for this company provided by Standard & Poor's Compustat Services Inc. Unless otherwise noted, all other data provided by Morgan Stanley Capital International. LOSS = Negative ratio. NA = Not available. NR = Not ranked. NEG = Negative return.

THE GLOBAL 1000

COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U.S. \$ MIL.	PRICE PER SHARE U.S. \$	% CHANGE FROM 1989 (U.S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U.S. \$ MIL.	PROFITS U.S. \$ MIL.	ASSETS U.S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
9	EBES	967	2072	115	2	-15	1.3	9	8.9	2287	223	4949	13.8	12
10	Electrafina	968	2071	93	9	-9	1.0	15	5.0	NA	50a*	837a*	7.0	11
11	Générale de Banque	973	2054	144	-16	-17	1.0	28	7.1	NA	74	66964	3.5	61
BRITAIN														
COUNTRY COMPOSITE		546623		8	17	9	2.3	13	4.8	615858	44247	1537430	19.9	
1	British Petroleum	25	29549	6	22	14	1.6	10	6.2	49718	2923	53094	15.7	11
2	British Telecommunications	27	29153	5	20	12	2.0	11	5.5	20693b	2531b	30335	17.0	55
3	Shell Transport & Trading (1)	NR	26025	8	23	15	1.5	11	5.2	85412	6539	90193	14.5	11
4	Glaxo Holdings	53	19679	13	24	16	5.1	15	4.2	4317	1156	5827	33.8	45
5	Hanson Trust	55	19243	4	29	20	9.0	11	5.0	11754	1362	18182	78.9	71
6	B. A. T. Industries	66	17995	12	45	35	2.5	10	5.5	22654	1969	19408	24.9	43
7	British Gas	84	15563	4	34	25	1.3	10	6.4	13404b	NA	19204	13.0	12
8	Imperial Chemical Industries	93	14023	20	2	-5	1.7	9	6.1	22121	1562	18931	18.4	22
9	BTR	108	12548	7	27	19	4.7	12	4.7	11800	1048	10154	39.3	71
10	SmithKline Beecham Group (2)	121	11551	9	12	5	NEG	15	2.1	7182	800	6294	NEG	45
11	Guinness	127	11353	13	69	57	2.2	15	2.7	3571	739	10409	14.7	43
12	Barclays Bank	141	10651	7	35	26	1.1	14	6.5	NA	759h	214324	7.9	61
13	Grand Metropolitan	148	10521	10	23	14	2.0	10	4.0	15617	853	16074	20.3	71
14	Marks & Spencer	156	10077	4	30	22	3.1	15	3.8	9406b	NA	5064	20.2	54
15	Cable & Wireless	162	9809	9	5	-2	4.2	19	2.0	2577	479	4900	22.5	55
16	General Electric	168	9608	4	-5	-11	1.9	10	5.2	11193	857	9433	18.1	34
17	National Westminster Bank	174	9443	6	30	21	0.9	24	6.4	NA	391h	195176	4.0	61
18	Wellcome	175	9438	11	55	45	6.8	30	1.1	2365	279	2383	23.1	45
19	RTZ	176	9408	10	24	16	2.2	9	4.3	10340	988	12213	24.4	24
20	Unilever PLC (3)	NR	9166	12	35	26	4.6	12	3.3	34434	1687	20564	38.2	44
21	Reuters Holdings	192	8666	20	58	48	12.6	27	1.4	1994	304	1637	46.0	52
22	J. Sainsbury	233	7444	5	30	22	3.8	16	2.8	12194b	NA	4817	23.3	54
23	Prudential	259	6889	4	35	26	5.0	15	5.6	7930	462	65691	33.9	63
24	Bass	281	6453	18	23	15	1.4	10	3.7	5617	623	7864	13.6	43
25	Racal Telecommunications	285	6315	6	-13	-19	20.8	40	0.3	403	104	490	51.9	55
26	Lloyds Bank	289	6120	5	39	30	1.5	LOSS	6.1	NA	-984	96647	NEG	61
27	Tesco	296	6057	4	42	33	2.9	14	2.5	9624b	427b	4088b	20.4	54
28	Allied-Lyons	298	6002	8	16	8	1.2	10	4.8	6489	543	8939	12.2	43
29	Enterprise Oil	366	5056	11	31	22	6.9	23	2.6	566	195	1948a	29.9	11
30	British Steel	383	4822	2	-5	-11	0.7	4	7.2	8240	942	9277	16.4	25
31	Boots	386	4785	5	9	2	1.6	12	4.7	4542	351	3749	13.9	54
32	Racal Electronics	411	4531	3	-11	-17	3.5	22	2.1	2669	197	2852	16.0	31
33	Ladbroke Group	415	4506	5	15	7	1.1	13	4.2	6146	348	7849	8.5	53
34	Abbey National	417	4477	3	NA	NA	NA	7	3.7	NA	543	62483	NA	61
35	BOC Group	427	4373	9	24	16	2.3	11	4.2	3878	385	4658	20.8	22
36	Great Universal Stores	433	4338	17	9	1	1.1	10	4.2	4417	445	5210a	11.4	54
37	Peninsular & Oriental Steam	437	4292	10	2	-5	1.3	10	6.3	7689	440	8358	13.4	58
38	Land Securities	438	4290	9	-4	-10	0.6	21	4.5	NA	208b	10083b	2.9	64
39	Sun Alliance & London Insurance	450	4201	5	24	16	0.9	12	5.3	5519	361	11653	7.4	63
40	Cadbury Schweppes	457	4151	6	6	-1	3.6	14	4.2	4775	272	3563	26.1	44
41	Fisons	465	4109	6	33	24	6.0	17	2.2	1713	222	1637	35.8	45
42	Reed International	473	4070	7	21	13	1.6	13	3.8	2654b	64b	3784	12.5	51
43	General Accident Fire & Life	490	3959	19	23	15	0.9	17	6.0	5849	217	17379	5.5	63
44	Royal Insurance	504	3854	8	28	20	1.1	20	7.2	6173	151	16771	5.2	63
45	TSB Group	507	3849	2	47	37	1.2	9	5.0	NA	462a	37809a	13.7	61
46	Thorn EMI	512	3823	12	12	5	3.9	10	5.1	6242b	333b	3766	37.3	41
47	Rank Organisation	524	3748	14	-4	-11	1.6	10	4.9	1836	301	3295	15.8	33
48	Rothmans International	525	3745	12	41	31	2.9	12	2.9	2190	277	3131	24.4	43
49	Argyll Group	527	3740	4	26	18	4.2	15	3.7	5880	210	2393	28.5	54
50	Midland Bank	532	3722	5	-9	-15	0.8	LOSS	8.5	NA	-368	104945	NEG	61
51	Rolls Royce	540	3660	4	28	20	1.9	10	4.2	4975	322	4355	18.2	31
52	Trusthouse Forte	541	3658	5	-10	-16	0.8	10	4.6	5010	341	7144	8.3	53
53	Lloyds Abbey Life	544	3645	5	31	22	2.6	11	7.0	1424	331	7889	23.8	63
54	BAA	564	3494	7	25	17	1.5	13	3.2	1077	230	3591	11.5	52
55	Commercial Union Assurance	572	3456	8	42	32	1.2	22	6.0	5921	155	26471	5.4	63
56	Guardian Royal Exchange	574	3453	4	25	17	1.3	21	6.4	3366	163	9381	6.0	63
57	Pearson	585	3387	12	13	5	3.0	11	3.9	2452	289	2603	26.8	71
58	BET	597	3302	4	1	-6	3.5	9	6.4	3616	304	2753	37.8	71
59	Whitbread	615	3219	7	32	24	0.9	11	4.6	3443b	NA	5325	7.9	43
60	Legal & General Group	621	3182	7	39	30	5.2	20	5.4	3887	158	29327	25.9	63
61	Reckitt & Colman	625	3158	21	22	14	3.2	13	3.1	2630	235	1910	23.8	44
62	Tarmac	633	3130	4	-14	-20	1.3	8	5.8	5924	391	5398	16.4	21
63	Associated British Foods	658	3022	7	22	14	1.1	10	3.7	4653b	317b	3724	11.0	44
64	Lasmo	660	3010	7	57	46	1.9	28	2.4	442	91	2693	6.9	11
65	Trafalgar House	719	2752	5	-3	-9	2.0	13	7.5	5424	359	4244	14.8	71
66	Redland	730	2718	10	8	1	2.2	10	5.3	2600	282	3267	23.0	21
67	MEPC	734	2707	8	-5	-12	0.6	16	4.7	NA	149	7406	3.5	64
68	Polly Peck International	741	2683	7	94	81	1.2	10	4.1	1952	232	3905	11.8	59
69	United Biscuits (Holdings)	749	2661	6	12	4	2.3	12	5.3	4569	212	2339	19.0	44
70	Lonrho	764	2625	4	11	3	1.1	9	8.5	6062	277	5911	12.2	71
71	Pilkington	789	2537	3	-5	-11	1.8	8	6.3	4896b	311b	4386	24.5	26
72	STC	791	2531	5	-20	-26	2.3	8	5.5	4379	296	3022	27.1	34
73	British Airways	799	2511	3	10	3	2.0	6	5.7	8130b	412b	5869	32.8	56

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U. S. \$ MIL.	PRICE PER SHARE U. S. \$	% CHANGE FROM 1989 (U. S. \$) (LOCAL)	PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U. S. \$ MIL.	PROFITS U. S. \$ MIL.	ASSETS U. S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE	
74	Sears Holdings	819	2441	2	-12	-18	1.1	9	7.4	3510b	NA	4157	13.0	54
75	Kingfisher	830	2409	5	16	8	1.5	6	4.7	4888b	388b	3279b	24.1	54
76	Hilldown Holdings	854	2350	4	5	-2	2.7	8	3.6	6195	250	2976	32.6	44
77	British Aerospace	864	2331	9	-12	-18	0.6	7	5.6	15251	400	15413	9.0	31
78	Royal Bank of Scotland Group	884	2272	3	22	14	1.0	6	5.6	NA	247	46090	15.1	61
79	RMC Group	890	2259	12	-1	-8	2.3	10	3.5	4317	223	2727	22.4	21
80	Courtaulds	895	2248	6	28	19	2.1	11	4.2	4384	235	3037	18.4	22
81	Maxwell Communication	896	2248	3	13	6	1.2	10	8.3	2336f	249	5450	11.7	52
82	Blue Circle Industries	913	2205	4	-5	-11	1.7	8	6.0	2155	244	3564	20.9	21
83	Hawker Siddeley Group	915	2200	11	2	-5	1.7	11	5.0	3605	207	3334	16.0	38
84	Scottish & Newcastle Breweries	928	2168	6	20	12	1.1	13	4.9	1727	144	2822	8.6	43
85	ASDA Group	947	2116	2	-31	-36	1.3	8	5.9	4550	282	3116	16.1	54
86	Ultramar	949	2111	6	22	14	1.3	12	3.5	2953	171	3821	10.6	11
87	Ranks Hovis McDougall	980	2035	6	-16	-21	2.2	10	4.9	3000	200	3244	21.8	44
88	BICC	986	2023	7	-5	-12	3.7	10	5.7	6369	197	2556a	39.2	37
89	Eurotunnel (London) (4)	NR	1516	9	-46	-50	1.8	NA	NA	NA	NA	NA	NA	52
CANADA														

CANADA

COUNTRY COMPOSITE		111017	25	9	6	1.9	23	3.7	86134	8710	526608	11.8		
1	BCE (Bell Canada Enterprises)	152	10232	34	6	3	1.3	10	6.4	14229	1024	33488	12.2	55
2	Imperial Oil	178	9303	49	8	5	1.5	22	3.1	8619	389	13290	7.0	11
3	Seagram	210	8173	86	15	12	1.5	12	2.3	NA	710b	10213b	13.1	43
4	International Thomson Organisation	262	6808	12	NA	NA	2.3	16	3.6	5112	420	6955	14.3	51
5	Northern Telecom	267	6717	28	60	56	2.5	18	1.0	6110	377	6375	14.1	34
6	Canadian Pacific	299	5975	19	0	-3	0.9	12	4.2	9400	567	16249	7.8	71
7	Royal Bank of Canada	312	5741	20	10	7	1.5	13	5.0	NA	451	97838a	11.7	61
8	Laidlaw Transportation	347	5346	22	56	51	4.3	24	1.1	1205	180	2261	17.7	57
9	Alcan Aluminium	364	5080	23	2	0	1.1	7	4.9	8839	835	9508	15.6	24
10	Toronto-Dominion Bank	400	4623	15	-10	-12	1.4	9	4.2	NA	593	53824	16.3	61
11	Canadian Imperial Bank of Commerce	462	4117	23	-4	-7	1.1	12	5.6	NA	384	85478	9.6	61
12	Placer Dome	513	3806	16	27	24	2.3	40	1.6	771	95	2419	5.8	81
13	Imasco	534	3713	31	17	13	1.9	12	3.5	3612	312	4587	15.6	43
14	Shell Canada	545	3644	33	-13	-15	1.4	27	2.4	4194	181	4835	5.1	11
15	Noranda	631	3140	17	-9	-12	0.8	12	5.1	7954	377	11979	6.9	24
16	PanCanadian Petroleum	654	3036	24	11	8	2.4	26	2.1	674	113	2334	9.4	11
17	Inco	687	2874	28	-6	-9	2.2	5	3.6	3948	753	3665	41.8	24
18	Moore	722	2745	29	-6	-8	1.9	13	3.2	2708	202	2008	14.1	52
19	Bank of Montreal	777	2572	23	-13	-16	0.9	111	7.9	NA	44h	67318	0.8	61
20	Trizec	796	2514	17	NA	NA	3.6	39	1.8	1016	96	8674	9.2	64
21	American Barrick Resources	838	2397	19	89	83	5.7	55	0.5	206	36	701a	10.3	81
22	Bank of Nova Scotia	891	2258	12	-19	-22	0.9	19	7.1	NA	189h	69092	4.9	61
23	Nova Corp. of Alberta	941	2136	7	-18	-21	1.1	35	6.2	4128	159	6740	3.2	12
24	Gulf Canada Resources	972	2061	13	6	2	1.8	LOSS	2.6	779	44	2834	NEG	11
25	TransCanada PipeLines	994	2007	13	7	4	2.0	12	4.4	2630	179	3943	16.7	12

DENMARK

COUNTRY COMPOSITE		11848	9878	48	23	12.7	140	1.6	1584	201	28712	8.5		
1	Dampskibsselskabet Svendborg	571	3468	23270	64	36	16.4	241	0.2	NA	14a	271a	6.8	58
2	Dampskibsselskabet Af 1912	575	3452	15982	61	34	18.7	278	0.3	NA	12a	246a	6.7	58
3	Den Danske Bank	788	2538	51	17	-3	NA	17	4.8	NA	78	26258	NA	61
4	Carlsberg	840	2389	209	50	24	3.0	26	1.1	1584	96	1936	11.9	43

FINLAND

COUNTRY COMPOSITE														
		2006	6	-16	-25	0.7	14	5.2	0	136	37193	5.1		
1	Union Bank of Finland	995	2006	6	-16	-25	0.7	14	5.2	NA	136	37193	5.1	61

FRANCE

COUNTRY COMPOSITE		205718	212	45	23	3.4	15	2.9	267072	15979	1195365	21.7	
1 Elf Aquitaine	99	13746	123	63	38	1.2	11	4.5	26304	1263	29789a	11.3	11
2 Compagnie Générale d'Electricité	123	11455	112	73	46	2.6	13	2.6	25252	866g	31407	19.3	34
3 LVMH Moët Hennessy	159	9932	817	31	11	5.6	19	2.0	3443	514	4964a	29.2	43
4 Cie Financière de Suez	164	9745	82	66	40	1.6	14	2.2	NA	712	71600a	12.1	61
5 Union des Assurances de Paris	181	9177	109	NA	NA	1.9	12	2.1	11308	600	37598a	15.6	63
6 Compagnie Générale des Eaux	186	8958	478	73	46	4.4	27	1.9	17308	321	15211a	16.1	52
7 BSN-Gervais Danone	204	8261	152	46	23	2.5	17	2.0	8535	473	9875	14.3	44
8 Paribas	221	7928	116	60	35	1.7	13	2.7	NA	605	129224a	13.9	61
9 Peugeot	240	7241	145	18	-1	1.4	4	2.9	26830	1806	17161a	35.2	42
10 Société Générale	269	6691	108	51	27	2.6	11	3.7	NA	624	165208a	24.2	61
11 Compagnie de Saint-Gobain	283	6410	103	14	-4	1.8	8	3.7	11591	756	12110a	21.0	26
12 Compagnie du Midi	291	6111	243	18	0	1.8	25	2.2	NA	243a	28338a	7.0	71
13 L'Air Liquide	301	5921	132	42	20	2.9	19	2.6	4954	317	5594a	15.4	22
14 L'Oréal	340	5448	942	55	30	3.8	23	1.7	4765	NA	3690a	16.5	45
15 BNP	370	5042	86	62	36	1.1	8	4.4	NA	599	209206a	13.5	61
16 Lafarge Coppée	409	4561	86	51	28	2.9	12	2.7	5325	382	7541	24.5	21
17 Total Française Pétroles	413	4516	124	74	47	1.1	12	4.2	18939	388	15423a	9.8	11
18 Crédit Lyonnais	446	4241	152	77	50	1.1	8	4.0	NA	549	190092a	14.0	61

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U. S. \$ MIL.	PRICE PER SHARE U. S. \$	% CHANGE FROM 1989 (U. S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U. S. \$ MIL.	PROFITS U. S. \$ MIL.	ASSETS U. S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
19	Compagnie de Navigation Mixte	449	4214	312	133	97	3.4	21	2.5	NA	142a	7648a	15.9	71
20	Carrefour	463	4112	644	46	23	3.8	20	2.5	12953	207	5357	19.1	54
21	Groupe Victoire	471	4086	240	75	48	2.6	13	1.2	NA	306	10680a	19.1	63
22	Havas	489	3960	119	118	84	11.3	27	1.3	3309	168	1765a	41.9	52
23	Rhône-Poulenc	506	3850	80	-8	-22	1.2	8	7.4	12813	529	11870a	15.2	22
24	Lyonnais des Eaux	533	3718	129	104	72	3.9	25	1.9	3792	127	6616	15.5	52
25	Pechelbronn	547	3594	319	95	65	2.5	11	1.2	NA	322	1037a	22.6	71
26	Accor	612	3235	177	78	51	4.2	28	1.9	3493	106	2638a	14.8	53
27	Sanofi	643	3090	180	42	20	1.7	17	3.2	3014	164	2934a	9.9	45
28	Pechiney	665	2973	59	15	-3	1.3	5	6.7	15520	586	13584	25.2	24
29	Canal Plus	678	2905	163	53	29	21.4	22	2.9	940	133	1336a	98.5	51
30	CMB Packaging	712	2784	37	3	-13	3.0	14	2.6	3738	199	1551a	21.6	26
31	Perrier	745	2676	298	21	2	7.3	14	1.8	3014	NA	2516a	53.0	43
32	Pernod Ricard	746	2672	227	41	19	3.4	20	2.6	2497	NA	2516a	17.4	43
33	Schneider	747	2671	191	70	44	3.1	15	1.7	8470	154	11221a	21.1	38
34	Thomson-CSF	803	2496	22	-32	-43	1.0	5	8.0	5908	462	19239a	17.9	31
35	Credit Foncier de France	846	2376	247	113	80	5.3	13	3.5	NA	141a	52854a	39.0	61
36	Michelin	851	2355	22	-20	-32	0.8	5	2.8	9690	429	11186a	16.8	37
37	Cap Gemini Sogeti	869	2316	92	26	7	6.2	25	1.7	1237	92	1280	24.6	52
38	Compagnie Bancaire	892	2256	111	50	27	1.5	12	2.4	NA	186	32652a	12.0	62
39	Ciments Francais	897	2247	314	38	17	3.3	13	2.5	2186	178	1901a	26.3	21
40	Legrand	923	2184	792	42	20	4.1	20	1.6	1528	109	1065a	20.4	34
41	Pechiney International	982	2030	27	-20	-32	1.0	9	3.9	8415	222	7886	10.9	26
42	Eurotunnel (Paris) (4)	NR	1533	9	-47	-56	1.6	NA	NA	NA	NA	NA	NA	52

HONG KONG

COUNTRY COMPOSITE		46326	2	20	20	2.2	12	4.8	17360	4226	194574	19.0		
1	Hong Kong Telecommunications	211	8170	1	16	16	7.2	16	4.3	1816b	560b	1636	45.0	55
2	Hongkong & Shanghai Banking	378	4851	1	10	10	0.7	8	7.1	NA	614	133363	9.1	61
3	Hutchison-Whampoa	432	4342	1	12	12	1.5	11	4.9	2275	389	5952	13.5	71
4	Swire Pacific	492	3958	2	7	7	1.1	10	4.1	3560	396	7421	11.4	71
5	Cheung Kong Holdings	561	3502	2	38	38	1.7	10	3.1	648	357	2403	17.0	64
6	Cathay Pacific Airways	602	3276	1	-3	-3	3.1	8	4.7	2221	427	3350	40.6	56
7	Sun Hung Kai Properties	680	2903	2	25	25	1.3	10	5.0	579	260	3440	13.0	64
8	China Light & Power	684	2899	2	22	23	2.5	11	4.8	1254	259	1919	23.9	12
9	Hongkong Land	702	2828	1	-8	-8	0.6	15	5.7	NA	194	6328	3.8	64
10	Jardine Matheson Holdings	715	2759	4	71	71	1.9	14	2.8	1935	203	3321	13.9	71
11	Hang Seng Bank	770	2597	3	4	4	1.6	11	5.9	NA	234	22555	14.4	61
12	Dairy Farm International Holdings	931	2162	1	46	46	3.2	19	2.9	2589	115	1176	17.2	54
13	Hongkong Electric Holdings	965	2077	1	17	17	2.2	9	7.5	483	220	1711	23.7	12

IRELAND

COUNTRY COMPOSITE		4731	7	0	0	2.9	11	1.9	2627	397	25176	25.7		
1	Allied Irish Banks	787	2544	4	NA	NA	2.1	10	3.0	NA	214b	23259	19.9	61
2	Smurfit Group	921	2187	10	NA	NA	3.8	12	0.7	2627b	184b	1916	31.6	23

ITALY

COUNTRY COMPOSITE	122437		17	48	14	3.0	26	2.1	125674	8191	476290	12.1	
1 Assicurazioni Generali	62	18709	35	26	9	5.6	46	0.8	8733a	410a	25652a	12.3	63
2 Fiat Group	68	17895	9	30	12	2.0	8	3.5	41931	2659	42473a	25.9	42
3 STET	182	9175	5	95	68	1.2	13	3.1	13898a	724a	39261a	9.3	55
4 SIP	302	5904	1	48	28	0.7	13	4.3	11954	378	30572a	5.0	55
5 Mediobanca	308	5841	17	77	53	4.4	50	0.6	NA	104*	11544*	8.8	61
6 Enimont	367	5053	1	NA	NA	NA	9	NA	12328	575	NA	NA	22
7 Banca Commerciale Italiana	435	4313	4	44	24	1.3	13	3.8	NA	346	90369	9.9	61
8 La Fondiaria	458	4142	51	26	9	5.7	51	0.8	1666a	78a	4473a	11.3	63
9 Montedison	461	4129	2	13	-3	1.4	9	2.4	11344a	506a	16178a	16.3	22
10 RAS	476	4058	22	11	-4	3.3	44	1.1	3560a	95a	8501a	7.5	63
11 Alleanza Assicurazioni	569	3470	41	60	38	9.9	59	0.9	610a*	62a	4702a*	17.0	63
12 Credito Italiano	576	3435	2	56	35	1.4	15	3.1	NA	223a	58753a	9.3	61
13 Olivetti Group	591	3339	6	-7	-20	1.2	22	3.7	7254	163	9459a	5.6	33
14 Ferruzzi Finanziaria	596	3306	3	21	4	1.4	8	1.4	NA	445a	28281a	18.3	71
15 CIR	605	3253	5	16	0	2.1	21	2.3	NA	145	5344a	9.7	71
16 IFI	651	3044	25	93	66	1.3	8	1.0	NA	396	2425	17.5	71
17 Gemina	778	2572	2	50	30	2.5	25	3.0	NA	91	1072	10.0	71
18 Banco di Roma	800	2506	2	73	50	1.3	33	NA	NA	47a	57436a	3.8	61
19 Mondadori (Arnoldo) Editore	824	2417	37	81	56	8.7	68	0.4	1901	43	1111a	12.7	51
20 Nuovo Banco Ambrosiano	828	2412	4	74	50	NA	19	2.2	NA	136	18793a	NA	61
21 Italcementi	847	2372	116	48	28	2.5	18	1.1	1149	NA	1887a	14.2	21
22 SAI	853	2351	16	26	9	3.7	38	0.8	NA	71	3437a	9.8	63
23 Pirelli	860	2340	2	7	-8	1.0	11	3.7	7326a	180a	9059a	8.8	37
24 IFIL	917	2194	6	103	75	2.8	41	1.5	NA	66	1403a	6.7	71
25 Sirti	922	2185	11	74	50	3.7	15	3.5	649a	150a	1145a	25.3	32
26 Toro Assicurazioni	985	2023	20	66	44	3.9	26	1.0	1369	96	2958a	15.0	63

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U.S. \$ MIL.	PRICE PER SHARE U.S. \$	% CHANGE FROM 1989 (U.S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U.S. \$ MIL.	PROFITS U.S. \$ MIL.	ASSETS U.S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
JAPAN														
COUNTRY COMPOSITE		2649916	19	-4	2	6.3	69	0.5	1987817	53042	6111647	9.2		
1	Nippon Telegraph & Telephone	1	118795	7620	-27	-22	4.6	66	0.4	39519b	1799b	75888	6.9	55
2	Industrial Bank of Japan	3	67612	29	-6	0	8.4	123	0.2	NA	549	234058	6.8	61
3	Sumitomo Bank	7	55813	18	-24	-19	4.9	46	0.3	NA	1208b	328839	10.6	61
4	Fuji Bank	8	53169	18	-23	-18	5.5	43	0.3	NA	1195	318302	12.7	61
5	Toyota Motor	9	50441	17	-9	-3	2.0	22	0.8	52655	2271	46957	9.3	42
6	Mitsui Taiyo Kobe Bank	10	49804	15	-5	1	5.6	105	0.3	NA	473bc	180122	5.3	61
7	Dai-ichi Kangyo Bank	11	49570	16	-27	-23	5.0	37	0.4	NA	1306	338325	13.6	61
8	Mitsubishi Bank	12	47165	16	-22	-17	5.2	42	0.3	NA	1136	307123	12.4	61
9	Sanwa Bank	14	45600	16	-12	-7	4.7	43	0.4	NA	1063b	304589	11.1	61
10	Tokyo Electric Power	15	41678	31	-23	-19	4.6	85	1.1	26850b*	486b	67308*	5.4	12
11	Hitachi Ltd.	17	33042	10	-9	-4	2.0	24	0.6	46465b	1385b	51237b	8.2	34
12	Nomura Securities	19	32540	17	-28	-24	2.9	17	0.6	NA	906de	30204	17.3	62
13	Long-Term Credit Bank of Japan	20	32444	135	-1	6	5.2	81	0.4	NA	403b	160100	6.4	61
14	Matsushita Electric Industrial	24	29634	14	-18	-13	1.6	20	0.6	39408b	1549b	42027	7.6	41
15	Nippon Steel	28	28172	4	-35	-30	5.7	53	0.8	17298	513	22786	10.7	25
16	Kansai Electric Power	37	24803	26	-20	-15	3.9	67	1.3	13655b*	368b	35417*	5.8	12
17	Tokai Bank	38	23520	12	-27	-22	4.2	53	0.5	NA	419	208121	7.8	61
18	Mitsubishi Heavy Industries	39	23492	7	-13	-7	4.6	57	0.7	14968b	443b	20508	8.0	38
19	Toshiba	40	22909	7	-28	-24	3.8	26	0.8	27900b	867b	27611	14.5	34
20	NEC	50	20451	13	3	9	4.2	37	0.4	22609b	NA	21965	11.5	34
21	Nissan Motor	51	19926	8	-27	-22	1.8	26	1.2	37091b	762b	31130	6.9	42
22	Japan Air Lines	52	19908	118	5	12	10.7	118	0.3	7169	133	7989	9.1	56
23	Nippon Credit Bank	56	19193	111	7	13	7.3	71	0.4	NA	230b*	103860*	10.4**	61
24	Bank of Tokyo	57	19117	10	-18	-13	4.4	46	0.5	NA	398	173341	9.5	61
25	Sony	61	18783	57	5	12	2.1	31	0.6	14081	476	26239	6.8	41
26	Mitsubishi Trust & Banking	64	18541	14	-25	-20	3.8	35	0.4	NA	534	107661	11.1	62
27	Chubu Electric Power	67	17916	24	-18	-13	3.2	63	1.4	11226b*	282b	26246*	5.0	12
28	Sumitomo Trust & Banking	70	17546	14	-21	-16	3.8	33	0.4	NA	520	101103	11.5	62
29	Fujitsu	71	17393	10	-11	-5	2.7	32	0.6	15670	459	17232	8.4	33
30	Mitsubishi Corp.	76	16707	11	0	7	4.1	42	0.5	121578b	397b	62450	9.7	59
31	NKK	80	16189	5	-24	-20	7.4	25	0.7	9059	602	17508	29.1	25
32	Tokio Marine & Fire	81	15915	10	-24	-19	5.1	60	0.5	6072b*	265b	24027*	8.5	63
33	Seibu Railway	83	15645	36	0	6	43.9	422	0.1	2600	37	4246	10.4	57
34	All Nippon Airways	85	15424	11	-13	-7	12.9	304	0.3	4090	51	5637	4.3	56
35	Tokyo Gas	86	15143	5	-28	-24	6.4	57	0.6	4786	265	5642*	11.2**	12
36	Asahi Glass	87	15142	13	-21	-16	5.1	50	0.5	7175	388	6698	10.2	26
37	Daiwa Securities	88	14954	11	-23	-19	2.8	15	0.8	NA	486d	33795	18.4	62
38	Nintendo	89	14467	138	177	194	200.1	39	0.2	1576b	216bf	1832	512.6	46
39	Daiwa Bank	90	14230	10	-16	-11	5.1	46	0.5	NA	217bd*	96304*	11.1**	61
40	Tokyu Corp.	92	14119	13	8	15	9.0	239	0.3	2376	58	6681	3.7	57
41	Mitsubishi Electric	95	13950	7	-23	-18	3.3	28	0.9	19563b	504b	17758	12.0	34
42	Mitsubishi Estate	96	13911	11	-36	-31	5.6	57	0.5	1904	241	7232	9.8	64
43	Nikko Securities	100	13368	9	-30	-25	2.8	17	0.9	NA	387d	24257	16.8	62
44	Yasuda Trust & Banking	101	13351	13	2	9	4.5	34	0.4	NA	401	69868	13.2	62
45	Kawasaki Steel	102	13341	4	-41	-38	5.2	39	0.8	7490	318	10877*	13.2**	25
46	Mitsui Trust & Banking	104	12975	11	-24	-19	4.0	28	0.5	NA	446	80680	14.4	62
47	Sharp	105	12666	12	20	28	3.3	60	0.6	8265	191	11587	5.4	41
48	Sanyo Electric	106	12644	7	-2	4	2.7	113	0.8	8994	110	13307	2.4	41
49	Kirin Brewery	107	12568	13	-8	-2	3.9	63	0.4	8252	201	7825	6.2	43
50	Kajima	109	12548	13	-9	-3	7.2	92	0.6	10372b	188b	11147	7.8	32
51	Sumitomo Metal Industries	111	12477	4	-34	-30	4.7	31	0.8	8029	381	12867	15.2	25
52	Nippondenso	112	12437	15	3	9	2.8	39	0.6	8554	318	8501	7.3	37
53	Kobe Steel	117	11804	4	-31	-26	7.0	66	0.8	8206	167	13037	10.7	25
54	Osaka Gas	118	11776	5	-22	-17	5.3	54	0.7	3919	219	5514	9.8	12
55	Fuji Photo Film	122	11536	27	2	9	2.3	21	0.3	6099	547	7691a	10.7	46
56	Yamaichi Securities	125	11399	9	-26	-21	2.7	17	0.9	NA	328d	22812	16.1	62
57	Honda Motor	126	11358	12	-16	-11	1.7	21	0.8	22904	637	16038	8.0	42
58	Ito-Yokado	129	11334	28	9	16	4.1	30	0.5	10897b	384b	5304	14.0	54
59	Shimizu Construction	131	11230	14	-3	3	7.2	107	0.4	8508	102	11298	6.7	32
60	Fanuc	134	11000	46	2	9	5.1	80	0.3	991	137	2533	6.3	35
61	Kinki Nippon Railway	135	10986	7	-23	-18	9.0	108	0.5	4799	101	7309	8.3	57
62	Kyowa Bank	137	10889	8	-10	-4	4.3	43	0.6	NA	237*	91118*	10.1	61
63	Seven-Eleven Japan	139	10708	50	25	33	11.4	66	0.3	4503*	158	1287*	17.2	54
64	Mitsui Real Estate Development	144	10616	13	-23	-18	4.0	40	0.5	6959b	267b	16451	10.1	64
65	Tohoku Electric Power	145	10611	21	-19	-14	3.4	49	1.5	6788*	217	14876*	6.9	12
66	Mitsui & Co.	150	10448	7	6	13	3.7	44	0.6	128077b	239b	41535	8.6	59
67	Kubota	151	10353	7	-17	-12	5.0	96	0.6	5390b	50b	5464	5.2	38
68	Ishikawajima-Harima Heavy Inds.	153	10229	8	-4	2	11.6	116	0.3	5160	88	7453	9.9	38
69	Nippon Oil	154	10105	8	-23	-18	3.1	54	0.5	14725	185	11672	5.8	11
70	Takeda Chemical Industries	155	10081	12	-32	-28	3.4	39	0.6	4510	255	5821	8.7	45
71	Dai Nippon Printing	157	10008	13	-20	-15	3.2	41	0.5	7024b	269b	6250	7.8	52
72	Kyushu Electric Power	163	9773	21	-20	-15	3.0	45	1.6	6821*	235	19281*	6.7	12
73	Toyo Trust & Banking	165	9729	12	-3	3	4.4	29	0.4	NA	311	48277	15.2	62
74	Hanwa	166	9631	26	51	60	5.1	60	0.3	4352*	110	22346*	8.5	54
75	Taisei	169	9559	9	-21	-16	5.0	86	0.6	9926	110	12847	5.8	32
76	Saitama Bank	170	9558	9	-16	-11	3.8	44	0.5	NA	190*	84048*	8.8	61

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U.S. \$ MIL.	PRICE PER SHARE U.S. \$	% CHANGE FROM 1989 (U.S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U.S. \$ MIL.	PROFITS U.S. \$ MIL.	ASSETS U.S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
77	Kyocera	172	9526	52	49	59	3.5	43	0.6	2764b	222b	3423	8.2	35
78	Sumitomo Corp.	177	9324	9	1	8	2.7	37	0.6	97315	234	31038	7.3	59
79	Bank of Yokohama	180	9201	9	-17	-11	3.9	55	0.4	NA	133*	71503*	7.1	61
80	Joyo Bank	183	9026	12	65	75	6.0	70	0.3	NA	113*	44404*	8.6	61
81	Ajinomoto	184	9008	14	-28	-23	4.1	86	0.5	3348	104	4604	4.8	44
82	C. Itoh	188	8897	6	-10	-5	2.7	40	0.5	104799	200	38587	6.8	59
83	Kawasaki Heavy Industries	189	8825	7	-20	-14	14.3	115	0.5	5751	77	6529	12.4	38
84	Asahi Chemical Industry	197	8526	6	-28	-24	3.9	37	0.7	6650	227	6590	10.7	22
85	Nippon Express	198	8506	8	-24	-19	9.3	75	0.4	8994b	114b	5139	12.5	57
86	Ohbayashi	199	8484	11	-11	-5	6.7	115	0.4	6230	71	8875	5.8	32
87	Canon	200	8451	11	0	6	2.3	33	0.7	8869	251	10740	7.0	46
88	Matsushita Electric Works	205	8252	14	-7	-1	3.6	39	0.6	5856	209	5639	9.3	34
89	Marubeni	206	8250	6	-15	-9	3.7	39	0.6	123219b	221b	44981	9.3	59
90	Bridgestone	214	8067	11	-9	-3	3.0	127	0.8	11088	66	9189	2.4	37
91	Komatsu	220	7934	8	-16	-10	2.6	44	0.7	5823b	179b	7412	5.8	38
92	Toppan Printing	223	7758	12	-13	-7	3.0	37	0.5	6007	190	5170	7.9	52
93	Toray Industries	224	7654	6	-23	-18	3.1	34	0.9	5173	221	6349	9.1	22
94	Matsuzakaya	225	7647	49	1	8	19.8	222	0.1	3341	34	1350	8.9	54
95	Chugoku Electric Power	227	7630	21	-19	-13	3.2	46	1.6	5258*	204	14167*	7.0	12
96	Sumitomo Chemical	228	7611	5	-30	-26	6.4	33	0.8	6177	230	6450a	19.4	22
97	Sekisui House	229	7563	13	-9	-3	3.4	37	0.9	5022	169	6015	9.3	32
98	Mitsubishi Kasei	231	7455	5	-35	-31	5.2	50	0.7	3847d	71	9343	10.4	22
99	Sumitomo Electric Industries	234	7390	11	-4	2	4.0	42	0.5	6565b	175b	5000	9.5	37
100	Hokkaido Takushoku Bank	236	7387	8	4	11	4.5	49	0.5	NA	110b*	65955*	9.1	61
101	Daiwa House Industry	238	7356	16	3	9	5.1	47	0.5	3689	147	3999	11.0	32
102	Nippon Yusen	239	7334	6	-14	-9	5.0	384	0.4	4267	19	4671*	1.3**	58
103	KDD	244	7172	112	-17	-11	4.1	77	0.3	1700b*	93b	3026*	5.3	55
104	Pioneer Electronic	248	7085	39	72	83	5.3	37	0.3	3361b	194b	2122	14.5	41
105	Tonen	249	7046	11	-15	-10	2.8	38	1.5	4280	167	4144a	7.3	11
106	Isuzu Motors	257	6904	7	5	12	7.3	63	0.5	8757	109	4736*	11.6**	38
107	Marui	258	6896	21	6	13	3.6	39	0.6	3158	166	3874	9.2	54
108	Yasuda Fire & Marine	261	6814	8	-15	-10	5.6	63	0.6	4477b*	109b	18348*	9.0	63
109	Mitsui O. S. K. Lines	273	6606	6	-10	-4	7.9	178	0.4	2934	37	4887	4.5	58
110	Shizuoka Bank	274	6603	8	-1	6	3.3	42	0.5	NA	133*	40760*	7.9	61
111	Nissin Steel	275	6571	6	-41	-38	5.9	30	0.6	2902	205	5231	19.4	25
112	Nissan Fire & Marine	277	6514	32	52	62	26.2	264	0.1	1320*	25	4298*	9.9	63
113	Mazda Motor	278	6508	6	-14	-8	2.7	56	0.8	15755b	154b	8634	4.9	42
114	Tobu Railway	290	6120	8	-30	-25	6.8	157	0.4	1477	39	4646	4.3	57
115	Nippon Mining	292	6108	7	7	14	6.2	66	0.5	5665	90	6143	9.3	11
116	Sankyo	294	6079	17	-2	4	5.2	65	0.3	2797	93	2672	8.0	45
117	Mitsukoshi	297	6057	13	-26	-21	9.2	127	0.3	6552b	48b	2352*	7.2**	54
118	Hitachi Zosen	306	5868	6	-3	3	14.3	628	NA	1641	9	3254	2.3	38
119	Shikoku Electric Power	311	5751	21	-19	-14	3.2	49	1.6	2567*	127	6793*	6.4	12
120	Chiba Bank	313	5731	8	-13	-8	3.0	47	0.5	NA	104*	50830*	6.4	61
121	Hokuriku Bank	314	5710	8	0	7	3.4	47	0.4	NA	106*	45835*	7.3	61
122	Daiiei	320	5637	15	-18	-13	7.6	104	0.7	12736	53	6640	7.3	54
123	Toyoda Automatic Loom Works	321	5627	20	40	49	5.1	58	0.4	2869*	85	2040*	8.9	38
124	Isetan	324	5610	26	51	60	6.8	77	0.3	1116d	24	1857	8.9	54
125	Honshu Paper	326	5595	17	121	136	14.1	191	0.2	2829	26	3251	7.4	23
126	Yamanouchi Pharmaceutical	328	5582	19	-24	-19	4.7	27	0.4	1733b	209b	2547	17.6	45
127	Odakyu Electric Railway	329	5578	8	-20	-15	7.9	139	0.4	2179	39	4103	5.7	57
128	Hankyu Corp.	331	5555	7	-10	-4	7.6	91	0.5	1864	57	4545	8.3	57
129	Showa Denko	334	5517	5	-37	-33	10.2	108	0.7	3729	49	3871a	9.4	22
130	Kao	336	5502	11	-9	-4	3.5	47	0.5	4070b	117b	3494	7.5	44
131	Kumagai Gumi	338	5473	8	-33	-28	2.6	99	0.7	3171d	27	10714a	2.6	32
132	Sekisui Chemical	339	5458	10	-3	3	4.4	31	0.5	4129	151	3716	14.3	21
133	TDK	342	5410	43	17	25	2.4	36	0.6	3138b	152b	3284	6.6	35
134	Toyo Sash	344	5388	32	-17	-12	4.6	31	0.1	1346d	80	2659	14.5	21
135	Sumitomo Metal Mining	346	5348	11	9	16	10.6	53	0.4	3295	89	3036	19.9	24
136	Mitsubishi Motors	349	5325	6	-24	-19	3.2	39	0.6	14350	125	9827	8.2	42
137	Nagoya Railroad	353	5282	7	-22	-17	7.0	110	0.4	2600	46	6945	6.3	57
138	Taisho Marine & Fire Insurance	357	5248	8	-19	-14	4.6	49	0.6	2921b*	108b	11889*	9.4	63
139	Mitsui Engineering & Shipbuilding	358	5210	7	5	11	9.4	LOSS	0.4	1346	-29	3062	NEG	38
140	Fuji Electric	359	5167	7	-12	-7	5.7	82	0.6	4464	62	4720	7.0	34
141	Asahi Breweries	369	5045	13	-9	-4	4.7	195	0.3	5311	26	4907	2.4	43
142	Teijin	372	4957	5	-18	-13	3.0	36	0.9	3637	134	5459	8.3	22
143	Toto	376	4877	15	-11	-5	5.2	94	0.4	768d	49	1918	5.5	21
144	Fujita Corp.	379	4850	11	-20	-15	4.8	86	0.5	3597	56	7263	5.6	32
145	Sumitomo Marine & Fire	381	4825	8	-16	-11	4.7	49	0.6	2225*	93	10471*	9.7	63
146	Ashikaga Bank	382	4823	8	5	12	3.7	40	0.4	NA	106*	37438*	9.3	61
147	Nissho Iwai	385	4796	6	-5	2	4.9	50	0.5	75153	85	24342	9.8	59
148	Ricoh	387	4770	7	-15	-9	2.2	40	0.9	4786	117	4794	5.6	33
149	Oji Paper	389	4746	8	-41	-38	3.3	28	0.7	4208b	169b	4398	11.7	23
150	Daishowa Paper	390	4731	22	10	17	11.5	84	0.2	2390	53	3634*	13.7**	23
151	Taisho Pharmaceutical	394	4681	15	-6	0	4.6	35	0.9	965*	134	1537*	13.0	45
152	Janome Sewing Machine	398	4634	30	38	47	17.3	311	0.1	486	15	629	5.6	41
153	Bank of Hiroshima	401	4622	8	21	28	4.5	55	0.4	NA	74*	35344*	8.2	61
154	Hokkaido Electric Power	402	4621	21	-16	-11	3.3	36	1.5	2823*	150	8875*	9.1	12
155	Jusco	404	4608	15	12	19	4.0	59	0.8	7759	77	4685	6.8	54
156	Hokuriku Electric Power	405	4608	21	-16	-11	2.9	42	1.5	2350	108	6216	6.8	12

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157	Nippon Fire & Marine	407	4602	8	4	10	5.1	60	0.6	1891*	71	8889*	8.5	63
158	Bank of Fukuoka	410	4553	8	15	22	3.7	37	0.4	NA	104*	33690*	9.8	61
159	Hachijuni Bank	414	4514	8	3	10	4.6	46	0.4	NA	87*	29725*	9.9	61
160	Matsushita Communication Industrial	416	4485	24	18	25	4.3	56	0.3	2376	79	1612	7.6	34
161	Ono Pharmaceutical	418	4470	36	20	27	8.0	56	0.2	472*	81	1180*	14.4	45
162	Shiseido	421	4423	16	30	38	2.7	59	0.5	2994b	75b	3447	4.5	45
163	Fujisawa Pharmaceutical	426	4378	14	13	20	3.3	73	0.4	1582	57	2432	4.5	45
164	Keio Toei Electric Rail	429	4359	7	-21	-16	6.9	105	0.4	2285	41	3360	6.5	57
165	Takashimaya	434	4335	20	-9	-3	7.8	34	0.3	6282	125	3538	22.7	54
166	Daiichi Pharmaceutical	436	4299	16	-9	-3	4.8	33	0.4	1320	128	1822	14.5	45
167	Toyo Sanken Kaisha	445	4249	25	30	38	2.9	28	0.2	4411	154	3399	10.4	26
168	Nichii	447	4241	15	-13	-7	3.4	46	0.8	6827	89	5365	7.4	54
169	Nagasakiya	451	4188	29	-9	-4	10.8	138	0.3	2718	30	2026	7.8	54
170	Furukawa Electric	453	4178	6	-32	-27	4.0	51	0.6	4687	77	4322	7.8	37
171	Mitsubishi Metal	454	4173	6	-22	-17	5.5	51	0.6	5587	75	4801	10.7	24
172	Victor Co. of Japan	455	4161	17	-1	5	2.6	34	0.5	5692b	121b	3362	7.5	41
173	Ebara	456	4152	15	-6	0	6.3	180	0.4	1733	22	1958	3.5	38
174	Oki Electric Industry	466	4108	7	-13	-7	4.1	39	0.7	3650	70	3828	10.3	34
175	Nippon Seiko	467	4095	7	-8	-3	2.9	51	0.8	1983d	100	2885	5.7	37
176	Sumitomo Realty & Development	468	4094	11	-15	-9	2.9	41	0.5	1379	98	8337	6.9	64
177	Nippon Kangyo Kakumaru	478	4048	10	-19	-14	2.9	25	0.6	NA	79d	6980	11.6	62
178	Ube Industries	481	4015	5	-22	-17	9.1	31	0.7	3794	128	5498	29.1	26
179	Kyowa Hakko	482	4014	9	-17	-12	4.5	45	0.4	1950	89	2378	10.1	45
180	Secom	483	4013	40	18	26	6.2	79	0.3	840a	49a	1304a	7.8	52
181	Dai-kyo Bank	484	3995	22	36	44	4.2	37	0.7	3499b*	108b	7860*	11.4	64
182	Hyogo Bank	487	3965	12	27	35	4.7	89	0.3	NA	37*	23351*	5.3	61
183	Gunma Bank	491	3958	8	14	21	3.7	41	0.4	NA	80*	26797*	8.9	61
184	Omron Tateisi Electronics	493	3940	17	-8	-2	3.2	30	0.5	2442	125	2399	10.4	34
185	Mitsubishi Petrochemical	494	3939	8	-23	-18	4.4	20	0.7	696d	47	3536	22.0	22
186	Keihin Electric Express Railway	499	3904	8	-33	-29	6.8	119	0.4	1379	32	3285	5.7	57
187	Nippon Kogaku	502	3877	11	2	9	5.0	51	0.5	1667	75	1779	9.8	46
188	Sumitomo Heavy Industries	505	3853	7	-19	-14	8.8	139	NA	2422	28	3116	6.3	38
189	Tokyo Steel Mfg.	508	3836	26	3	9	4.8	27	0.3	1372b*	144b	1612b*	17.8	25
190	Cosmo Oil	510	3831	7	-3	3	8.4	53	0.5	8337	69	6973	15.7	11
191	Toyobo	514	3786	5	-13	-7	6.3	78	0.6	3302	48	3229	8.1	47
192	Dainippon Ink & Chemicals	515	3784	5	-25	-21	3.4	75	0.8	4674	48	4877	4.6	22
193	Mitsui Toatsu Chemicals	516	3778	5	-33	-28	7.7	32	0.7	3125	106	3817	24.4	22
194	New Japan Securities	519	3774	9	-25	-20	2.8	40	0.8	NA	91d	8331	7.0	62
195	Bank of Kyoto	521	3766	16	12	20	7.0	71	0.2	NA	49*	19405*	9.8	61
196	NGK Insulators	523	3756	11	-9	-4	4.5	57	0.6	1306	62	1600	7.9	37
197	Hasegawa Komuten	529	3734	9	-11	-6	2.4	45	0.8	3020	73	6427	5.3	32
198	Shionogi	530	3734	11	-5	1	3.5	48	0.5	1917	77	2019	7.3	45
199	Kawasaki Kisen	536	3690	6	-6	0	10.8	LOSS	NA	2554	-1	2874	NEG	58
200	Toyo Menka Kaisha	537	3687	6	-3	3	5.0	92	0.6	37937	40	11685	5.4	59
201	Konishiroku Photo Industry	542	3654	10	25	33	3.2	273	0.6	3125	13	3374	1.2	46
202	Tokyo Electron	543	3652	30	39	48	6.8	57	0.3	1136	59	949a	11.8	35
203	Shin-Etsu Chemical	552	3562	11	-17	-12	3.2	19	0.4	2646	183	3076	16.9	22
204	Korakuen	553	3559	24	-17	-12	9.2	185	0.3	546	18	2585	5.0	53
205	Kokuyo	557	3526	27	16	24	6.1	50	0.4	1694	70	1234a	12.3	52
206	Hitachi Metals	559	3522	10	-14	-8	3.8	53	0.5	2422	66	2453	7.2	25
207	Hattori Seiko	562	3501	33	118	132	14.3	LOSS	0.2	2619	-20	2201	NEG	46
208	Sapporo Breweries	567	3483	10	-16	-11	4.5	59	0.3	3158	59	3259a	7.5	43
209	Tokyo Land	568	3479	8	-7	-1	5.6	106	0.4	1996	32	3819a	5.3	64
210	Kyushu Matsushita Electric	573	3455	23	15	22	7.0	59	0.3	1595b*	60b	1036*	11.8	41
211	Chiyoda Corp.	577	3435	18	46	56	6.1	LOSS	NA	1287	-39	2051a	NEG	38
212	Tokyo Broadcasting System	587	3359	19	11	18	4.1	43	0.3	1280b*	77b	1379*	9.5	51
213	Keisei Electric Railway	588	3353	12	-32	-28	LOSS	48	NA	1103	70	1932	NEG	57
214	Murata Mfg.	589	3348	19	-3	3	2.2	23	0.5	1628b	125b	2533	9.3	35
215	Dai-kin Industries	590	3342	13	0	6	5.4	44	0.5	2140	75	1586	12.4	38
216	Chugai Pharmaceutical	592	3327	14	9	16	4.8	71	0.4	847	47	1301	6.8	45
217	Fujita Tourist Enterprises	593	3322	27	35	44	21.1	182	0.1	504a	15a	646a	11.6	53
218	Toho Co.	594	3319	236	39	48	7.5	69	0.3	952	47	1212	10.8	53
219	Amada	595	3317	12	-19	-14	2.8	49	0.9	1044	58	2161	5.7	38
220	Koito Mfg.	599	3295	21	-30	-25	8.6	137	0.3	1063	24	832	6.3	37
221	Dai-Tokyo Fire & Marine	600	3283	8	-3	3	4.8	50	0.6	1969*	58	7208*	9.5	63
222	Tokyo Department Stores	601	3281	12	23	31	4.9	84	0.4	2941b	38b	1937	5.8	54
223	Aoki	604	3265	8	-18	-13	2.9	75	0.7	2252	40	3981	3.9	32
224	Hazama-Gumi	607	3246	10	-5	1	5.7	99	0.5	3466*	33	3234a*	5.8	32
225	Arabian Oil	608	3245	63	31	39	9.2	LOSS	0.4	1385	-10	869	NEG	11
226	Sato Kogyo	609	3244	13	-27	-22	12.2	153	0.3	2541	21	2530a*	8.0**	32
227	Nanto Bank	619	3199	12	29	38	4.1	44	0.3	NA	69	18585	9.3	61
228	Sanrio	624	3159	42	38	47	6.3	74	0.4	624	40	1971	8.6	54
229	Okumura	639	3103	13	-1	5	4.5	65	0.5	1937*	45	2798*	6.9	32
230	Nichido Fire & Marine	641	3097	7	-10	-4	4.7	50	0.6	1884*	57	8935*	9.4	63
231	Mitsubishi Rayon	644	3074	5	-19	-14	4.3	81	0.7	1950	37	2439	5.3	22
232	Orient Finance	650	3046	9	-12	-7	2.2	29	0.9	NA	106b*	36171*	7.7	62
233	Sagami Railway	661	3005	8	-26	-21	8.2	160	0.4	1083	19	2585	5.1	57
234	Kinki Electrical Construction	663	2984	22	18	25	3.5	42	0.3	2212*	63	2441*	8.3	32
235	Nishi-Nippon Bank	676	2910	7	33	41	3.3	51	0.4	NA	52*	21158*	6.6	61
236	Chugoku Bank	679	2904	14	2	8	2.6	32	0.3	NA	82*	23147*	8.2	61

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237	Mitsubishi Oil	682	2900	8	2	8	6.6	50	0.4	4477	57	3782	13.2	11
238	Yakult Honsha	688	2873	16	10	17	3.8	33	0.7	965	76	1266	11.5	44
239	Hitachi Cable	693	2860	8	-20	-15	3.2	43	0.8	2002	66	1717	7.4	37
240	NTN Toyo Bearing	694	2856	6	-10	-5	3.7	44	1.0	932d	32	2479	8.3	37
241	Aisin Seiki	696	2853	11	-7	-1	2.5	34	0.7	3873	79	2688	7.2	37
242	Casio Computer	698	2835	11	7	13	3.1	63	0.8	1779	44	2199	4.9	46
243	Eisai	699	2834	12	-14	-8	3.3	34	0.5	1293b*	84b	1772*	9.9	45
244	Yokogawa Electric	700	2834	11	-21	-16	2.8	40	0.4	1490	68	1820	6.9	35
245	Nissin Food Products	706	2806	21	-5	1	2.7	44	0.7	1090b	64b	1556	6.2	44
246	Inax	708	2796	12	-6	0	4.2	50	0.4	1470*	56	1216a*	8.6	21
247	Nippon Sheet Glass	709	2794	6	-16	-11	3.5	48	0.7	1582	54	1932	7.3	26
248	Nippon Light Metal	710	2790	6	-5	1	13.1	29	0.5	3466	97	3088	45.0	24
249	Mitsubishi Gas Chemical	716	2759	6	-21	-16	3.4	43	0.7	1832	62	2296	7.8	22
250	Seiyu	717	2756	15	7	13	4.6	55	0.7	7654b	50b	6293	8.4	54
251	Onoda Cement	721	2746	6	-20	-15	4.5	36	0.6	2586	77	3374	12.7	21
252	Jufo Paper	725	2725	6	-40	-36	3.1	26	0.8	3276	104	3755	12.2	23
253	Minebea	728	2720	7	-14	-8	2.3	72	1.1	1503	38	3305a	3.2	37
254	Daido Steel	729	2719	6	-45	-41	3.9	55	0.6	2718	49	2665	7.0	25
255	Seventy-Seven Bank	731	2716	7	4	10	3.3	36	0.5	NA	69*	21683*	9.2	61
256	NCR Japan	732	2715	12	-9	-3	5.6	45	0.7	762*	65	760*	12.5	33
257	Fukuoka City Bank	733	2711	13	35	43	4.0	53	0.2	NA	51*	14029*	7.5	61
258	Tobishima	735	2705	12	18	25	7.0	117	0.4	2678	22	4806	6.0	32
259	Kuraray	736	2704	10	9	16	7.0	71	0.4	1989	35	2146	9.9	22
260	Nippon Television Network	737	2693	215	37	46	4.8	45	0.2	1195	57	1000	10.6	51
261	Makita Electric	738	2690	17	39	48	2.8	28	0.8	512d	53	1207	9.7	34
262	Dainippon Pharmaceutical	739	2689	18	8	15	7.6	108	0.3	561d	21	798	7.0	45
263	Toho Gas	742	2683	4	-14	-9	4.7	50	0.8	1306	53	1634	9.3	12
264	Navis Line	753	2650	7	-14	-8	55.2	259	NA	807	11	1186	21.3	58
265	Kandenko	754	2648	25	6	13	4.6	42	0.2	2692*	59	1939*	11.2	32
266	Yamazaki Baking	755	2646	12	8	15	3.1	40	0.5	2816	66	1619a*	7.7**	44
267	Hino Motors	762	2630	7	-8	-2	4.4	47	0.5	4595b*	65b	1844*	9.2	38
268	Chiyoda Fire & Marine	765	2614	7	-1	6	4.9	48	0.6	1740*	50	5897*	10.3	63
269	Mitsui Mining & Smelting	767	2607	5	-14	-8	16.5	69	NA	2068	38	2402	23.8	24
270	Fuji Heavy Industries	769	2603	4	-40	-36	1.4	55	1.2	4418	45	4787	2.6	42
271	Sankyo Aluminium	771	2598	12	67	78	6.3	83	0.3	1490	28	1493	7.6	21
272	Alps Electric	772	2586	15	21	28	3.0	72	0.7	2475	36	2543	4.2	35
273	Kyodo Printing	775	2576	29	14	22	23.5	190	0.1	762	14	455	12.4	52
274	Daimaru	779	2569	10	17	24	6.8	129	0.3	4983	19	2107*	5.2**	54
275	Uny	784	2554	14	7	14	2.7	43	0.8	4142	59	2436	6.4	54
276	Mitsubishi Mining & Cement	785	2554	6	-15	-10	5.1	76	0.7	2252	33	1992*	6.7**	21
277	Sanyo Securities	794	2516	10	NA	NA	3.1	16	0.7	NA	77d	6194	19.9	62
278	Matsushita-Kotobuki Electric	797	2512	16	3	10	2.8	42	0.5	1490*	56	1285*	6.6	41
279	Penta-Ocean Construction	798	2512	8	-18	-12	9.7	137	0.5	2330*	20	2086*	7.1	32
280	Mochida Pharmaceutical	801	2505	25	3	10	10.0	156	0.2	327*	15	395*	6.4	45
281	Fukuyama Transporting	806	2486	10	-11	-6	4.4	44	0.7	1136*	43	1376*	9.9	57
282	Nippon Meat Packers	807	2485	12	-16	-10	2.8	32	0.7	3893	75	2364	8.9	44
283	Green Cross	808	2485	12	10	17	5.0	LOSS	0.3	591	-2	851	NEG	45
284	Kanebo	809	2481	5	-16	-11	21.1	84	0.7	4221	29	3218*	25.1**	47
285	Mitsui Petrochemical Industries	810	2471	8	-40	-36	3.5	22	0.5	1917	109	2923	16.0	22
286	Yamaha (Nippon Gakki)	811	2470	13	-1	5	2.6	61	0.5	3276b	41b	2139	4.2	46
287	Nippon Electric Glass	812	2469	17	-5	2	4.6	38	0.3	1280*	51	1646*	12.2	37
288	Nippon Shokubai Kagaku Kogyo	813	2468	13	-7	-2	4.9	37	0.4	978	67	1115	13.3	22
289	Daiel Chemical Industries	818	2443	7	-13	-7	3.3	39	0.6	1313	61	2001	8.5	22
290	Advantest	821	2429	36	14	21	4.8	73	0.2	487	32	898	6.6	35
291	Meiji Seika	825	2416	6	-23	-18	3.6	117	0.6	1937	21	1326	3.1	44
292	Suzuki Motor	827	2412	6	-8	-2	2.0	66	0.8	6453b	37b	4098	3.0	42
293	Nippon Shinpan	832	2406	8	-20	-14	2.0	25	0.9	NA	94	33821	7.9	62
294	Hitachi Chemical	836	2401	12	-8	-2	6.0	69	0.4	2921	34	1960	8.7	22
295	Hokkaido Bank	841	2386	6	NA	NA	3.1	36	0.6	NA	60*	20009*	8.5**	61
296	Showa Shell Sekiyu	842	2384	9	-15	-10	5.6	44	0.5	9269	54	4933a	12.5	11
297	Mori Seiki	844	2382	25	11	18	4.6	44	0.5	504	45	789	10.4	38
298	Kanagafuchi Chemical Industry	849	2368	7	-5	1	3.5	34	0.6	1523	69	1513	10.3	22
299	Tosoh Corp.	850	2357	5	-21	-16	4.6	55	0.6	1681	41	2862	8.4	22
300	Nichirei	855	2347	8	-13	-7	5.5	81	0.5	2757	28	1513	6.8	44
301	Kakusai Electric	857	2342	32	57	67	9.1	71	0.3	683	33	446	12.8	34
302	Yamato Transport	861	2337	9	-30	-26	3.2	87	0.7	2626b	27b	1503	3.6	57
303	Sanyo-Kokusaku Pulp	865	2329	5	-38	-34	3.0	31	0.9	2902	71	2782	9.5	23
304	Japan Radio	866	2324	19	48	58	7.2	65	0.2	1096	33	1190	11.0	34
305	Unitika	867	2322	5	-14	-9	12.9	96	0.5	2179	24	2152	13.5	22
306	Nihon Cement	871	2308	7	-17	-11	3.5	30	0.6	1812	69	2687	11.5	21
307	Maeda Construction	875	2305	13	3	9	2.9	61	0.4	2606*	35	2929*	4.7	32
308	Banyu Pharmaceutical	876	2305	9	-21	-16	2.5	51	0.6	631	45	1220	4.9	45
309	Fujikura	877	2299	7	-22	-17	3.6	66	0.6	1628	35	1826	5.5	37
310	Japan Steel Works	879	2292	6	-28	-23	10.3	241	NA	762	10	1052	4.3	38
311	Kansai Paint	880	2284	9	NA	NA	6.4	73	0.4	945*	26	1016*	8.7	22
312	Olympus Optical	882	2279	10	18	26	2.8	41	0.8	1438b	55b	1622	6.7	46
313	Denki Kagaku Kogyo	907	2231	5	-28	-24	3.7	44	0.8	1700	50	2671	8.3	22
314	Nippon Hodo	908	2230	19	-3	3	3.5	56	0.4	1615*	42	1391*	6.3	32
315	Hitachi Maxell	911	2209	22	17	24	2.1	33	0.5	1103	66	1423	6.3	46
316	Teikoku Oil	914	2202	8	6	12	3.8	70	0.4	325	32	840a	5.5	11

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317	Yokohama Rubber	918	2193	9	1	7	6.7	37	0.4	2357	59	2063a	18.0	37
318	Shimadzu	919	2192	8	-23	-18	4.1	48	0.6	1109	46	1278	8.6	35
319	Citizen Watch	926	2171	7	-16	-11	2.7	39	0.8	2193b	64b	1906	7.0	46
320	Tanabe Seiyaku	927	2168	9	-28	-23	3.0	43	0.6	1484b	50b	1673	7.0	45
321	Nissin Flour Milling	934	2156	11	-14	-8	3.7	41	0.4	2363	51	1360	9.1	44
322	CSK	939	2138	36	44	53	3.3	62	0.1	530	32	1110	5.4	52
323	Showa Line	940	2136	8	12	19	61.2	LOSS	NA	611	-2	968	NEG	58
324	Terumo	945	2122	11	-10	-5	3.8	90	0.4	633	23	1430	4.2	22
325	Nisshinbo Industries	950	2108	9	-12	-7	2.1	27	0.6	1425d	69	1855	7.8	47
326	Niigata Engineering	954	2099	6	-2	4	7.4	247	0.3	1300	9	1659	3.0	38
327	Snow Brand Milk Products	959	2088	7	-16	-11	3.5	47	0.6	6033	44	2667	7.5	44
328	Canon Sales	962	2082	28	42	51	2.7	37	0.3	2527	55	1390	7.3	52
329	Hoya	976	2048	19	24	32	3.5	52	0.4	368d	20	879	6.9	45
330	Seino Transportation	981	2034	13	-22	-17	2.2	34	0.6	1635	57	1716	6.6	57
331	Anritsu	983	2030	17	17	24	5.2	53	0.3	611	38	696	9.9	34
332	Onward Kashiya	993	2011	14	0	6	2.8	37	0.8	1352b	55b	1108*	7.7**	47
333	Orix	1000	1992	31	17	24	2.0	17	0.4	NA	54d	22057	11.4	62

NETHERLANDS

COUNTRY COMPOSITE		90337	49	27	7	5.4	11	5.2	183610	12487	506846	36.3		
1	Royal Dutch Petroleum (1)	NR	41111	77	24	5	1.4	9	5.2	85412	6539	90193	15.7	11
2	Unilever NV (3)	NR	12979	81	32	12	5.1	13	3.1	34434	1687	20564	38.2	44
3	Nationale-Nederlanden	317	5679	39	48	25	1.1	11	4.1	7708	511	48792	10.0	63
4	Philips' Gloeilampenfabrieken	371	5011	18	7	-9	0.6	7	5.8	30045	720	28884	8.1	41
5	Polygram	630	3143	18	NA	NA	6.9	18	NA	2154	175	1545a	38.2	46
6	Elsevier	667	2954	46	58	34	17.4	18	2.0	1030	167	740a	97.9	51
7	Akzo	714	2769	62	-2	-17	1.2	6	6.8	9841	501	7503	21.7	22
8	Aegon	727	2722	66	53	30	1.4	11	4.6	3826	256	29635	13.0	63
9	NMB Postbank Groep	763	2626	27	44	22	1.0	8	5.3	NA	346	84725	13.3	61
10	Amro Bank	834	2403	38	20	2	0.7	6	7.7	NA	379	94390	11.1	61
11	Dordtsche Petroleum	872	2307	69	21	3	35.3	18	5.4	NA	126a	66a	191.7	11
12	Algemene Bank Nederland	874	2306	19	8	-8	0.7	6	8.0	NA	368	90976	10.8	61
13	DSM	929	2167	62	-1	-16	1.1	4	6.8	5658	544	5092	27.1	22
14	Heineken	932	2159	67	33	13	1.4	13	2.7	3502	171	3741	11.0	43

NEW ZEALAND

COUNTRY COMPOSITE		2679	3	-5	-3	1.1	6	6.2	6639	399	8126	17.8		
1	Fletcher Challenge	744	2679	3	-5	-3	1.1	6	6.2	6639	399	8126	17.8	23

NORWAY

COUNTRY COMPOSITE		6507	32	40	26	3.1	16	1.9	10201	411	10061	19.5		
1	Norsk Hydro	279	6507	32	40	26	3.1	16	1.9	10201	411	10061	19.5	11

SINGAPORE/MALAYSIA

COUNTRY COMPOSITE		13167	5	20	14	2.7	21	1.5	4310	974	37292	16.9		
1	Singapore Airlines	403	4608	7	4	-1	2.6	7	1.7	2749b	648b	3434a	36.4	56
2	Development Bank of Singapore	578	3434	7	63	54	2.6	25	0.8	NA	135	22180	10.3	61
3	OCBC Overseas Chinese Bank	723	2743	5	-8	-13	2.4	24	1.2	NA	108	10135	10.1	61
4	Sime Darby (Malaysia)	845	2381	2	23	16	3.1	28	2.4	1562	83	1542a	10.9	71

SOUTH AFRICA

COUNTRY COMPOSITE		24626	19	56	46	2.1	11	4.4	2301	2851	17533	20.4		
1	De Beers	160	9874	26	79	67	1.6	6	4.1	1588	1539	7644	24.6	26
2	Anglo American	226	7640	33	92	79	2.0	15	3.2	NA	567b	5529	13.7	81
3	Gencor	689	2873	3	38	29	1.2	6	4.9	NA	396	2831	20.4	81
4	Driefontein Consolidated	899	2244	11	24	16	3.3	12	6.3	714	225	940	28.0	81
5	Gold Fields of South Africa	999	1995	21	49	39	2.2	14	3.6	NA	124	589	15.6	81

SPAIN

COUNTRY COMPOSITE		52308	32	8	-10	2.0	14	5.8	27002	5203	322804	14.7		
1	Telefónica Nacional de España	241	7238	8	2	-16	0.6	11	6.7	6777	657	25991	5.6	55
2	Repsol	242	7220	24	46	21	2.3	12	5.1	9722	614	6911a	19.6	11
3	Banco Bilbao Vizcaya	252	7034	30	1	-16	1.4	8	9.2	NA	915	73189	17.9	61
4	Endesa	304	5873	23	25	3	1.6	9	4.2	5233	681	13115a	18.9	12
5	Banco de Santander	374	4940	45	-9	-25	2.0	11	3.9	NA	444	43157	18.7	61
6	Banco Central	399	4630	47	21	0	2.2	12	4.1	NA	383	42366	18.2	61
7	Banco Español de Crédito	538	3675	37	-6	-22	1.8	15	4.6	NA	242a	34931a	11.8	61
8	Iberduero	668	2951	6	27	5	0.5	9	8.5	2411a	318a	12467a	5.9	12
9	Banco Popular España	833	2405	83	10	-9	1.9	7	5.7	NA	354	21883	27.4	61
10	Banco Hispano Americano	873	2306	27	-18	-32	6.5	37	6.9	NA	328	34045	17.8	61
11	Asland	984	2025	53	-22	-36	2.7	26	1.6	411a	68a	1034a	10.3	21
12	Hidroelectrica Española	992	2013	5	22	1	0.4	10	8.7	2449a	198a	13715a	3.9	12

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U.S. \$ MIL.	PRICE PER SHARE U.S. \$	% CHANGE FROM 1989 (U.S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U.S. \$ MIL.	PROFITS U.S. \$ MIL.	ASSETS U.S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
SWEDEN														
COUNTRY COMPOSITE			73664	56	29	18	3.7	23	2.3	97246	4313	192338	17.2	
1	L. M. Ericsson	203	8269	202	168	145	3.9	23	1.1	6460	355	6680	16.7	34
2	Astra	219	7948	90	188	162	10.9	47	0.5	1219	172	1651	23.1	45
3	ASEA (5)	NR	7402	124	62	48	3.5	20	1.6	20560	589	24156	17.5	34
4	Skanska	361	5106	83	5	-4	4.9	37	0.8	4906	NA	4733a	13.4	32
5	Volvo	425	4385	75	-6	-14	1.1	8	3.4	14881	721	16049	14.0	42
6	Skandinaviska Enskilda Banken	581	3403	13	-5	-13	1.7	9	3.7	NA	381a	47294a	18.7	61
7	Svenska Cellulosa Aktiebolaget	614	3224	19	1	-8	2.7	16	2.5	4072	NA	4509a	17.1	23
8	Stera Kopparbergs Bergslags	618	3208	53	-14	-22	1.7	10	3.7	6917	NA	8023a	16.4	23
9	Saab-Scania	640	3100	46	22	11	1.4	17	2.8	7343	180	7608	8.2	38
10	SKF	672	2937	27	19	9	1.8	12	2.6	4099	237	4402	14.9	37
11	Electrolux	683	2900	40	-18	-26	1.1	7	5.1	13884	422	10350	16.0	41
12	Procordia	726	2724	25	0	-8	2.2	17	1.7	3364	NA	2908a	13.1	71
13	Sandvik	752	2651	49	-4	-12	2.5	7	2.5	3074	376	3691	35.9	25
14	Svenska Handelsbanken	761	2634	19	4	-5	1.9	9	3.5	NA	293a	38921a	20.9	61
15	Skandia	790	2536	33	-3	-12	5.8	32	2.0	822a*	78a	2762a*	18.0	63
16	Alfa-Laval	816	2446	41	85	69	3.7	15	2.1	2490	158	2720	23.9	38
17	AGA	856	2344	49	30	19	2.6	14	2.3	1805	161	2798	17.9	22
18	Investor	909	2218	74	20	9	3.3	30	1.9	NA	80	1104	11.1	71
19	Huvudstaden	942	2127	18	9	-1	14.4	108	0.6	116a	20a	552a	13.3	64
20	Pharmacia	953	2104	33	15	5	3.3	24	1.1	1233	90	1428	14.0	45
SWITZERLAND														
COUNTRY COMPOSITE			110830	3827	42	17	2.2	22	2.1	118039	7122	421217	11.8	
1	Nestlé	41	22809	6346	57	29	2.5	14	2.2	33751	1695	24898	18.2	44
2	Roche Holding	94	13993	5520	66	37	2.8	38	0.5	6901	598	12150	7.4	45
3	Union Bank of Switzerland	119	11724	2517	42	17	1.5	NA	3.8	NA	634*	123822*	NA	61
4	Ciba-Geigy	120	11712	2391	16	-4	1.1	12	1.9	14490	1095	17374	9.7	22
5	Sandoz	142	10634	8192	33	10	2.5	17	1.3	8787	671	8399	15.0	45
6	Swiss Bank Corp.	237	7367	228	35	11	1.2	NA	4.3	NA	527*	114260*	NA	61
7	CS Holding	245	7160	1726	26	4	1.2	12	4.5	NA	605	7179	10.3	61
8	BBC Brown Boveri (5)	NR	6759	4272	100	65	3.8	18	1.0	20560	589	24156	21.8	34
9	Zürich Vers.	337	5479	3340	28	6	1.7	27	1.3	12024	NA	31704a	6.2	63
10	Schweiz. Rück.	423	4409	2566	52	25	3.4	45	0.7	8667a	173a	24814a	7.4	63
11	Winterthur	509	3833	2876	22	1	2.7	27	1.6	8170	183	23548a	9.8	63
12	Jacobs Suchard	670	2948	4975	25	3	2.5	16	3.0	4690	193	3220a	16.2	44
13	Holderbank	996	2003	4799	47	21	1.1	14	1.7	NA	159a	5692a	8.0	21
UNITED STATES														
COUNTRY COMPOSITE			2288516	72	12	12	2.9	19	3.5	2362681	151121	5287568	18.0	
1	International Business Machines	2	68894	120	9	9	1.8	13	4.0	62700	5260	77740	13.5	33
2	General Electric	5	62543	69	26	26	3.0	15	2.7	54600	3940	128300	19.4	34
3	Exxon	6	60000	48	11	11	2.0	21	5.0	95200	2980	83220	9.7	11
4	American Telephone & Telegraph	13	46961	43	21	21	4.0	17	3.1	36100	2700	37690	24.1	55
5	Philip Morris	16	39114	42	21	21	4.1	12	3.3	44800	2950	38530	32.8	43
6	Merck	18	32720	83	19	19	9.3	21	2.2	6551	1495	6757	44.4	45
7	Bristol-Myers Squibb	21	32127	61	22	22	6.3	39	3.5	9189	747	5190	16.0	45
8	Wal-Mart Stores	22	31885	56	48	48	10.6	28	0.5	25811b	1076b	8199b	37.6	54
9	Coca-Cola	23	30416	45	56	56	9.5	26	1.8	8966	1193	8283	36.9	43
10	General Motors	26	29451	49	20	20	0.8	10	6.2	110000	4220	173300	8.7	42
11	Du Pont	29	27981	40	9	9	1.8	12	4.0	35500	2480	34720	15.0	22
12	Amoco	30	27340	53	19	19	2.0	17	3.9	26400	1610	29920a	12.2	11
13	BellSouth	31	27101	56	16	16	2.1	16	4.8	14000	1700	28470	13.3	55
14	Procter & Gamble	32	26780	83	61	61	4.3	20	2.2	21398	1206	16351	21.9	44
15	Atlantic Richfield	33	26046	118	28	28	3.0	11	4.2	16000	1950	22260	26.4	11
16	Mobil	34	25667	63	22	22	1.8	15	4.6	56200	1810	39080	12.1	11
17	Chevron	36	24937	70	27	27	1.8	61	4.0	32800	250	33880	2.9	11
18	Ford Motor	43	22481	46	-5	-5	1.1	6	6.5	82900	3840	160900	18.7	42
19	Eli Lilly	45	21817	78	41	41	5.8	23	2.1	4176	940	5848	25.0	45
20	Johnson & Johnson	47	21283	64	29	29	5.1	21	2.1	9757	1082	7919	24.3	45
21	GTE	48	21127	65	22	22	2.4	15	4.5	17424	1417	31100a	15.4	55
22	Bell Atlantic	49	20558	52	20	20	2.4	19	4.5	11400	1070	26220	12.5	55
23	PepsiCo	54	19481	74	36	36	5.0	21	1.6	15242	901	15127	23.4	43
24	Pacific Telesis	58	19091	46	14	14	2.4	16	4.4	9593	1242	21190	15.1	55
25	Boeing	59	19053	83	54	54	3.5	23	1.8	20276	675	12608a	15.1	31
26	Waste Management	63	18631	40	53	53	6.8	31	0.9	4459	562	6405	21.6	52
27	Minnesota Mining & Mfg.	65	18385	83	13	13	3.4	15	3.5	11990	1244	9776	23.5	71
28	Southwestern Bell	69	17547	58	13	13	2.1	16	4.7	8730	1093	21160	13.2	55
29	Nynex	72	17266	88	12	12	1.8	15	5.2	13200	1130	25360	12.1	55
30	Ameritech	73	17239	65	9	9	2.3	14	4.9	10200	1240	19840	16.2	55
31	Walt Disney	74	17201	129	39	39	7.3	23	0.5	4594	703	5109a	31.0	53
32	Dow Chemical	75	16764	62	1	1	2.1	8	4.2	17600	2487	22166	27.7	22
33	American International Group	77	16614	102	24	24	2.0	12	0.5	8940	1367	46140	16.3	63
34	Abbott Laboratories	78	16565	75	26	26	6.1	19	2.2	5380	860	4852	32.4	45
35	American Home Products	79	16525	53	14	14	8.4	15	4.1	6747	1102	5682	57.7	45
36	Texaco	82	15697	59	33	33	1.8	14	5.1	NA	1220	25640	13.6	11

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U. S. \$ MIL.	PRICE PER SHARE U. S. \$	% CHANGE FROM 1989 (U. S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U. S. \$ MIL.	PROFITS U. S. \$ MIL.	ASSETS U. S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
37	US West	97	13900	37	9	9	1.7	6	5.4	9691	1111	25430	28.3	55
38	Schlumberger	98	13873	58	48	48	4.8	31	2.1	4086	407	5482	15.7	36
39	Eastman Kodak	103	13064	40	-10	-10	2.0	25	5.0	18398	529	23652	8.0	46
40	McDonald's	110	12534	35	16	16	3.5	17	1.0	6142	727	9175	20.4	53
41	Sears, Roebuck	113	12416	36	-23	-23	0.9	10	5.5	53800	1450	86970	9.3	54
42	American Express	114	12224	29	-10	-10	2.3	8	3.1	NA	1157	130900	28.0	62
43	Anheuser-Busch	115	12168	43	1	1	4.0	16	2.0	9481	767	9026	25.2	43
44	Hewlett-Packard	128	11348	48	-12	-12	2.1	14	0.9	11899	829	10075	14.5	35
45	Digital Equipment	130	11318	93	1	1	1.4	18	NA	12742	1073	10668	7.8	33
46	Pfizer	136	10890	66	8	8	2.4	16	3.6	5672	681	8325	15.0	45
47	Motorola	138	10824	83	47	47	2.8	22	0.9	9620	498	7686	13.1	35
48	Schering-Plough	140	10668	47	42	42	5.5	22	1.9	3158	471	3614	25.5	45
49	MCI Communications	143	10625	43	9	9	5.3	18	0.5	6471	603	6338	29.2	55
50	Westinghouse Electric	146	10558	36	15	15	2.4	11	3.8	12844	922	20310	21.3	34
51	Capital Cities/ABC	147	10530	585	33	33	3.5	24	0.0	4773a	387a	6089a	14.8	51
52	Pacific Gas & Electric	161	9813	23	17	17	1.3	13	6.6	8588	901	21350	10.4	12
53	United Telecommunications	171	9527	46	32	32	4.6	25	2.2	7549	363	9821	18.5	55
54	Federal National Mortgage Assn.	173	9484	40	35	35	4.1	11	1.4	NA	807	112200a	36.8	62
55	Emerson Electric	179	9276	42	17	17	3.0	16	3.0	7071	588	5408	19.3	34
56	Limited	185	8987	50	58	58	9.5	25	1.0	4648b	347b	2146	38.1	54
57	Intel	187	8903	48	48	48	3.5	21	NA	3127	391	3994	16.5	35
58	Dun & Bradstreet	190	8749	47	-16	-16	4.0	16	4.5	4322	586	5184	25.2	52
59	Toys 'R' Us	191	8716	46	45	45	5.1	28	NA	4788b	321b	3075b	18.4	54
60	H. J. Heinz	194	8606	34	26	26	4.9	18	2.5	5801	440	4001	26.4	44
61	USX	195	8594	34	-4	-4	1.6	11	4.2	18717	965	17500	14.8	25
62	Loews	201	8425	112	4	4	2.1	9	0.9	11437	907	25830a	22.7	71
63	SCEcorp	202	8329	38	11	11	1.6	10	6.7	6904	778	15440	15.7	12
64	Warner-Lambert	207	8209	61	36	36	7.3	20	2.5	4196	413	2860	38.2	45
65	Tenneco	208	8202	65	21	21	2.5	14	4.7	14083	584	17380	17.9	11
66	Berkshire Hathaway (d)	209	8194	7150	11	11	1.7	20	0.0	2483	447	9460	8.4	71
67	J. C. Penney	212	8076	66	13	13	2.1	10	4.0	16405b	802b	12254	20.5	54
68	Microsoft	213	8076	73	NA	NA	14.2	35	NA	804	171	721	40.6	52
69	General Re	215	8039	89	40	40	2.6	14	1.7	1898	599	10389	19.2	63
70	Union Pacific	216	8033	71	-3	-3	1.8	13	3.3	6492	595	12228a	14.3	57
71	Occidental Petroleum	217	8001	28	-2	-2	1.2	27	9.1	20068	256	20740a	4.5	11
72	Kellogg	218	7952	65	-6	-6	4.9	20	2.9	4652	422	3390	24.8	44
73	Southern Co.	222	7900	25	-2	-2	1.2	9	8.6	7492	846	20090	12.3	12
74	Archer Daniels Midland	232	7450	27	39	39	2.5	16	0.4	7929	425	4729	15.8	44
75	Citicorp	235	7388	23	-28	-28	0.9	95	7.8	NA	500h	230600	0.9	61
76	May Department Stores	243	7197	58	37	37	3.1	15	2.7	9526b	515b	7802b	20.8	54
77	Upjohn	246	7104	39	22	22	4.1	22	2.6	2916	311	3247	18.2	45
78	United Technologies	247	7099	59	14	14	1.5	11	3.1	19757	702	14598	13.9	31
79	ITT	250	7043	57	-4	-4	1.0	9	2.8	20054	922	45510	11.6	71
80	K mart	251	7039	35	-7	-7	1.4	21	4.9	29533bi	323bi	13145b	6.6	54
81	Norfolk Southern	253	7005	41	15	15	1.4	12	3.5	4536	606	10244	11.7	57
82	Campbell Soup	254	7004	54	22	22	3.7	150	1.9	5672	13	3610a	2.5	44
83	Texas Utilities	255	6955	36	21	21	1.0	8	8.2	4321	779	17220	13.5	12
84	J. P. Morgan	256	6942	38	-7	-7	1.7	LOSS	4.8	NA	-1275h	88960	NEG	61
85	Unocal	260	6886	30	30	30	3.2	21	2.4	11357	336	9508a	15.0	11
86	Caterpillar	263	6795	67	5	5	1.5	15	1.8	10882	497	10926	10.2	38
87	Sara Lee	264	6763	30	9	9	3.5	16	2.8	11718	411	6523	22.1	44
88	Marion Merrell Dow	265	6762	24	17	17	6.4	16	2.5	2211	397	784	39.1	45
89	Rockwell International	266	6758	27	22	22	1.7	13	2.8	12518	631	8939	13.1	37
90	Monsanto	268	6694	103	-5	-5	1.7	11	3.8	8681	679	8599	16.5	22
91	Commonwealth Edison	270	6673	32	-13	-13	1.0	12	9.5	5751	694	17950	8.0	12
92	General Mills	271	6644	81	26	26	8.9	19	2.7	5621	315	2888	47.8	44
93	Gannett	272	6620	41	-4	-4	3.3	17	2.9	3518	398	3783	19.9	51
94	Phillips Petroleum	276	6555	27	14	14	3.1	20	3.7	12384	499	11256	15.6	11
95	Syntex	280	6504	58	21	21	11.1	20	2.8	1349	303	1440	54.0	45
96	BankAmerica	282	6441	31	7	7	1.3	8	3.3	NA	820	98760	15.9	61
97	American Brands	284	6374	67	-2	-2	2.2	10	4.1	11921	631	11394	21.9	43
98	Browning-Ferris Industries	286	6238	42	23	23	7.1	23	1.5	2551	263	2258a	31.0	52
99	Burlington Resources	287	6186	42	NA	NA	1.9	38	1.7	1715	149	6098	5.1	12
100	American General	288	6129	48	36	36	1.4	14	6.6	4227	413	30420a	10.3	63
101	Time Warner	295	6077	106	-16	-16	0.9	LOSS	0.9	10779	-432	24791	NEG	51
102	Paramount Communications	300	5925	49	-9	-9	1.6	39	1.4	3392	144	7066	4.1	71
103	Aetna Life & Casualty	303	5879	53	-3	-3	0.8	9	5.3	13311	639	87100	9.3	63
104	CPC International	305	5869	78	33	33	5.8	18	2.6	5103	327	3705	32.5	44
105	Baxter International	307	5843	24	9	9	1.9	LOSS	2.7	7399	446	8550a	NEG	45
106	Marsh & McLennan	309	5812	79	29	29	6.6	19	3.3	NA	295	2035	34.5	63
107	Aluminum Co. of America	310	5778	66	2	2	1.1	7	4.5	10910	945	11541	15.6	24
108	International Paper	315	5709	53	7	7	1.1	7	3.2	11378	864	11582	15.6	23
109	Kimberly-Clark	316	5708	71	7	7	2.7	13	3.8	5734	424	4923	21.0	45
110	Public Service Enterprise Group	318	5647	27	3	3	1.3	10	7.8	4805	542	12919	12.9	12
111	Weyerhaeuser	319	5641	27	-8	-8	1.4	10	4.4	10106	601	15976	13.6	23
112	American Electric Power	322	5613	29	5	5	1.3	9	8.3	5140	629	14750	14.0	12
113	AMP	323	5612	52	24	24	3.4	20	2.6	2797	281	2530	17.4	35
114	Deere	325	5602	74	23	23	2.0	14	2.7	6234	380	9145	14.8	38
115	Duke Power	327	5583	55	15	15	1.5	11	5.7	3639	572	9542	14.2	12
116	Ralston-Purina	333	5520	90	3	3	6.6	39	2.1	6658	351	4382	17.0	44

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U.S. \$ MIL.	PRICE PER SHARE U.S. \$	% CHANGE FROM 1989 (U.S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U.S. \$ MIL.	PROFITS U.S. \$ MIL.	ASSETS U.S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
117	Gillette	335	5507	57	40	40	LOSS	22	1.9	3819	285	2868a	NEG	45
118	PPG Industries	341	5413	50	10	10	2.4	12	3.4	5734	465	5646	20.0	22
119	Dayton Hudson	345	5360	76	41	41	3.1	14	1.7	13644b	410b	6684b	22.6	54
120	Consolidated Edison of New York	348	5329	23	-5	-5	1.2	10	7.8	5551	606	10349	12.7	12
121	American Cyanamid	350	5322	57	4	4	2.5	18	2.4	4825	292	4593a	13.7	22
122	Allied-Signal	352	5293	37	4	4	1.6	10	4.9	11942	528	10132	15.3	71
123	PacifiCorp	354	5259	22	11	11	1.8	12	6.7	3717	467	11396	15.3	71
124	Halliburton	355	5254	49	63	63	2.5	33	2.0	5661	134	4263	7.4	36
125	Tele-Communications	356	5252	15	-15	-15	4.3	LOSS	NA	3026	-257	8574a	NEG	51
126	Borden	360	5160	35	5	5	3.1	11	3.0	7593	404	4825	28.5	44
127	Melville	362	5095	50	9	9	3.1	15	2.9	7554	398	3032	21.4	54
128	Apple Computer	363	5085	41	-14	-14	3.5	10	1.1	5284	454	2744	33.9	33
129	Student Loan Marketing Assn.	368	5052	51	26	26	6.1	20	1.0	NA	258	35490	30.7	62
130	Chemical Waste Management	375	4912	24	40	40	6.2	32	0.7	892	144	1105	19.2	52
131	NCR	377	4853	69	21	21	2.4	13	2.0	5956	412	4500	19.0	33
132	Oryx Energy	380	4825	46	NA	NA	NA	NA	2.6	NA	NA	NA	NA	11
133	Cooper Industries	384	4797	44	38	38	1.8	17	2.4	5129	268	6745	10.4	36
134	CBS	388	4756	202	1	1	2.1	16	2.2	2962	297	4407a	13.1	51
135	CNA Financial	391	4708	76	5	5	1.2	8	NA	7454	614	28680	15.0	63
136	Compaq Computer	392	4701	119	26	26	4.0	15	NA	2876	333	2090	26.6	33
137	Corning	393	4688	50	29	29	2.7	18	1.8	2439	259	3361	15.5	41
138	Home Depot	395	4678	61	NA	NA	9.1	43	0.3	2759b	112b	1118b	21.0	54
139	Security Pacific	406	4604	40	-10	-10	1.1	6	5.7	NA	741	83940	17.6	61
140	Newmont Gold	408	4601	44	46	46	9.6	32	0.1	559	118	663	30.3	81
141	Banc One	412	4518	31	28	28	1.8	12	3.3	NA	363	26550	15.2	61
142	MCA	419	4463	61	10	10	2.4	18	1.1	3382	245	4211	13.4	53
143	Humana	420	4430	45	48	48	3.3	16	2.3	4088	256	3696	21.1	52
144	Albertson's	422	4411	66	44	44	4.7	22	1.5	7423b	197b	1863b	21.1	54
145	Food Lion	424	4389	14	17	17	10.2	32	1.0	4717	140	1089	32.1	54
146	Xerox	428	4364	47	-26	-26	0.9	8	6.3	17635	704	30090	11.3	33
147	Contel	430	4355	28	-3	-3	2.6	16	4.0	3114	277	5846	16.2	55
148	Federal Home Loan Mortgage (d)	431	4349	72	NA	NA	2.3	10	2.2	3757	437	35462	22.9	62
149	Automatic Data Processing	439	4285	58	48	48	4.4	21	1.2	1678	188	1679	21.5	52
150	Sun	440	4281	40	-4	-4	1.3	16	4.5	11377	275	8699	7.9	11
151	Times Mirror	441	4273	33	-16	-16	2.5	16	3.2	3517	298	3947	16.2	51
152	Woolworth	442	4272	67	27	27	2.3	13	3.1	8820b	329b	3535	17.8	54
153	Colgate-Palmolive	443	4271	65	28	28	6.1	16	2.8	5039	280	3536	39.2	44
154	Dominion Resources	444	4268	44	-1	-1	1.3	10	7.6	3700	411	11034	13.1	12
155	FPL Group	448	4217	32	1	1	1.2	11	7.5	6180	410	12325	11.0	12
156	Raytheon	459	4134	63	-12	-12	1.7	8	3.8	8796	529	5338	22.1	31
157	Pitney Bowes	469	4092	52	16	16	2.9	22	2.3	2876	180	5611	12.9	52
158	Cigna	470	4087	52	-5	-5	0.8	10	5.8	15654	458	57780	8.0	63
159	Entergy	472	4080	20	10	10	1.0	11	5.0	3724	390	14720	9.0	12
160	Arco Chemical	474	4063	42	16	16	2.6	10	5.9	2663	405	2655	26.0	22
161	Wells Fargo	475	4060	80	4	4	1.7	7	4.5	NA	601	48740	22.9	61
162	Chubb	477	4053	48	38	38	1.6	10	2.8	3190	421	11179a	16.1	63
163	Homeywell	479	4030	101	34	34	2.1	8	2.7	6059	550	5258	27.4	34
164	American TV & Communications	480	4029	37	-23	-23	15.4	40	NA	973	95	1508a	38.6	51
165	Quaker Oats	485	3978	51	-15	-15	4.5	18	2.8	5724	203	3222	24.9	44
166	AMR	486	3976	64	4	4	1.1	11	NA	10480	455	10877	9.7	56
167	Georgia-Pacific	495	3932	45	-4	-4	1.4	7	3.5	10171	661	7056	22.2	23
168	NCNB	496	3922	39	-17	-17	1.3	8	3.6	NA	447	66190	17.6	61
169	Detroit Edison	498	3908	27	34	34	1.8	9	6.7	3203	426	10060a	19.0	12
170	Masco	500	3891	25	-11	-11	2.1	18	2.1	3151	221	3641	11.6	37
171	Fluor	501	3880	49	74	74	5.4	34	0.5	6228	108	2154	15.8	38
172	Consolidated Natural Gas	503	3858	47	8	8	2.3	23	3.9	2802	182	4601	10.1	12
173	Houston Industries	517	3778	32	9	9	1.1	13	9.3	NA	414	10218a	8.8	12
174	McCaw Cellular Communications	520	3771	29	NA	NA	LOSS	21	NA	504	-289	2076a	NEG	55
175	ConAgra	522	3759	31	41	41	3.9	17	1.9	11340	198	4278	22.6	44
176	Central & South West	526	3740	40	17	17	1.4	14	6.9	2549	337	8347	10.1	12
177	Amerasia Hess	528	3737	46	20	20	1.5	13	1.3	5679	476	6867	11.5	11
178	LIN Broadcasting	531	3732	73	-12	-12	5.7	LOSS	NA	251	108	675	NEG	51
179	Delta Air Lines	535	3702	77	11	11	1.4	10	1.6	8089	461	6485	15.1	56
180	Electronic Data Systems	546	3621	36	36	36	NA	19	1.6	5467	435	3416a	NA	52
181	Chrysler	548	3584	15	-35	-35	0.5	64	7.8	34922	359	48567a	0.7	42
182	Primerica	549	3584	33	46	46	1.6	11	1.0	NA	289	14440a	15.1	62
183	Ethyl	551	3565	30	25	25	4.0	16	2.0	2432	219	5632	24.4	22
184	Dresser Industries	554	3546	52	35	35	2.2	22	2.1	3956	163	3056	10.0	36
185	Carolina Power & Light	555	3536	44	15	15	1.5	10	6.6	2481	376	7504a	14.9	12
186	Bankers Trust New York	556	3528	43	-8	-8	1.5	LOSS	5.4	NA	-980	55660	NEG	61
187	Baker Hughes	558	3523	29	72	72	3.5	34	1.6	2328	83	2066	10.5	36
188	Coastal	560	3521	35	27	27	2.4	18	1.2	8271	178	7870a	13.5	11
189	Philadelphia Electric	563	3498	17	-21	-21	0.9	5	13.3	3406	590	11860	17.4	12
190	Santa Fe Southern Pacific	565	3493	22	-3	-3	4.1	LOSS	0.5	2978	-196	6609	NEG	57
191	Reynolds Metals	566	3486	59	6	6	1.3	7	3.1	6143	533	5556	18.2	24
192	R. R. Donnelley & Sons	570	3470	44	3	3	2.4	15	2.2	3122	222	2507	15.9	52
193	Texas Instruments	580	3423	42	-5	-5	1.7	19	1.7	6522	292	4804	9.1	35
194	UAL	583	3398	156	27	27	2.2	15	NA	9794	324	7207	14.3	56
195	Genuine Parts	586	3373	41	-2	-2	3.5	16	3.3	3161	199	1292	21.9	37
196	CSX	598	3295	34	2	2	1.0	9	4.2	7745	427	12300	11.0	57

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U. S. \$ MIL.	PRICE PER SHARE U. S. \$	% CHANGE FROM 1989 (U. S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U. S. \$ MIL.	PROFITS U. S. \$ MIL.	ASSETS U. S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
197	Dillard Department Stores (6)	603	3273	92	54	54	2.9	20	0.2	3049	148	2496	14.3	54
198	PNC Financial	610	3242	36	-24	-24	1.2	10	6.0	NA	377	40810	11.4	61
199	Scott Paper	613	3227	44	-7	-7	1.6	12	1.8	5066	302	5746	13.6	23
200	Tribune	616	3218	43	-7	-7	2.7	14	2.2	2455	242	2941a	19.6	51
201	Pennsylvania Power & Light	620	3190	42	10	10	1.5	10	7.0	2356	353	7525	14.6	12
202	Tandy	622	3179	37	-15	-15	1.8	11	1.6	4181	324	2574	16.9	54
203	Washington Post	623	3166	258	3	3	3.4	17	1.6	1444	198	1532	20.5	51
204	Hershey Foods	626	3157	35	22	22	2.8	18	2.2	2421	171	1814	16.0	44
205	Sysco	628	3148	34	46	46	4.9	25	0.6	6851	108	1869	19.4	44
206	UST	632	3137	29	13	13	6.5	17	3.8	682	190	636	38.7	43
207	Ohio Edison	634	3128	21	-5	-5	1.2	9	9.6	2155	361	7723	12.9	12
208	Air Products & Chemicals	635	3126	57	34	34	2.2	15	2.3	2642	217	3366	14.4	22
209	Travelers	636	3122	30	-25	-25	0.6	8	7.9	12523	424	56560	8.5	63
210	Carnival Cruise Lines (6)	637	3115	23	28	28	3.5	18	2.1	1148	194	2220	19.3	53
211	Readers Digest Association (6)	638	3106	26	NA	NA	7.4	NA	1.8	1832	151	1174	39.2	51
212	Newmont Mining	642	3093	46	32	32	LOSS	18	1.3	582	130	1302	NEG	24
213	Consolidated Rail	646	3066	45	19	19	0.8	26	3.1	3411	148	7224a	2.9	57
214	Salomon	647	3064	26	-1	-1	1.1	6	2.5	8999	470	118300	18.6	62
215	Centel	648	3054	34	7	7	3.1	119	2.5	1188	11	3417	2.6	55
216	TRW	652	3038	50	10	10	1.8	12	3.4	7340	263	5259	14.4	37
217	Chase Manhattan	653	3036	27	-20	-20	0.8	LOSS	9.4	NA	-665h	107400	NEG	61
218	SunTrust Banks	655	3033	24	-2	-2	1.6	9	3.6	NA	337	29180a	18.2	61
219	Ingersoll-Rand	659	3020	59	41	41	2.2	15	2.1	3447	211	2595	14.5	38
220	Pacific Enterprise	662	3001	43	-2	-2	1.6	15	8.1	6762	211	7326	10.7	12
221	Transamerica	664	2975	39	NA	NA	1.0	11	4.9	NA	292	29840	9.4	62
222	Illinois Tool Works	671	2945	55	49	49	3.4	18	1.1	2173	164	1688	19.2	38
223	Nike	673	2935	79	NA	NA	5.2	14	1.0	1711	167	825	37.3	47
224	Champion International	674	2928	31	-10	-10	0.8	8	3.6	5163	432	7531	10.8	23
225	First Wachovia	677	2907	42	9	9	1.9	11	4.0	NA	269	21820a	17.3	61
226	Rubbermaid	681	2901	39	29	29	4.8	24	1.3	1344	116	915	20.1	44
227	Walgreen	686	2876	47	12	12	3.5	18	1.7	5380	154	1681	19.7	54
228	St. Paul	690	2872	58	14	14	1.3	7	4.1	3789	398	11030	18.0	63
229	Tandem Computers	691	2870	28	52	52	2.9	23	NA	1633	118	1619	12.6	33
230	Whitman	692	2863	28	-18	-18	7.3	16	3.6	3986	228	3718	44.7	44
231	Viacom (6)	695	2855	27	8	8	6.5	LOSS	0.0	1436	131	2753	NEG	51
232	Enron	697	2844	57	27	27	1.9	13	4.4	9836	226	9105	14.3	12
233	Union Carbide	701	2832	20	-25	-25	1.2	6	5.0	8744	573	8546	19.5	22
234	Burlington Northern	704	2818	37	53	53	2.6	11	3.2	4606	243	6148	24.2	57
235	National Medical Enterprises	705	2806	36	24	24	2.4	13	2.0	3676	193	3877	19.5	52
236	Dow Jones	711	2786	28	-23	-23	2.4	9	2.8	1688	317	2112a	26.4	51
237	Nordstrom	718	2755	34	-2	-2	3.8	26	0.9	2671b	115b	1707b	14.3	54
238	Deluxe	720	2748	32	12	12	4.4	17	3.2	1316	153	847	25.0	52
239	Computer Associates International	724	2733	15	-28	-28	3.3	15	NA	1296b	158b	1167	22.6	52
240	Pennzoil	740	2688	74	-8	-8	2.1	13	4.1	1985	235	4882	15.8	11
241	Knight-Ridder	748	2662	52	10	10	2.9	15	2.6	2268	180	2135	19.9	51
242	Winn-Dixie Stores	750	2659	67	35	35	3.4	17	3.0	9151	135	1575	19.4	54
243	McGraw-Hill	751	2657	55	-20	-20	3.0	81	3.9	1789	40	2208	3.8	51
244	Union Electric	758	2641	26	2	2	1.4	9	8.0	2010	286	5760	15.2	12
245	Dover	759	2641	41	29	29	3.6	17	1.8	2121	144	1366a	20.8	21
246	Hilton Hotels	760	2635	55	-35	-35	3.2	22	1.8	998	110	1892a	14.8	53
247	Liz Claiborne	766	2611	30	29	29	5.7	15	0.8	1411	165	629a	37.7	47
248	Centerior Energy	768	2605	19	9	9	0.9	10	8.6	2302	267	11973a	9.0	12
249	Union Camp	773	2585	38	-1	-1	1.5	9	4.2	2761	299	3417	16.4	23
250	Morgan Stanley Group	774	2577	71	NA	NA	1.5	6	2.1	NA	443	53280	23.5	62
251	Becton, Dickinson	776	2574	67	23	23	2.4	16	1.6	1811	158	2270	15.2	45
252	Manufacturers Hanover	780	2561	37	1	1	0.9	LOSS	9.0	NA	-588h	60480	NEG	61
253	International Flavors & Fragrances	782	2560	67	23	23	3.3	18	3.2	870	139	970	18.6	22
254	Oracle Systems	783	2556	20	NA	NA	10.9	27	NA	584	82	460	39.6	52
255	Sun Microsystems	786	2550	30	NA	NA	3.9	66	0.0	1765	61	1269	5.8	33
256	Bank of New York	792	2529	37	-25	-25	1.1	186	5.7	NA	50	47390	0.6	61
257	Marriott	793	2519	25	-32	-32	4.0	15	1.1	7536	181	6732	26.5	53
258	Turner Broadcasting (6)	795	2515	52	38	38	NEG	LOSS	0.0	1065	28	2115	NEG	51
259	NBD Bancorp	802	2501	35	13	13	1.6	10	3.7	NA	259	25770	17.2	61
260	Torchmark	804	2494	48	21	21	2.8	12	2.9	NA	211	4921	22.9	63
261	Aon	805	2488	39	15	15	2.0	11	3.9	NA	232	8265a	18.3	63
262	Fleet/Northstar Financial	814	2458	23	-22	-22	1.3	7	6.1	NA	371	29050a	18.5	61
263	General Public Utilities	815	2457	44	19	19	1.2	9	5.9	2911	282	6688	13.5	12
264	Kerr-McGee	817	2444	49	8	8	1.7	20	3.0	3087	126	3123a	8.2	11
265	Merrill Lynch	822	2426	24	-22	-22	0.8	15	4.2	NA	178	63940	5.1	62
266	W. R. Grace	823	2425	28	-14	-14	1.4	9	4.9	6115	257	5619	14.9	22
267	Federal Express	826	2416	46	-5	-5	1.6	22	NA	5167	166	5293	7.5	52
268	San Diego Gas & Electric	829	2412	43	9	9	1.9	12	6.3	2082	187	3546	15.6	12
269	CMS Energy	831	2407	29	1	1	1.4	8	1.4	2961	312	8305	18.7	12
270	Great Western Financial	835	2402	19	-4	-4	1.2	24	4.5	NA	100	37180	5.0	61
271	Gap	837	2399	67	NA	NA	8.8	24	1.1	1587b	98b	481b	36.4	54
272	American Stores	839	2395	70	10	10	2.3	20	1.6	22004b	118b	7010	11.3	54
273	USF&G	843	2382	29	-12	-12	1.3	20	10.2	3671	119	13600	6.5	63
274	Safeco	848	2370	38	30	30	1.3	8	3.6	1850	300	9279	15.7	63
275	Clerox	852	2354	43	13	13	3.0	15	3.4	1356	146	1213	19.5	44
276	CoreStates Financial	858	2341	43	-9	-9	1.4	9	4.5	NA	199	16850	15.1	61

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THE GLOBAL 1000

COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U.S. \$ MIL.	PRICE PER SHARE U.S. \$	% CHANGE FROM 1989 (U.S. \$) (LOCAL)		PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U.S. \$ MIL.	PROFITS U.S. \$ MIL.	ASSETS U.S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
277	Geico	862	2337	154	19	19	2.6	11	1.3	1621	213	3434	23.4	63
278	Baltimore Gas & Electric	868	2320	29	-5	-5	1.2	11	7.3	2004	276	5986	11.0	12
279	Unisys	878	2296	15	-46	-46	0.9	LOSS	6.9	10097	-639	10750	NEG	33
280	Lincoln National	881	2284	55	13	13	1.0	10	4.6	5961	269	25070	10.4	63
281	Genentech	885	2270	27	46	46	5.7	48	NA	400	44	669a	11.8	45
282	Eaton	888	2265	61	0	0	2.0	12	3.3	3671	210	3052	17.0	37
283	Rohm & Haas	889	2265	34	-3	-3	1.7	13	3.5	2661	176	2455	13.5	22
284	Panhandle Eastern	894	2253	26	11	11	1.6	21	7.8	27811	70	6266	7.7	12
285	Wm. Wrigley Jr. (d)	898	2245	57	20	20	6.2	20	2.6	993	106	499	30.1	44
286	Northern States Power	900	2244	36	1	1	1.5	11	6.2	1990	222	4593	13.4	12
287	National City	901	2240	37	0	0	1.5	8	5.1	NA	263	22910	17.6	61
288	Tyco Laboratories	902	2237	53	30	30	4.6	20	0.6	1971	91	1399	22.7	71
289	Lockheed	903	2235	35	-27	-27	1.1	393	5.1	9891	6	6792	0.3	31
290	Tyson Foods (d)	904	2234	34	87	87	4.5	21	0.1	2538	101	2586	21.8	44
291	Ashland Oil	905	2231	38	-9	-9	2.0	80	2.6	8464	86	4456	2.4	11
292	Barnett Banks	906	2231	36	-7	-7	1.3	11	3.7	NA	257	29000	12.4	61
293	First Interstate Bancorp	910	2217	39	-29	-29	0.9	LOSS	7.6	NA	-152	58190	NEG	61
294	Polaroid	912	2208	42	6	6	14.8	20	1.4	1905	145	1777	73.4	46
295	Chemical Banking	916	2195	27	-24	-24	0.6	LOSS	9.9	NA	-482h	67350a	NEG	61
296	Rorer Group	920	2191	69	73	73	4.9	32	1.2	1182	87	1388a	15.1	45
297	Textron	924	2179	25	-11	-11	0.9	8	4.1	7440	269	12554	10.6	71
298	Martin Marietta	930	2166	43	-6	-6	1.6	7	3.2	5796	307	3505	22.6	31
299	Alltel (d)	933	2159	33	8	8	2.4	14	3.9	1226	154	2379	17.2	55
300	Great Atlantic & Pacific Tea	935	2153	56	-2	-2	2.2	15	1.2	1148b	147	2640	15.1	54
301	Reebok International	936	2149	19	NA	NA	2.5	12	1.6	1822	175	1166	21.0	47
302	First Union (d)	937	2143	20	-19	-19	0.9	8	5.4	3313	256	32131	10.6	61
303	Southern New England Telecomms.	938	2142	35	-2	-2	1.8	12	5.0	1671	189	3178	15.3	55
304	Amax	943	2127	24	-4	-4	1.0	7	3.3	3892	360	4190	14.5	24
305	Capital Holding	944	2124	47	25	25	1.8	8	2.3	1027	276	12960a	22.0	63
306	Northeast Utilities	946	2119	20	-3	-3	1.2	10	9.0	2206	203	6765a	11.4	12
307	First Chicago	951	2108	33	-19	-19	0.9	8	6.2	NA	359	47900	11.9	61
308	Long Island Lighting	955	2099	19	14	14	1.0	LOSS	5.3	2348	-96	8326a	NEG	12
309	United Artists Entertainment	956	2098	16	NA	NA	2.6	LOSS	NA	1199	-104	4013a	NEG	51
310	Norwest	957	2092	22	15	15	1.6	9	3.7	NA	237	24330	18.9	61
311	H. F. Ahmanson	958	2091	21	4	4	1.0	10	4.2	NA	194	44650	10.7	61
312	Brown-Forman (d)	960	2085	75	21	21	3.7	26	2.8	1006	145	1003	14.1	43
313	Columbia Gas System	961	2084	46	8	8	1.3	18	4.8	3204	146	5878	7.2	12
314	Potomac Electric Power	963	2081	21	3	3	1.5	11	7.2	1395	215	4643	13.4	12
315	Mead	966	2073	33	-20	-20	1.2	10	3.1	4612	216	3750	11.8	23
316	Goodyear Tire & Rubber	969	2067	36	-33	-33	1.0	18	5.0	10869	189	8460	5.4	37
317	Super Valu Stores	970	2065	28	2	2	2.4	14	2.2	11136b	148b	2429b	17.0	54
318	Whirlpool	971	2064	30	-2	-2	1.5	12	3.7	6289	187	5354	12.3	41
319	Allegheny Power System	974	2052	39	3	3	1.3	10	8.1	2258	195	4433	12.4	12
320	James River Corp. of Virginia	975	2050	25	-15	-15	1.0	9	2.4	5872	255	5557	10.9	23
321	Morton International (d)	977	2048	43	5	5	2.1	17	2.1	1407	97	1364	12.7	22
322	Phelps Dodge	978	2043	59	0	0	1.5	5	5.1	2700	504	2505	32.1	24
323	Great Lakes Chemical (d)	979	2037	58	65	65	3.3	16	0.8	762	123	1097	20.7	22
324	Medtronic	987	2023	75	48	48	4.3	20	0.9	742	97	760	21.7	45
325	H&R Block (d)	988	2019	38	34	34	5.2	19	3.3	877	100	826	27.6	62
326	Golden West Financial	990	2014	32	40	40	2.2	12	0.5	NA	158	19520	18.9	61
327	W. W. Grainger	991	2013	74	18	18	2.8	17	1.6	1727	120	1065	16.5	34
328	Castle & Cooke (d)	997	2000	34	-1	-1	2.4	20	0.0	2718	95	2270	11.8	44
329	Temple Inland	998	2000	36	22	22	1.8	9	2.2	1894	207	1982a	19.6	23
WEST GERMANY														
COUNTRY COMPOSITE		270315	452	62	37	4.2	34	3.0	418941	13759	1025769	14.1		
1	Allianz	35	24979	1514	85	57	6.4	68	0.7	7392*	NA	19592a*	9.4	63
2	Daimler-Benz	42	22580	485	47	25	3.1	14	2.3	45176	3802e	30710a	22.4	42
3	Siemens	46	21292	428	56	32	2.1	16	2.7	36149	871	38084	13.1	34
4	Deutsche Bank	60	19032	461	75	49	2.1	NA	2.8	NA	778	203075	NA	61
5	RWE	116	11997	284	94	64	2.9	22	2.9	23046	372	25364	13.3	12
6	Volkswagen	124	11399	356	83	55	1.6	10	2.9	38646	582	33631	15.7	42
7	Bayer	132	11185	175	12	-5	1.3	9	6.9	25606	1232	21366	15.4	22
8	VEBA	133	11128	253	74	47	1.7	15	4.0	29100	747	24494	11.3	12
9	BASF	158	9960	175	11	-6	1.3	8	6.9	28159	1192	20769	16.6	22
10	Hoechst	167	9630	170	7	-9	1.6	8	7.1	27143	1141	19716	21.2	22
11	Münchener Rück.	193	8610	1354	42	20	24.7	78	0.7	7368	36	18817	31.9	63
12	Dresdner Bank	196	8569	245	58	34	1.6	NA	4.5	NA	373	146008	NA	61
13	Mannesmann	293	6080	210	80	53	2.5	20	3.5	13205	NA	8788a	12.1	38
14	BMW	332	5546	352	34	13	2.7	15	3.3	12389	NA	6837a	18.1	42
15	Thyssen	351	5312	169	32	12	2.0	8	5.5	20254	452	12351	24.2	25
16	Henkel	365	5077	361	46	24	2.7	20	2.3	6875	214	5050	13.4	44
17	Mercedes Automobil-Holding	397	4658	396	49	27	3.0	NA	2.8	NA	76a	1318a	NA	42
18	MAN	460	4131	285	98	67	1.6	25	2.6	10085	141	8905	6.5	38
19	Commerzbank	464	4111	164	37	16	1.2	NA	5.1	NA	329	113128	NA	61
20	Hochtief	497	3918	784	130	95	5.1	56	1.2	3231	NA	2507a	9.1	32
21	VIAG	511	3827	242	61	36	2.0	15	3.0	6201	147	7051	13.5	71

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COUNTRY RANK		GLOBAL 1000 RANK	MARKET VALUE U. S. \$ MIL.	PRICE PER SHARE U. S. \$	% CHANGE FROM 1989 (U. S. \$) (LOCAL)	PRICE/BOOK VALUE RATIO	P/E RATIO	YIELD %	SALES U. S. \$ MIL.	PROFITS U. S. \$ MIL.	ASSETS U. S. \$ MIL.	RETURN ON EQUITY %	INDUSTRY CODE
22	Preussag	518	3776	267	154 115	4.2	32	2.8	9426	NA	3150a	13.0	71
23	Bayerische Hypotheken	539	3672	222	20 2	1.5	NA	5.4	NA	164	90065	NA	61
24	Linde	582	3402	590	62 37	3.5	24	2.2	3225	106	2664	14.6	38
25	Rheinelektra	584	3396	1543	92 63	39.1	108	0.7	380*	25	374a*	36.0	38
26	AEG	606	3249	174	66 40	3.6	NA	1.3	724j	173	5433	NA	34
27	Kaufhof	617	3211	384	61 37	4.2	46	2.0	7688	NA	2666a	9.0	54
28	Bayerische Vereinsbank	629	3145	221	21 3	1.3	NA	5.4	NA	165	100532	NA	61
29	Victoria Holding	656	3031	1378	95 65	2.2	NA	0.5	2494a	52a	12431a	NA	63
30	Deutsche Lufthansa	657	3029	101	19 1	1.7	28	3.6	7720	NA	6157a	6.1	56
31	Karstadt	685	2887	401	54 31	3.2	41	2.3	7318a	84a	2912a	7.7	54
32	Metallgesellschaft	703	2822	371	90 61	3.2	28	2.5	11902	84	5378	11.6	71
33	Schering	707	2801	471	48 26	2.2	19	2.5	3457	133	3637	11.2	45
34	Verein. Elek. Westfalen	756	2643	132	55 31	2.3	21	4.2	3642	NA	6164a	10.8	12
35	Holzmann (Philipp)	781	2561	911	129 94	4.7	149	1.0	1543a	18a	1423a	3.2	32
36	Feldmühle Nobel	820	2435	304	84 56	2.3	25	3.0	5632	96	4092	9.1	26
37	Aachener & Münchener Bet.	859	2341	538	NA NA	1.7	27	2.1	NA	41*	1419a*	6.4	63
38	Heidelberger Zement	863	2333	778	89 60	6.8	39	1.0	1193	NA	1110a	17.2	21
39	Isar-Amperwerke	883	2275	403	62 38	7.3	65	1.8	978	31	1818	11.2	12
40	Nixdorf Computer	886	2269	203	25 6	1.4	LOSS	NA	3105	NA	2860a	NEG	33
41	Degussa	989	2016	276	20 2	2.6	15	3.7	8490	103	3921	17.1	26

OTHER MARKETS AROUND THE WORLD

The Global 1000 ranking excludes companies from countries where stock markets are largely closed to foreign investors and where major corporations are often privately owned. Many of

these companies are significant global competitors, and the list below includes those companies where annual revenues for the most recent fiscal year are over \$1 billion.

Company Sales U.S. \$ Bil. Profits U.S. \$ Mil.

SOUTH KOREA

SAMSUNG (Trading)	10.6	16
HYUNDAI (Trading)	8.0	7
DAEWOO (Trading)	6.7	302
KOREA ELECTRIC POWER	6.4	1,076
POHANG IRON & STEEL	6.1	203
SAMSUNG ELECTRONICS	5.6	223
HYUNDAI MOTOR	5.3	64
GOLDSTAR	3.6	25
LUCKY GOLDSTAR INT'L (Trading)	3.6	6
YUKONG	3.5	92
KIA MOTOR	2.6	39
SUNKYONG (Trading)	2.3	19
SSANGYONG	2.2	15
KOREA AIR	2.1	45
HYUNDAI ENG. & CONST.	1.9	27

Company Sales U.S. \$ Bil. Profits U.S. \$ Mil.

LUCKY (Chemicals)	1.8	90
DAEWOO ELECTRONICS	1.7	20
HYOSONG (Trading)	1.6	1
DAELIM INDUSTRIAL	1.3	16
DONGHAN CONST.	1.2	10
CHEIL SUGAR	1.1	55
HYUNDAI MOTOR SERVICE	1.0	34
DAEWOO HEAVY INDUSTRIES	1.0	21

TAIWAN

CATHAY LIFE INSURANCE	3.4	138
CHINA STEEL	2.4	682
NAN YA PLASTICS	2.0	135
FIRST COMMERCIAL BANK	1.3	100
CHANG HWA COMMERCIAL BANK	1.3	65
HUA NAN COMMERCIAL BANK	1.3	77
TATUNG	1.2	56

DATA: BW

Company Sales U.S. \$ Bil. Profits U.S. \$ Mil.

FORMOSA PLASTICS	1.1	122
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MEXICO

TELEFONOS DE MEXICO	2.1	440
GRUPO INDUSTRIAL ALFA	2.0	366
VISA	1.4	41
CIFRA	1.3	105
VITRO	1.3	19
GRUPO DESC	1.2	95
CEMENTOS MEXICANOS	1.0	130

BRAZIL

VOTORANTIM	2.3	90
PAO DE ACUCAR	1.8	22
VARIG BRAZILIAN AIRLINES	1.8	-187
COPERSUCAR	1.6	34
PETROLEO IPIRANGA	1.2	8

† Fiscal 1988

KEY TO INDUSTRY CODES

Left-hand digit represents broad economic sector as defined by Morgan Stanley Capital International. Right-hand digit is industry classification code within each economic sector.

1. ENERGY

- 11. Energy sources
- 12. Electric & gas utilities

2. MATERIALS

- 21. Building materials & components
- 22. Chemicals
- 23. Forest products & paper
- 24. Nonferrous metals
- 25. Steel
- 26. Misc. materials & commodities

3. CAPITAL EQUIPMENT

- 31. Aerospace & military technology
- 32. Construction & housing

- 33. Data processing & reproduction
- 34. Electrical & electronics
- 35. Electronic components & instruments
- 36. Energy equipment & services
- 37. Industrial components
- 38. Machinery & engineering

4. CONSUMER GOODS

- 41. Appliances & household durables
- 42. Automobiles
- 43. Beverages & tobacco
- 44. Food & household products
- 45. Health & personal care
- 46. Recreation & other consumer goods
- 47. Textiles & apparel

5. SERVICES

- 51. Broadcasting & publishing
- 52. Business & public services
- 53. Leisure & tourism
- 54. Merchandising
- 55. Telecommunications
- 56. Airlines
- 57. Road & rail transportation
- 58. Shipping
- 59. Wholesale & international trade

6. FINANCE

- 61. Banking
- 62. Financial services
- 63. Insurance
- 64. Real estate

7 & 8. OTHER

- 71. Multi-industry
- 81. Gold mines

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THE GLOBAL 1000

ALPHABETICAL LIST OF COMPANIES

The number preceding each company is its Global 1000 rank. The code following each company shows its nationality and rank within that nation. To find the statistics for a company, turn to the country listing and look for the company by its rank.

A 859 Aachener & Munchener Bet. (WG-37) 91 ABB Asea Brown Boveri (SWE/SWI-NM) 417 Abbey Laboratories (US-34) 78 Abbott Laboratories (US-34) 612 Accor (FR-26) 469 ACEC-Union Miniere (BE-5) 821 Adventest (JA-290) 606 AEG (WG-26) 737 Aegon (NE-8) 303 Aetna Life & Casualty (US-103) 856 AGA (SWE-17) 958 Ahmanson (H. F.) (US-311) 301 Air Liquide (L) (FR-13) 635 Air Products & Chemicals (US-208) 696 Aisin Seiki (JA-241) 184 Ajinomoto (JA-81) 714 Akzo (NE-7) 422 Albertson's (US-144) 364 Alcan Aluminum (CA-9) 816 Alfa-Laval (SWE-16) 874 Algemeene Bank Nederland (NE-12) 85 All Nippon Airways (JA-34) 569 Allianz Assicurazioni (IT-11) 974 Allegheny Power System (US-319) 35 Allianz (US-304) 787 Allied Irish Banks (IR-1) 298 Allied-Lyons (BR-28) 332 Allied-Signal (US-122) 933 Alltel (US-299) 772 Alps Electric (JA-272) 310 Aluminia Co. of America (US-107) 595 Amada (JA-219) 943 Amax (US-304) 528 Amerasia Bank (US-177) 638 American Braid Resources (CA-21) 284 American Brands (US-97) 350 American Cyanamid (US-121) 322 American Electric Power (US-112) 114 American Express (US-42) 288 American General (US-100) 79 American Home Products (US-35) 77 American International Group (US-33) 839 American Stores (US-272) 13 American Telephone & Telegraph (US-4) 480 American TV & Communs. (US-164) 73 Ameritech (US-30) 30 Amoco (US-12) 323 AMP (US-113) 486 AMR (US-166) 834 Ansa Bank (NE-10) 236 Anglo American (SA-2) 115 Anheuser-Busch (US-43) 983 Anritsu (JA-331) 550 ANZ Group Holdings (AS-6) 604 Aoki (JA-223) 805 Aon (US-261) 363 Apple Computer (US-128) 608 Arabi Oil (JA-225) 232 Archer Daniels Midland (US-74) 474 Arco Chemical (US-160) 327 Argyll Group (BR-49) 369 Asahi Breweries (JA-141) 197 Asahi Chemical Industry (JA-84) 87 Asahi Glass (JA-36) 947 ASDA Group (BR-85) NR ASEA (SWE-3) 382 Ashtokha Bank (JA-146) 905 Ashland Oil (US-291) 984 Asland (SP-11) 62 Assicurazioni Generali (IT-1) 658 Associated British Foods (BR-63) 219 Astra (SWE-2) 33 Atlantic Richfield (US-15) 439 Automatic Data Processing (US-149)	307 Baxter International (US-105) 132 Bayer (WG-7) 539 Bayerische Hypotheken (WG-23) 629 Bayerische Vereinsbank (WG-28) NR BBC Brown Boveri (SWI-8) 152 BCE (Bell Canada Enterprises) (CA-1) 776 Becton, Dickinson (US-251) 49 Bell Atlantic (US-22) 31 BellSouth (US-13) 209 Berkshire Hathaway (US-66) 597 BET (BR-58) 986 BICC (BR-88) 988 Black (H&R) (US-325) 913 Blue Circle Industries (BR-82) 332 BMW (WG-14) 370 BNP (FR-15) 427 BOC Group (BR-35) 59 Boeing (US-25) 386 Boots (BR-31) 870 Boral (AS-12) 360 Borden (US-126) 925 Brambles Industries (AS-14) 214 Bridgestone (JA-90) 21 Bristol-Myers Squibb (US-7) 864 British Aerospace (BR-77) 799 British Airways (BR-73) 84 British Gas (BR-7) 25 British Petroleum (BR-1) 383 British Steel (BR-30) 27 British Telecommunications (BR-2) 149 Broken Hill Proprietary (AS-1) 960 Brown-Forman (US-312) 286 Browning-Ferris Industries (US-98) 204 BSN-Gervais Danone (FR-7) 108 BTR (BR-9) 373 BTR Nylax (AS-3) 704 Burlington Northern (US-234) 287 Burlington Resources (US-99)	838 CoreStates Financial (US-276) 393 Corning (US-137) 510 Cosma Oil (JA-190) 895 Courtaulds (BR-80) 305 CPC International (US-104) 343 CRA (AS-2) 846 Credit Foncier de France (FR-35) 446 Credit Lyonnais (FR-18) 488 Credianstalt-Bankverein (AT-1) 576 Credito Italiano (IT-12) 245 CS Holding (SWI-7) 939 CSK (JA-322) 675 CSR (AS-10) 598 CSX (US-196)	501 Fluor (US-171) 458 Fondaria (LA) (IT-8) 424 Food Lion (US-145) 43 Ford Motor (US-18) 448 FPL Group (US-155) 8 Fuji Bank (JA-4) 339 Fuji Electric (JA-140) 769 Fuji Heavy Industries (JA-270) 123 Fuji Photo Film (JA-55) 877 Fujikura (JA-309) 426 Fujisawa Pharmaceutical (JA-163) 379 Fujita Corp. (JA-144) 593 Fujita Tourist Enterprises (JA-217) 71 Fujitsu (JA-29) 733 Fukuoka City Bank (JA-257) 453 Fukuoka Transporting (JA-281) 453 Funakawa Electric (JA-170)	420 Humana (US-143) 432 Hutchinson-Whampoa (HK-3) 942 Huvudstaden (SWE-19) 487 Hyogo Bank (JA-182)
B 864 BAA (BR-54) 558 Baker Hughes (US-187) 868 Baltimore Gas & Electric (US-278) 412 Banc One (US-141) 435 Banca Commerciale Italiana (IT-7) 252 Banco Bilbao Vizcaya (SP-3) 399 Banco Central (SP-6) 374 Banco de Santander (SP-5) 800 Banco di Roma (IT-18) 538 Banco Espanol de Credito (SP-7) 873 Banco Hispano Americano (SP-10) 833 Banco Popular Espanol (SP-9) 410 Bank of Fukuoka (JA-158) 401 Bank of Hiroshima (JA-153) 531 Bank of Kyoto (JA-195) 777 Bank of Montreal (CA-19) 792 Bank of New York (US-256) 891 Bank of Nova Scotia (CA-22) 87 Bank of Tokyo (JA-24) 180 Bank of Yokohama (JA-79) 282 BankAmerica (US-96) 556 Bankers Trust New York (US-186) 876 Banyu Pharmaceutical (JA-308) 141 Barclays Bank (BR-12) 906 Barnett Banks (US-292) 158 BASF (WG-9) 281 Bass (BR-24) 66 B. A. T. 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THE GLOBAL 1000

ALPHABETICAL LIST OF COMPANIES

The number preceding each company is its Global 1000 rank. The code following each company shows its nationality and rank within that nation. To find the statistics for a company, turn to the country listing and look for the company by its rank.

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159 LVMH Moët Hennessy (FR-3)
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875 Maeda Construction (JA-307)
738 Makita Electric (JA-261)
460 MAN (WG-18)
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780 Manufacturers Hanover (US-252)
265 Marion Merrell Dow (US-88)
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993 Onward Kashiyoama (JA-332)
783 Oracle Systems (US-254)
340 Oreal (L) (FR-14)
650 Orient Finance (JA-232)
1000 Orix (JA-333)
380 Oryx Energy (US-132)
118 Osaka Gas (JA-54)
952 Österreichische Länderbank (AT-3)

P

743 Pacific Dunlop Olympic (AS-11)
642 Pacific Enterprise (US-220)
161 Pacific Gas & Electric (US-52)
38 Pacific Telesis (US-24)
354 PacificCorp (US-123)
654 PanCanadian Petroleum (CA-16)
894 Panhandle Eastern (US-284)
300 Paramount Communications (US-102)
221 Paribas (FR-8)
585 Pearson (BR-57)
647 Pechelbronn (FR-25)
543 Pechiney (FR-28)
982 Pechiney International (FR-41)
437 Peninsula & Oriental Steam (BR-37)
212 Penney (J. C.) (US-67)
620 Pennsylvania Power & Light (US-201)
740 Pennzoil (US-240)
798 Pentac-Ocean Construction (JA-279)
54 PepsiCo (US-23)
746 Pernod Ricard (FR-32)
745 Perrier (FR-31)

230 Petrofina (BE-1)
240 Peugeot (FR-9)
136 Pfizer (US-46)
953 Pharmacia (SWE-20)
978 Phelps Dodge (US-322)
563 Philadelphia Electric (US-189)
16 Philip Morris (US-5)
371 Philips' Gloeilampenfabrieken (NE-4)
276 Phillips Petroleum (US-94)
789 Pilkington (BR-71)
248 Pioneer Electronic (JA-104)
840 Pirelli (IT-23)
449 Pitney Bowes (US-157)
513 Placer Dome (CA-12)
610 PNC Financial (US-198)
912 Polaroid (US-294)
741 Polly Peck International (BR-68)
630 Polygram (NE-5)
963 Potomac Electric Power (US-314)
341 PPG Industries (US-118)
518 Preussag (WG-22)
549 Prisma (US-182)
726 Procter & Gamble (US-14)
259 Prudential (BR-23)
318 Public Service Enterprise Group (US-110)
485 Quaker Oats (US-165)

R

411 Racal Electronics (BR-32)
285 Racial Telecommunications (BR-25)
333 Rakston-Purina (US-116)
524 Rank Organisation (BR-47)
900 Rank Hovis McDougall (BR-87)
476 RAS (IT-10)
459 Raytheon (US-156)
628 Readers Digest Association (US-211)
665 Reckitt & Colman (BR-61)
730 Redland (BR-66)
936 Reebok International (US-301)
473 Reed International (BR-42)
242 Repsol (SP-2)
192 Reuters Holdings (BR-21)
566 Reynolds Metals (US-191)
584 Rheintelekom (WG-25)
506 Rhone-Poulenc (FR-23)
387 Ricoh (JA-148)
890 RMC (BR-79)
94 Roche Holding (SWI-2)
286 Rockwell International (US-89)
889 Rohm & Haas (US-283)
540 Rolls Royce (BR-51)
920 Rorer Group (US-296)
525 Rothmans International (BR-48)
312 Royal Bank of Canada (CA-7)
884 Royal Bank of Scotland Group (BR-78)
NR Royal Dutch Petroleum (NE-1)
4 Royal Dutch/Shell Group (NE/BR-NM)
304 Royal Dutch (BR-44)
757 Royale Belge (BE-7)
176 RTT (BR-19)
611 Rubbermaid (US-226)
186 RWE (WG-5)

S

640 Saab-Scania (SWE-9)
848 Safeco (US-274)
861 Sagami Railway (JA-233)
553 SAI (IT-22)
233 Sainsbury (J.) (BR-22)
283 Saint-Gobain (Compagnie de) (FR-11)
170 Saitama Bank (JA-76)
647 Salomon (US-214)
829 San Diego Gas & Electric (US-268)
143 Sandoz (SWI-5)
752 Sandvik (SWE-13)
294 Sankyo (JA-116)
771 Sankyo Aluminum (JA-271)
643 Sanofi (FR-27)
624 Sannie (JA-228)
565 Santa Fe Southern Pacific (US-190)
14 Sanwa Bank (JA-9)
106 Sanyo Electric (JA-48)
794 Sanyo Securities (JA-277)
845 Sanyo-Kokusaku Pulp (JA-303)
567 Sapporo Breweries (JA-208)
264 Sara Lee (US-87)
609 Sato Kogyo (JA-226)
202 SCEcorp (US-63)
707 Schering (WG-33)
140 Schering-Plough (US-48)
98 Schlumberger (US-38)
747 Schneider (FR-33)
423 Schweizer. Ruck. (SWI-10)
613 Scott Paper (US-199)
928 Scottish & Newcastle Breweries (BR-84)
210 Seagram (CA-3)
819 Sears Holdings (BR-74)
113 Sears, Roebuck (US-41)
483 Secom (JA-180)
406 Security Pacific (US-139)
83 Seibu Railway (JA-33)
981 Seino Transportation (JA-330)
717 Seiyu (JA-250)
339 Sekisui Chemical (JA-132)

229 Sekisui House (JA-97)
731 Seventy-Seven Bank (JA-255)
139 Seven-Eleven Japan (JA-63)
105 Sharp (JA-47)
545 Shell Canada (CA-14)
NR Shell Transport & Trading (BR-3)
311 Shikoku Electric Power (JA-119)
919 Shimadzu (JA-318)
131 Shimizu Construction (JA-59)
552 Shin-Etsu Chemical (JA-203)
530 Shionogi (JA-198)
421 Shiseido (JA-162)
131 Shizuoka Bank (JA-110)
334 Showa Denko (JA-129)
940 Showa Line (JA-323)
842 Showa Shell Sekiyu (JA-296)
46 Siemens (WG-3)
845 Sime Darby (Malaysia) (SM-4)
403 Singapore Airlines (SM-1)
302 SIP (IT-4)
922 Sirti (IT-25)
790 Skandia (SWE-15)
581 Skandinaviska Enskilda Banken (SWE-6)
361 Skanska (SWE-4)
672 SKF (SWE-10)
21 SmithKline Beecham (BR-10)
921 Smurfit Group (IR-2)
959 Snow Brand Milk Products (JA-327)
269 Societe Generale (FR-10)
579 Solvay (BE-3)
61 Sony (JA-25)
222 Southern Co. (US-73)
938 Southern New Eng. Telecomms. (US-303)
69 Southwestern Bell (US-28)
791 STC (BR-72)
182 STET (IT-3)
618 Stora Kopparbergs Bergslags (SWE-8)
368 Student Loan Marketing Assn. (US-129)
690 St. Paul (US-228)
164 Suez (Cie Financiere de) (FR-4)
7 Sumitomo Bank (JA-3)
228 Sumitomo Chemical (JA-96)
177 Sumitomo Corp. (JA-78)
234 Sumitomo Electric Industries (JA-99)
505 Sumitomo Heavy Industries (JA-188)
381 Sumitomo Marine & Fire (JA-145)
111 Sumitomo Metal Industries (JA-51)
346 Sumitomo Metal Mining (JA-135)
468 Sumitomo Realty & Dev. (JA-176)
70 Sumitomo Trust & Banking (JA-28)
440 Sun (US-150)
450 Sun Alliance & London Insurance (BR-39)
680 Sun Hung Kai Properties (HK-7)
786 Sun Microsystems (US-255)
635 SunTrust Banks (US-218)
970 Super Valu Stores (JA-317)
827 Suzuki Motor (JA-292)
614 Svenska Cellulosa Aktiebolaget (SWE-7)
761 Svenska Handelsbanken (SWE-14)
492 Swire Pacific (HK-4)
237 Swiss Bank Corp. (SWI-6)
280 Syntax (US-95)
628 Sysco (US-205)

T

169 Taisei (JA-75)
257 Taisho Marine & Fire Insurance (JA-138)
394 Taisho Pharmaceutical (JA-151)
434 Takashimaya (JA-165)
155 Takeda Chemical Industries (JA-70)
927 Tanabe Seiyaku (JA-320)
691 Tandem Computers (US-229)
622 Tandy (US-202)
633 Tamoco (BR-62)
342 TDK (JA-133)
372 Teijin (JA-142)
914 Teikoku Oil (JA-316)
336 Tele-Communications (US-125)
241 Telefonica Nacional de Espana (SP-1)
998 Temple Inland (US-329)
208 Tenneco (US-65)
945 Teruma (JA-324)
296 Tesco (BR-27)
82 Texaco (US-36)
580 Texas Instruments (US-193)
255 Texas Utilities (US-83)
924 Textract (US-297)
803 Thomson-CSF (FR-34)
512 Thorn EMI (BR-46)
351 Thyssen (WG-15)
295 Time Warner (US-101)
441 Times Mirror (US-151)
735 Tobishima (JA-258)
290 Tobu Railway (JA-114)
594 Toho Co. (JA-218)
742 Toho Gas (JA-263)
145 Tohoku Electric Power (JA-65)
38 Tokai Bank (JA-17)
81 Tokio Marine & Fire (JA-32)
587 Tokyo Broadcasting System (JA-212)
15 Tokyo Electric Power (JA-10)
543 Tokyo Electron (JA-202)
84 Tokyo Gas (JA-35)
506 Tokyo Steel Mfg. (JA-189)
92 Tokyu Corp. (JA-40)

601 Tokyu Department Stores (JA-222)
568 Tokyu Land (JA-209)
249 Tonen (JA-105)
223 Toppin Printing (JA-92)
224 Toray Industries (JA-93)
804 Torchmark (US-260)
985 Toro Assicurazioni (IT-26)
400 Toronto-Dominion Bank (CA-10)
40 Toshiba (JA-19)
830 Tosoh Corp. (JA-299)
413 Total Francaise Petroles (FR-17)
376 Toto (JA-143)
344 Toyota Motor (JA-200)
344 Toyota Sash (JA-134)
445 Toyota Seikan Kaisha (JA-167)
165 Toyota Trust & Banking (JA-73)
314 Toyobo (JA-191)
321 Toyoda Automatic Loom Works (JA-123)
9 Toyota Motor (JA-5)
191 Toys 'R' Us (US-59)
611 Tractebel (BE-4)
719 Trafalgar House (BR-65)
664 Transamerica (US-221)
994 TransCanada PipeLines (CA-25)
636 Travelers (US-209)
616 Tribune (US-200)
796 Trizec (CA-20)
541 Trusthouse Forte (BR-52)
652 TRW (US-216)
507 TSB Group (BR-45)
795 Turner Broadcasting (US-258)
902 Tyco Laboratories (US-288)
904 Tyson Foods (US-290)

U

583 UAL (US-194)
491 Ube Industries (JA-178)
989 Ultramar (BR-86)
44 Unilever (NE/BR-NM)
NR Unilever NV (NE-2)
NR Unilever PLC (BR-20)
181 Union des Assurances de Paris (FR-5)
995 Union Bank of Finland (FI-1)
119 Union Bank of Switzerland (SWI-3)
773 Union Camp (US-249)
701 Union Carbide (US-233)
758 Union Electric (US-244)
216 Union Pacific (US-70)
878 Unisys (US-279)
956 United Artists Entertainment (US-309)
749 United Biscuits (Holdings) (BR-69)
247 United Technologies (US-78)
171 United Telecommunications (US-53)
867 Unilever (JA-305)
260 Unocal (US-85)
784 Uny (JA-275)
246 Uniphon (US-77)
97 US West (US-37)
843 USF&G (US-273)
632 UST (US-206)
195 USX (US-61)

V

133 VEB (WG-8)
756 Verein. Elek. Westfalen (WG-34)
695 Viscum (US-231)
511 VIAG (WG-21)
455 Victor Co. of Japan (JA-172)
656 Victoria Holding (WG-29)
124 Volkswagen (WG-6)
452 Volvo (SWE-5)

W

686 Walgreen (US-227)
22 Wal-Mart Stores (US-8)
207 Warner-Lambert (US-64)
623 Washington Post (US-203)
63 Waste Management (US-26)
175 Wellcome (BR-18)
475 Wells Fargo (US-161)
645 Western Mining (AS-8)
146 Westinghouse Electric (US-50)
452 Westpac Banking (AS-5)
319 Weyerhaeuser (US-111)
971 Whirlpool (US-318)
615 Whitbread (BR-59)
692 Whitman (US-230)
750 Winn-Dixie Stores (US-242)
309 Winterthur (SWI-11)
442 Woolworth (US-152)
898 Wrigley (Wm.) Jr. (US-285)

X Y Z

428 Xerox (US-146)
688 Yakult Honsha (JA-238)
811 Yamaha (Nippon Gakki) (JA-286)
328 Yamanouchi Pharmaceutical (JA-126)
861 Yamato Transport (JA-302)
755 Yamazaki Baking (JA-266)
261 Yasuda Fire & Marine (JA-108)
101 Yasuda Trust & Banking (JA-44)
700 Yokagawa Electric (JA-244)
918 Yokohama Rubber (JA-317)
337 Zurich Vers. (SWI-9)

NM = not meaningful. NR = not ranked

Baker

Carter sued ATT, & court referred it to FCC, maintaining potential jurisdiction.

Baker argued at FCC

Raytheon (Tosol) financed
M&I equip. Jernold
(who?) financed cable
→ Melker

Mobile phones and development

Less is more

Mobile phones can boost development in poor countries—if governments let them



IMAGINE a magical device that could boost entrepreneurship and economic activity, provide an alternative to bad roads and unreliable postal services, widen farmers' access to markets, and allow swift and secure transfers of money. Now stop

imagining: the device in question is the mobile phone. Not surprisingly, people in the developing world are clamouring for them, and subscriber growth is booming. The fastest growth rates are to be found in Africa, albeit from a low base. Already, 80% of the world's population lives within range of a mobile network; but only about 25% have a mobile phone.

The primary obstacle to wider adoption is the cost of handsets. In the rich world, these typically cost around \$200 (though most pay less than this thanks to subsidies from network operators), or less than 1% of the average income per person. In the developing world, in contrast, a \$50 handset would account for 14% of the annual income of someone earning \$1 a day. So the first step in promoting the adoption of mobile phones, say operators in developing countries, is to reduce the cost of the handsets. Several such schemes are under way: in particular, several operators in developing countries have joined together to aggregate their buying power, and Motorola, the world's second-largest handset-maker, has agreed to supply up to 6m handsets for less than \$40 each (see pages 51-52). There is already talk of prices falling below \$30 next year.

Industry observers believe cheaper handsets could expand the market by as many as 150m new subscribers a year. As well as boosting economic development in poor countries, this will help to close the "digital divide" between the commu-

nications-rich and communications-poor. Governments, you would have thought, would be doing everything in their power to promote the spread of mobile phones.

But rather than treating mobile phones as an important tool for development, many governments see them instead as an opportunity to impose hefty taxes and milk a fast-growing industry for all it is worth. In both Turkey and Bangladesh, for example, anyone buying a new mobile phone must pay a \$15 connection tax. Many countries slap large import duties on handsets and impose special taxes on subscribers and operators. In many cases, these taxes double the cost of acquiring a mobile phone. As handset prices fall, such taxes will become an ever more prominent obstacle to wider adoption.

Governments should reduce these taxes at once. Indeed, by doing so, they can both speed adoption and increase revenues. High import tariffs discourage legal imports of phones and encourage people to buy them on the black market instead. Reducing such tariffs would boost revenues as legal imports increased. Lower taxes on phone calls would encourage adoption and increase the tax base. It can be done: both Mauritius and India have recently reduced their taxes and tariffs.

Mobile phones have created more entrepreneurs in Africa in the past five years than anything else, says the boss of one pan-African operator. Promoting their spread requires no aid payments or charity handouts: handset-makers, acting in their own interest, are ready to produce low-cost phones for what they now regard as a promising new market. Mobile operators across the developing world would love to sign up millions of new customers. But if developing countries are to realise the full social and economic benefits of mobile phones, governments must ensure that their policies help, rather than hinder, the wider adoption of this miraculous technology. ■

German elections

Where Angelas need to tread

An early German election could boost much-needed economic reform



NOW that Chancellor Gerhard Schröder has held, and deliberately lost, a vote of confidence in the Bundestag, Germany's lower house of parliament, the stage is set for an early election, probably on September 18th. It could yet be

called off, either by the federal president or by the Constitutional Court. But that would be a shame for Germany—and for Europe. The ruling Social Democrat (SPD)/Green coalition has lost its way and looks certain to lose in September. A new government led by Angela Merkel's Christian Democrats (CDU) offers the best chance of reviving Europe's biggest economy, whose slow growth has blighted the neighbourhood.

Mr Schröder has, admittedly, tried to shake up the economy in recent years, first with his Agenda 2010 set of pension, social-security and health-care changes and then through the Hartz labour-market reforms. But he largely wasted his first term from 1998 to 2002, and made no effort in the 2002 election campaign to persuade voters of the need for changes that might hurt. He has since been hamstrung by left-wingers in his own party, by trade-union resistance, by the opposition's grip on the upper house, the Bundesrat, by his government's unpopularity and by the SPD's losses in state elections—but also by that failure to prepare the voters for pain.

This creates an opportunity for Ms Merkel. She knows that Germany needs more and deeper reforms if it is to prosper again. She is also aware that Mr Schröder and, even more so, German business have laid the groundwork for improvement. ►►

How the internet killed the phone business

Almost-free internet phone calls herald the slow death of traditional telephony



THE term “disruptive technology” is popular, but is widely misused. It refers not simply to a clever new technology, but to one that undermines an existing technology—and which therefore makes life very difficult for the many busi-

nesses which depend on the existing way of doing things. Twenty years ago, the personal computer was a classic example. It swept aside an older mainframe-based style of computing, and eventually brought IBM, one of the world's mightiest firms at the time, to its knees. This week has been a coming-out party of sorts for another disruptive technology, “voice over internet protocol” (VOIP), which promises to be even more disruptive, and of even greater benefit to consumers, than personal computers (see pages 69-71).

VOIP's leading proponent is Skype, a small firm whose software allows people to make free calls to other Skype users over the internet, and very cheap calls to traditional telephones—all of which spells trouble for incumbent telecoms operators. On September 12th, eBay, the leading online auction-house, announced that it was buying Skype for \$2.6 billion, plus an additional \$1.5 billion if Skype hits certain performance targets in coming years.

This seems a vast sum to pay for a company that has only \$60m in revenues and has yet to turn a profit. Yet eBay was not the only company interested in buying Skype. Microsoft, Yahoo!, News Corporation and Google were all said to have also considered the idea. Perhaps eBay, rather like some over-excited bidder in one of its own auctions, has paid too much. The company says it plans to use Skype's technology to make it easier for buyers and sellers to communicate, and to offer new “click to call” advertisements, but many analysts are sceptical that eBay is the best owner of Skype. Whatever the merits of the deal, however, the fuss over Skype in recent weeks has highlighted the significance of VOIP, and the enormous threat it poses to incumbent telecoms operators.

For the rise of Skype and other VOIP services means nothing less than the death of the traditional telephone business, established over a century ago. Skype is merely the most visible manifestation of a dramatic shift in the telecoms industry, as voice calling becomes just another data service delivered via high-speed internet connections. Skype, which has over 54m users, has received the most attention, but other firms routing calls partially or entirely over the internet have also signed up millions of customers.

A price of zero

The ability to make free or almost-free calls over a fast internet connection fatally undermines the existing pricing model for telephony. “We believe that you should not have to pay for making phone calls in future, just as you don't pay to send e-mail,” says Skype's co-founder, Niklas Zennstrom. That means not just the end of distance and time-based pricing—it also means the slow death of the trillion-dollar voice telephony

market, as the marginal price of making phone calls heads inexorably downwards.

VOIP makes possible more than just lower prices, however. It also means that, provided you have a broadband connection, you can choose from a number of providers of VOIP telephony and related add-on services, such as voicemail, conference calling or video. Many providers allow a VOIP account to be associated with a traditional telephone number—or with multiple numbers. So you can associate a San Francisco number, a New York number and a London number with your computer or VOIP phone—and then be reached via a local call by anyone in any of those cities.

Furthermore, your phone (or computer) will ring wherever you are in the world, as soon as it is plugged into the internet. So you can take your Madrid number with you to Mumbai, or your San Francisco number to Shanghai. Skype and other VOIP services, in other words, are leading to lower prices, more choice and greater flexibility. It is great news for consumers—but terrible for telecoms operators. What can they do?

Watching the elephants dance

As is always the case with a disruptive technology, the incumbents it threatens are dividing into those who are trying to block the new technology in the hope that it will simply go away, and those who are moving to embrace it even though it undermines their existing businesses. Since VOIP will cause revenue from voice calls to wither away, the most vulnerable operators are those that are most dependent on such revenue.

In particular, that means mobile operators, which have been struggling for years to get their subscribers to spend more on data services, but are still hugely dependent on voice. Worse, the very “third generation” (3G) networks that are supposed to provide future growth for these firms could now undermine them, because such networks make mobile VOIP possible too. Least vulnerable, by contrast, are those fixed-line operators that are now building new networks based on internet technology, which will enable such firms to benefit from the greater efficiency and lower cost of VOIP compared with traditional telephony.

These operators are taking an “if you can't beat 'em, join 'em” approach and getting into the VOIP business. While their voice revenues will slowly evaporate, they will then be well placed to offer fee-based add-on services over their new networks. Again, this is a common pattern with disruptive technologies: forward-looking incumbents can end up giving upstart innovators a run for their money.

It is now no longer a question of whether VOIP will wipe out traditional telephony, but a question of how quickly it will do so. People in the industry are already talking about the day, perhaps only five years away, when telephony will be a free service offered as part of a bundle of services as an incentive to buy other things such as broadband access or pay-TV services. VOIP, in short, is completely reshaping the telecoms landscape. And that is why so many people have been making such a fuss over Skype—a small company, yes, but one that symbolises a massive shift for a trillion-dollar industry. ■

John C. Dvorak

Computers and Modern Anarchy



An exercise I like to do when writing this column and others is to create a faux reality by speculating on how things would be different if certain other things did not exist. Rarely does it lead me to conclude that we are heading to a world dominated by anarchy. But this time it does.

I've speculated on a world with no Microsoft or Apple or IBM, but I've also wondered what the world would be like without the Internet, if life had continued the way it was in 1990. The Internet existed in 1990, but it had no real influence on the social structure until the mid-1990s. Let's say it never existed at all.

The online phenomenon back then took the form of pure P2P interaction using modems. The BBS was at its peak. Though people were online, the Net was a kludge compared with today's online world.

BBS era. If you were running a nexus point or a BBS, you had to have banks of modems and multiple phone lines to receive users on your "site." Most users today can probably no longer configure or use a modem. Dial-up is automatic, and it dials the Internet, not each individual target.

Imagine how you surf the Web today and realize that before it existed, you had to get the phone number of the site and call it directly each time. There was no hyperlinking; if you wanted to jump from site A to site B, you'd have to hang up on one site and dial another. This was standard practice a mere 13 years or so ago.

Pre-BBS era. Consider a time frame 12 or 13 years earlier: 1979-ish. There were 300-baud modems but no place to call. So how did we go from zero to infinity in about 25 years? Today nearly everyone has a Web address, and everyone except the most primitive cultures understands "www." Google is a verb worldwide. This is a phenomenal societal change. We've watched it happen within a generation.

It seems to me that every sociologist in the world should be studying the Web phenomenon every minute of the day. Not doing so is like being a film company parked outside of Pompeii in A.D. 79 and not filming the Mount Vesuvius eruption. This sort of radical, fast change doesn't happen often. Let's hope not; I don't want to go through another one!

Better or worse? So let's take it away. Let's remove the Web from existence and see what we have. Let's go back to 1990 and work our way forward without

an Internet. Are we better off under that scenario or worse?

The differences may not be that substantial. We'd still have e-mail, running through CompuServe, AOL, and MCI. There would probably be bunches of information utilities such as AOL—each a closed system you'd call with a modem. One or two would come to dominate the scene, and most people would be members of both. We probably wouldn't have spam as we have it today, and viruses would have a different character. We might be better off!

In the early days of the Web, many observers still believed that AOL and closed systems were the way to go. One semifamous guru made the bold statement that MSN—then being developed—would kill the Internet.

Although it's hard to imagine the world without the Internet, I'm more convinced than ever that things would have evolved along a different path to give us pretty much what we have today in terms of access to information and convenience. It's demand-driven.

But that's not what happened. When the old model of proprietary closed systems ran up against the Internet, the closed systems had to adapt.

Control freaks lose. So what was special? The only essential difference is the control factor. That's it. When given a choice, the public will opt for less third-party control. The Web is wide open, and people moan about any sorts of controls when they are implemented.

In a choice between any two products, the one with the least restrictions will always win. The Web has proven this, and people complain about DRM and Microsoft and any sort of perceived control factor for the same reason.

If this phenomenon is as solid as I see it, open source will be one of many future success stories that may not be fully understood in context. It's not about "free." It's about control. I'm guessing that people naturally do not like that.

But does that mean the general phenomenon is a reflection of a bigger desire for no controls whatsoever—in other words, for true anarchy? I can't see any other explanation.

MORE ON THE WEB: Read John C. Dvorak's column every Monday at go.pcmag.com/dvorak. You can reach him directly at pcmag@dvorak.org.

Not studying the Internet explosion's effects on society is like being a film company parked outside of Pompeii in A.D. 79 and not filming the Mount Vesuvius eruption.

comparison. "If consumers even know there's a DRM, what it is, and how it works, we've already failed," says Peter Lee, an executive at Disney. The same goes for codecs. "The user shouldn't know or care what format they're using," says James Poder, an engineer at Comcast, America's largest cable company and broadband internet service provider, because "consumers don't want to be IT administrators for their own home."

Prisoner's dilemma

It may seem ironic, therefore, that vendors are refusing to make their technologies interoperable, thus potentially killing their own vision. On the other hand, it makes sense for each to try to make its own proprietary technology the winner, in order later to grab a disproportionate share of the market. The starting point of cable and telecoms companies, for instance, is as providers of broadband pipes into the home. So they are investing in IPTV (internet-protocol television), a vision in which content resides on the network and is pulled into the home on demand. Thus, says Cyrus Mewawalla, an analyst at Westhall Capital, a broker in London, America's Verizon and SBC and others are investing hugely in laying fibre-optic cables to homes (at a cost of about \$1,000 per household), hoping that IPTV and the necessary set-top box could "evolve into the primary gateway to the digital home." By controlling this gateway, they could offer a bundle of telephony, internet and entertainment, in effect "owning" the customer.

This would at the same time help them to parry their biggest threat: Microsoft. Microsoft has itself invested in IPTV, ostensibly in partnership with telecoms and cable companies. Like its loss-making investment in game consoles (called Xbox), however, Microsoft intends this as a purely defensive hedge, says Matt Rosoff, an analyst at Directions on Microsoft, an independent research outfit near Seattle. Instead, thinks Mr Rosoff, Microsoft's strategy is to establish the Windows-run PC as the uncontested hub of the digital home. Hence its all-out push to establish its codecs and DRM as the standard. This would allow Microsoft to keep selling Windows upgrades and to earn royalties from hardware and from consumer-electronics companies that make "spokes" for the Windows hub, such as portable music and video players, screens and online services.

Microsoft's most explicit attempt so far is a version of its current operating system called Windows Media Centre Edition (MCE), which puts a simplified menu on top of the desktop screen for use with a remote control from the sofa. The MCE was first launched in October 2002, and has been upgraded several times since, but it has so far been mostly a dud, running fewer than 1% of all PCs sold last year. Mi-

crosoft now hopes to make MCE more relevant by selling "extenders", little devices that can hook on to a TV set or stereo and communicate with the PC over a wireless network. Its biggest hope, however, is for Vista (previously known by the code name of Longhorn), the next version of Windows, which is due to be released late next year (after several delays).

According to Microsoft's Mr Mundie, there is no question that the Windows PC will win this fight to become the central repository for all digital content, for a simple reason. The cable and telecoms companies, he says, are hampered by their business model, in which the set-top boxes sit on their own balance sheet and are leased, at subsidised rates, to consumers. This means that their incentive will always be to make the boxes cheaper. By contrast, Microsoft's incentive is to make its operating system more sophisticated, in everything from parental controls to usability. By the same logic, Microsoft will beat the consumer-electronics companies (such as Sony and Samsung). Their business model relies on selling devices rather than on recurring licence revenues. This leads to clutter in the home, without organisation of the content.

Tom Berquist, an industry analyst at Citigroup, broadly agrees that the PC is likely to win. The on-demand world on offer from, say, Comcast, is simply not portable enough, he thinks. By contrast, he says, moving content to PCs potentially "liberates you from proprietary technology and lets you use content on any device." In this sense, the only real competition to Microsoft is Apple, whose Macintosh operating

system is widely considered to be more elegant and user-friendly than Windows, and which has a considerable headstart with the huge popularity of its iTunes music service and iPod player.

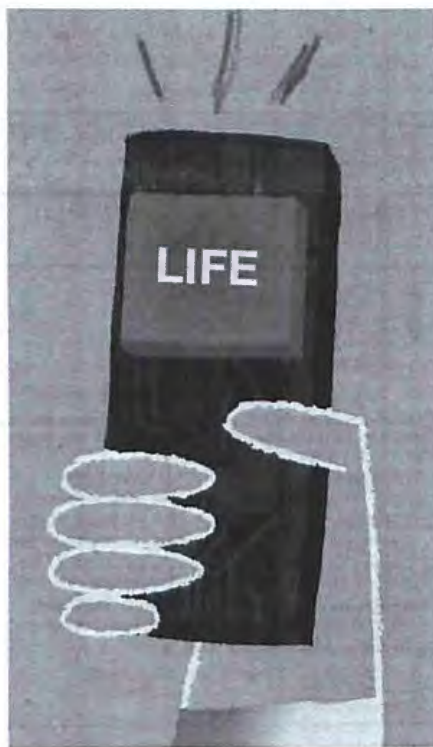
Apple's problem, however, is that it has only 2.6% of the world market for PCs, whereas Windows runs on almost all the rest. Apple also differs from Microsoft in that it simultaneously wants to be the main portable-device maker. It is, in other words, a software, hardware and consumer-electronics company all at once, and that does not leave much room for alliances with other industries to manufacture spokes for an Apple hub. There are signs that Apple is becoming more agnostic in order to compete with Microsoft. It has a deal with HP, traditionally a Microsoft ally (HP was, for instance, the first computer maker to ship Windows Media Centre Edition), under which HP bundles Apple's iTunes software on to PCs running Microsoft Windows. In a surprising announcement in June, Apple also said that it would start using microprocessors from Intel, another traditional Microsoft ally.

Winner takes all?

For the foreseeable future, the only certainty is that all these mighty companies will continue to preach interoperability while pursuing proprietary hegemony. This could lead to several scenarios. One is that one company, or camp, wins. The digital home, unified by the winner's standards, might then become a reality in the mass market. For this to happen, however, several companies and industries would first have to make huge strategic mistakes, and consumers would have to accede, in effect, to a repeat of the "Wintel" (Windows and Intel) near monopoly in the PC industry today.

Another possibility is that the technology wars end with a truce, perhaps brokered by industry consortia that push open standards. This would be infinitely preferable for consumers and would probably make the digital home a reality much sooner, since it would mean that consumers could shop incrementally for new gadgets, all of which will fit with the others. The catch for providers is that this is much less exciting for their own bottom lines.

There is a third possibility. This is that the wars continue, but consumers continue not to care. As John Barrett, research director at Parks Associates, says, "it seems that we've concocted a new variant of the 'paperless' office." This, you recall, was the consensus a decade or so ago among technophiles (but almost nobody else), that computer technology would save our forests by freeing us from having to read and write on paper. Today's variant, says Mr Barrett, is "no more tapes, CDs, DVDs, discs." In other words, expect them to be around for a very long time to come. ■



► to conventional telephones (called SkypeOut) or from conventional phones into Skype (called SkypeIn). This involves pre-paid accounts, which Skype users can top up via PayPal with their credit cards.

For Skype, however, the main attraction may be that eBay, unlike the other potential suitors, plans to leave it largely alone, both as a brand and as a business. "When Yahoo! and Microsoft buy companies, they typically disintegrate them," says Mr Zennstrom. His vision for Skype, by contrast, is to become the world's biggest and best platform for all communications—text, voice or video—from any internet-connected device, whether a computer or a mobile phone.

This is every bit as audacious as it sounds. Mr Zennstrom, in general, is a modest man. But his company is only three years old, will probably make only \$60m in revenues this year, and will certainly not turn a profit. So it is the fact that his ambition is not nearly as ridiculous as it sounds that should make incumbent telecoms firms everywhere break out in a cold sweat.

That is because Skype can add 150,000 users a day (its current rate) without spending anything on new equipment (users "bring" their own computers and internet connections) or marketing (users invite each other). With no marginal cost, Skype can thus afford to maximise the number of its users, knowing that if only some of them start buying its fee-based services—such as SkypeOut, SkypeIn and voicemail—Skype will make money. This adds up to a very unusual business plan.

"We want to make as little money as possible per user," says Mr Zennstrom, because "we don't have any cost per user, but we want a lot of them." This is the exact opposite of the traditional business model in the telecoms industry, which is based on maximising the average revenue per user, or ARPU. And that has only one logical consequence. According to Rich Tehrani, the founder of *Internet Telephony*, a magazine devoted to the subject, Skype and services like it are leading inexorably to a future in which all voice communication, near or far, will be free.

End of the line

The technical term that encompasses all forms of voice communication using the internet is voice-over-internet-protocol, or VOIP. This includes pure computer-to-computer calling as well as the various hybrid states, such as a Skype user connecting to the traditional telephone network, or even two people talking on seemingly conventional phones that are linked, behind the scenes, via the internet. It also includes residential VOIP providers such as Vonage, based in New Jersey and the market leader in America with over 1m subscribers, that supply their customers with

Skype's the limit

Skype's worldwide subscribers, m



adapters so they can plug ordinary telephones into their broadband connections without using a computer.

Sandvine, a telecoms-equipment firm, estimates that there are 1,100 VOIP providers in America alone. But the trend is worldwide. IDC, a market-research firm, predicts that the number of residential VOIP subscribers in America will grow from 3m at the end of 2003 to 27m by the end of 2009; Japan already has over 8m subscribers today. Worldwide, according to iSuppli, a market-research firm, the number of residential VOIP subscribers will reach 197m by 2010. Even these numbers, however, do not include people using VOIP without subscribing to a service (ie, by downloading free software from Google, Skype or others). Skype alone has 54m users.

Even before VOIP makes 100% of telephone calls in the world completely free (which may take many years), it utterly ruins the pricing models of the telecoms industry. Factors such as the distance between the callers or the duration of a call, the key determinants of cost today, are simply irrelevant with VOIP. Vonage already lets its customers choose telephone numbers in San Francisco, New York or London, no matter where they live. A Londoner calling the London number is making a "local" call, even if the Vonage subscriber is picking up the phone in Shanghai. As when checking e-mail on, say, Hotmail, the only thing needed is a broadband-internet connection, but it can be anywhere in the world. Sooner or later, people will discard their unwieldy phone numbers altogether and use names, just as they do with their e-mail addresses, predicts Mr Zennstrom.

Call duration is also becoming irrelevant. "A lot of people open a Skype audio channel and keep it open," says Mr Zennstrom. After all, it costs nothing. Many people with Apple computers are already accustomed to this. They open an application called iChat, which is a video and voice link, and stay connected to their loved ones far away. Increasingly, members of a family or a business team can stay

online throughout the day, escalating from unobtrusive instant-messaging ("Can you talk?") to a conference call, a video call and back to a little icon on their screen.

It is thus altogether wrong to call this phenomenon the end, or death, of telephony. "Calling it the death of telephony suggests people aren't going to make calls, but they are," says Sam Paltridge, a telecoms guru at the OECD. "It's just the death of the traditional pricing models." In short, all this is great news for consumers and awful news for telecoms operators. "VOIP will destroy voice revenues faster than most analysts' models predict," says Cyrus Mewawalla, an analyst at Westhall Capital. "Voice will very rapidly cease to become a major revenue generator for all telecoms operators, fixed and mobile."

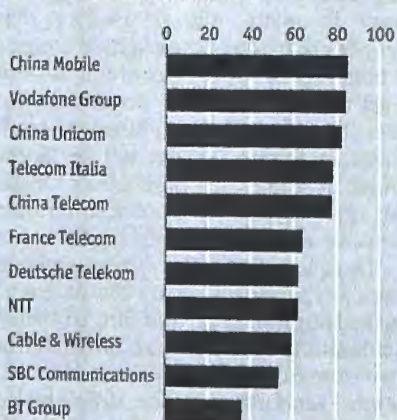
That said, some telecoms carriers are much more vulnerable to VOIP than others, says Mr Mewawalla. Telecoms operators offer and charge for a number of services besides pure voice calls. Because VOIP will cause only the revenues from voice calls to shrink, it will hit those operators hardest that are most dependent on their revenues from voice (see chart 2).

For pure mobile operators, such as Vodafone or Taiwan Mobile—as it happens, Taiwan is the country with the highest ratio of Skype users—VOIP could be an "enormous problem", says Mr Mewawalla, because voice accounts for over 80% of their revenues. By contrast, VOIP is less threatening to integrated operators (ie, those offering both fixed and mobile services) such as Deutsche Telekom or Japan's NTT. And those carriers—such as BT, France Telecom or KPN—that are currently building next-generation networks based on internet technologies will be able to offer VOIP services themselves, bundled with other offerings, and might emerge relatively unscathed.

Some operators are taking an unenlightened view by trying to delay the advance of VOIP. China Telecom has been ►

Vulnerable to VOIP

% of revenues derived from voice



The Internet Is Broken

The Net's fundamental flaws cost companies billions, impede innovation, and threaten national security. It's time for a clean-slate approach.

By David Talbot

In his office within the gleaming-stainless-steel and orange-brick jumble of MIT's Stata Center, Internet elder statesman and onetime chief protocol architect David D. Clark prints out an old PowerPoint talk. Dated July 1992, it ranges over technical issues like domain naming and scalability. But in one slide, Clark points to the Internet's dark side: its lack of built-in security. In others, he observes that sometimes the worst disasters are caused not by sudden events but by slow, incremental processes—and that humans are good at ignoring problems. “Things get worse slowly. People adjust,” Clark noted in his presentation. “The problem is assigning the correct degree of fear to distant elephants.”

Today, Clark believes the elephants are upon us. Yes, the Internet has wrought wonders: e-commerce has flourished, and e-mail has become a ubiquitous means of communication. Almost one billion people now use the Internet, and critical industries like banking increasingly rely on it. At the same time, the Internet's shortcomings have resulted in plunging security and a decreased ability to accommodate new tech-

nologies. “We are at an inflection point, a revolution point,” Clark now argues. And he delivers a strikingly pessimistic assessment of where the Internet will end up without dramatic intervention. “We might just be at the point where the utility of the Internet stalls—and perhaps turns downward.”

Indeed, for the average user, the Internet these days all too often resembles New York's Times Square in the 1980s. It was exciting and vibrant, but you made sure to keep your head down, lest you be offered drugs, robbed, or harangued by the insane. Times Square has been cleaned up, but the Internet keeps getting worse, both at the user's level, and—in the view of Clark and others—deep within its architecture. Over the years, as Internet applications proliferated—wireless devices, peer-to-peer file-sharing, telephony—companies and network engineers came up with ingenious and expedient patches, plugs, and workarounds. The result is that the originally simple communications technology has become a complex and convoluted affair. For all of the Internet's wonders, it is also difficult to manage and more fragile with each passing day.

That's why Clark argues that it's time to rethink the Internet's basic architecture, to potentially start over with a fresh design—and equally important, with a plausible strategy for proving the design's viability, so that it stands a chance of implementation. "It's not as if there is some killer technology at the protocol or network level that we somehow failed to include," says Clark. "We need to take all the technologies we already know and fit them together so that we get a different overall system. This is not about building a technology innovation that changes the world but about architecture—pulling the pieces together in a different way to achieve high-level objectives."

Just such an approach is now gaining momentum, spurred on by the National Science Foundation. NSF managers are working to forge a five-to-seven-year plan estimated to cost \$200 million to \$300 million in research funding to develop clean-slate architectures that provide security, accommodate new technologies, and are easier to manage. They also hope to develop an infrastructure that can be used to prove that the new system is really better than the current one. "If we succeed in what we are trying to do, this is bigger than anything we, as a research community, have done in computer science so far," says Guru Parulkar, an NSF program manager involved with the effort. "In terms of its mission and vision, it is a very big deal. But now we are just at the beginning. It has the potential to change the game. It could take it to the next level in realizing what the Internet could be that has not been possible because of the challenges and problems."

Firewall Nation

When AOL updates its software, the new version bears a number: 7.0, 8.0, 9.0. The most recent version is called AOL 9.0 Security Edition. These days, improving the utility of the Internet is not so much about delivering the latest cool application; it's about survival. In August, IBM released a study reporting that "virus-laden e-mails and criminal driven security attacks" leapt by 50 percent in the first half of 2005, with government and the financial-services, manufacturing, and health-care industries in the crosshairs. In July, the Pew Internet and American Life Project reported that 43 percent of U.S. Internet users—59 million adults—reported having spyware or adware on their computers, thanks merely to visiting websites. (In many cases, they learned this from the sudden proliferation of error messages or freeze-ups.) Fully 91 percent had adopted some defensive behavior—avoiding certain

kinds of websites, say, or not downloading software. "Go to a neighborhood bar, and people are talking about firewalls. That was just not true three years ago," says Susannah Fox, associate director of the Pew project.

Then there is spam. One leading online security company, Symantec, says that between July 1 and December 31, 2004, spam surged 77 percent at companies that Symantec monitored. The raw numbers are staggering: weekly spam totals on average rose from 800 million to more than 1.2 billion messages, and 60 percent of all e-mail was spam, according to Symantec. But perhaps most menacing of all are "botnets"—collections of computers hijacked by hackers to do remote-control tasks like sending spam or attacking websites. This kind of wholesale hijacking—made more potent by wide adoption of always-on broadband connections—has spawned hard-core crime: digital extortion. Hackers are threatening destructive attacks against companies that don't meet their financial demands. According to a study by a Carnegie Mellon University researcher, 17 of 100 companies surveyed had been threatened with such attacks.

Simply put, the Internet has no inherent security architecture—nothing to stop viruses or spam or anything else. Protections like firewalls and antispam software are add-

ons, security patches in a digital arms race. The President's Information Technology Advisory Committee, a group stocked with a who's who of infotech CEOs and academic researchers, says the situation is bad and getting worse. "Today, the threat clearly is growing," the council wrote in a report issued in early 2005. "Most indicators and studies of the frequency, impact, scope, and cost of cyber security incidents—among both organizations and individuals—point

"We are at an inflection point, a revolution point," says David Clark. "We might just be at the point where the utility of the Internet stalls—and perhaps turns downward."

to continuously increasing levels and varieties of attacks." And we haven't even seen a real act of cyberterror, the "digital Pearl Harbor" memorably predicted by former White House counterterrorism czar Richard Clarke in 2000 (see *A Tangle of Wires*, p. 80). Consider the nation's electrical grid: it relies on continuous network-based communications between power plants and grid managers to maintain a balance between production and demand. A well-placed attack could trigger a costly blackout that would cripple part of the country. The conclusion of the advisory council's report could not have been starker: "The IT infrastructure is highly vulnerable to premeditated attacks with potentially catastrophic effects."

The system functions as well as it does only because of "the forbearance of the virus authors themselves," says

Jonathan Zittrain, who cofounded the Berkman Center for Internet and Society at Harvard Law School and holds the Chair in Internet Governance and Regulation at the University of Oxford. "With one or two additional lines of code...the viruses could wipe their hosts' hard drives clean or quietly insinuate false data into spreadsheets or documents. Take any of the top ten viruses and add a bit of poison to them, and most of the world wakes up on a Tuesday morning unable to surf the Net—or finding much less there if it can."

Patchwork Problem

The Internet's original protocols, forged in the late 1960s, were designed to do one thing very well: facilitate communication between a few hundred academic and government users. The protocols efficiently break digital data into simple units called packets and send the packets to their destinations through a series of network routers. Both the routers and PCs, also called nodes, have unique digital addresses known as Internet Protocol or IP addresses. That's basically it. The system assumed that all users on the network could be trusted and that the computers linked by the Internet were mostly fixed objects.

The Internet's design was indifferent to whether the information packets added up to a malicious virus or a love letter; it had no provisions for doing much besides getting the data to its destination. Nor did it accommodate nodes that moved—such as PDAs that could connect to the Internet at any of myriad locations. Over the years, a slew of patches arose: firewalls, antivirus software, spam filters, and the like. One patch assigns each mobile node a new IP address every time it moves to a new point in the network.

Clearly, security patches aren't keeping pace. That's partly because different people use different patches and not everyone updates them religiously; some people don't have any installed. And the most common mobility patch—the IP addresses that constantly change as you move around—has downsides. When your mobile computer has a new identity every time it connects to the Internet, the websites you deal with regularly won't know it's you. This means, for example, that your favorite airline's Web page might not cough up a reservation form with your name and frequent-flyer number already filled out. The constantly changing address also means you can expect breaks in service if you are using the Internet to, say, listen to a streaming radio broadcast on your PDA. It also means that someone who commits a crime online using a mobile device will be harder to track down.

In the view of many experts in the field, there are even more fundamental reasons to be concerned. Patches create an ever more complicated system, one that becomes harder to manage, understand, and improve upon. "We've been on

a track for 30 years of incrementally making improvements to the Internet and fixing problems that we see," says Larry Peterson, a computer scientist at Princeton University. "We see vulnerability, we try to patch it. That approach is one that has worked for 30 years. But there is reason to be concerned. Without a long-term plan, if you are just patching the next problem you see, you end up with an increasingly complex and brittle system. It makes new services difficult to employ. It makes it much harder to manage because of the added complexity of all these point solutions that have been added. At the same time, there is concern that we will hit a dead end at some point. There will be problems we can't sufficiently patch."

The patchwork approach draws complaints even from the founder of a business that is essentially an elaborate and ingenious patch for some of the Internet's shortcomings. Tom Leighton is cofounder and chief scientist of Akamai, a company that ensures that its clients' Web pages and applications are always available, even if huge numbers of customers try to log on to them or a key fiber-optic cable is severed. Akamai closely monitors network problems, strategically stores copies of a client's website at servers around the world, and accesses those servers as needed. But while his company makes its money from patching the Net, Leighton says the whole system needs fundamental architectural change. "We are in the mode of trying to plug holes in the dike," says Leighton, an MIT mathematician who is also a member of the President's Information Technology Advisory Committee and chair of its Cyber Security Subcommittee. "There are more and more holes, and more resources are going to plugging the holes, and there are less resources being devoted to fundamentally changing the game, to changing the Internet."

When Leighton says "resources," he's talking about billions of dollars. Take Microsoft, for example. Its software mediates between the Internet and the PC. These days, of the \$6 billion that Microsoft spends annually on research and development, approximately one-third, or \$2 billion, is directly spent on security efforts. "The evolution of the Internet, the development of threats from the Internet that could attempt to intrude on systems—whether Web servers, Web browsers, or e-mail-based threats—really changed the equation," says Steve Lipner, Microsoft's director of security strategy and engineering strategy. "Ten years ago, I think people here in the industry were designing software for new features, new performance, ease of use, what have you. Today, we train everybody for security." Not only does this focus on security siphon resources from other research, but it can even hamper research that does get funded. Some innovations have been kept in the lab, Lipner says, because Microsoft couldn't be sure they met security standards.

Of course, some would argue that Microsoft is now scrambling to make up for years of selling insecure products. But the Microsoft example has parallels elsewhere. Eric Brewer, director of Intel's Berkeley, CA, research lab, notes that expenditures on security are like a "tax" and are "costing the nation billions and billions of dollars." This tax shows up as increased product prices, as companies' expenditures on security services and damage repair, as the portion of processor speed and storage devoted to running defensive programs, as the network capacity consumed by spam, and as the costs to the average person trying to dodge the online minefield of buying the latest firewalls. "We absolutely can leave things alone. But it has this continuous 30 percent tax, and the tax might go up," Brewer says. "The penalty for not [fixing] it isn't immediately fatal. But things will slowly get worse and might get so bad that people won't use the Internet as much as they might like."

The existing Internet architecture also stands in the way of new technologies. Networks of intelligent sensors that collectively monitor and interpret things like factory conditions, the weather, or video images could change computing as much as cheap PCs did 20 years ago. But they have entirely different communication requirements. "Future networks aren't going to be PCs docking to mainframes. It's going to be about some car contacting the car next to it. All of this is happening in an embedded context. Everything is machine to machine rather than people to people," says Dipankar Raychaudhuri, director of the Wireless Information Network Laboratory (Winlab) at Rutgers University. With today's architecture, making such a vision reality would require more and more patches.

Architectural Digest

When Clark talks about creating a new architecture, he says the job must start with the setting of goals. First, give the medium a basic security architecture—the ability to authenticate whom you are communicating with and prevent things like spam and viruses from ever reaching your PC. Better security is "the most important motivation for this redesign," Clark says. Second, make the new architecture practical by devising protocols that allow Internet service providers to better route traffic and collaborate to offer advanced services without compromising their businesses. Third, allow future computing devices of any size to connect to the Internet—not just PCs but sensors and

embedded processors. Fourth, add technology that makes the network easier to manage and more resilient. For example, a new design should allow all pieces of the network to detect and report emerging problems—whether technical breakdowns, traffic jams, or replicating worms—to network administrators.

The good news is that some of these goals are not so far off. NSF has, over the past few years, spent more than \$30 million supporting and planning such research. Academic and corporate research labs have generated a number of promising technologies: ways to authenticate who's online; ways to identify criminals while protecting the privacy of others; ways to add wireless devices and sensors. While nobody is saying that any single one of these technologies will be included in a new architecture, they provide a starting point for understanding what a "new" Internet might actually look like and how it would differ from the old one.

Some promising technologies that might figure into this new architecture are coming from PlanetLab, which

Princeton's Peterson has been nurturing in recent years (see "The Internet Reborn," October 2003). In this still-growing project, researchers throughout the world have been developing software that can be grafted onto today's dumb Internet routers. One example is software that "sniffs" passing Internet traffic for worms. The software looks for telltale packets sent out by worm-infected machines searching for new hosts and can warn system

administrators of infections. Other software prototypes detect the emergence of data traffic jams and come up with more efficient ways to reroute traffic around them. These kinds of algorithms could become part of a fundamental new infrastructure, Peterson says.

A second set of technologies could help authenticate Internet communications. It would be a huge boon to Internet security if you could be sure an e-mail from your bank is really from your bank and not a scam artist, and if the bank could be sure that when someone logs in to your account, that person is really you and not someone who stole your account number.

Today, the onus of authentication is on the Internet user, who is constantly asked to present information of various kinds: passwords, social-security numbers, employee ID numbers, credit card numbers, frequent-flyer numbers, PIN numbers, and so on. But when millions of users are

The collapse of the Net has been predicted for a decade and hasn't happened, notes Vinton Cerf. The real security problem, he says, is that operating systems don't protect themselves. "An argument could be made, 'Why does the network have to do that?'"

constantly entering these gate-opening numbers, it makes it that much easier for spyware, or a thief sniffing wireless Internet traffic, to steal, commit fraud, and do damage.

One evolving solution, developed by Internet2—a research consortium based in Ann Arbor, MI, that develops advanced Internet technologies for use by research laboratories and universities—effectively creates a middleman who does the job. Called Shibboleth, the software mediates between a sender and a recipient; it transmits the appropriate ID numbers, passwords, and other identifying information to the right recipients for you, securely, through the centralized exchange of digital certificates and other means. In addition to making the dispersal of information more secure, it helps protect privacy. That's because it discloses only the "attributes" of a person pertinent to a particular transaction, rather than the person's full "identity."

Right now, Shibboleth is used by universities to mediate access to online libraries and other resources; when you log on, the university knows your "attribute"—you are an enrolled student—and not your name or other personal information. This basic concept can be expanded: your employment status could open the gates to your company's servers; your birth date could allow you to buy wine online. A similar scheme could give a bank confidence that online account access is legitimate and conversely give a bank customer confidence that banking communications are really from the bank.

Shibboleth and similar technologies in development can, and do, work as patches. But some of their basic elements could also be built into a replacement Internet architecture. "Most people look at the Internet as such a dominant force, they only think how they can make it a little better," Clark says. "I'm saying, 'Hey, think about the future differently. What should our communications environment of 10 to 15 years from now look like? What is your goal?'"

The Devil We Know

It's worth remembering that despite all of its flaws, all of its architectural kluginess and insecurity and the costs associated with patching it, the Internet still gets the job done. Any effort to implement a better version faces enormous practical problems: all Internet service providers would have to agree to change all their routers and software, and someone would have to foot the bill, which will likely come

to many billions of dollars. But NSF isn't proposing to abandon the old network or to forcibly impose something new on the world. Rather, it essentially wants to build a better mousetrap, show that it's better, and allow a changeover to take place in response to user demand.

To that end, the NSF effort envisions the construction of a sprawling infrastructure that could cost approximately \$300 million. It would include research labs across the United States and perhaps link with research efforts abroad, where new architectures can be given a full workout. With a high-speed optical backbone and smart routers, this test bed would be far more elaborate and representative than the smaller, more limited test beds in use today. The idea is that new architectures would be battle tested with real-world Internet traffic. "You hope that provides enough value added that people are slowly and selectively willing to switch, and maybe it gets enough traction that people will switch over," Parulkar says. But he acknowledges, "Ten years from now, how things play out is anyone's guess. It could be a parallel infrastructure that people could use for selective applications."

Still, skeptics claim that a smarter network could be even more complicated and thus failure-prone than the original bare-bones Internet. Conventional wisdom holds that the network should remain dumb, but that the smart devices at its ends should become smarter. "I'm not happy with the current state of affairs. I'm not happy with spam; I'm not happy with the amount of vulnerability to various forms of attack," says Vinton Cerf, one of the inventors of the Internet's basic protocols, who recently joined Google

with a job title created just for him: chief Internet evangelist. "I do want to distinguish that the primary vectors causing a lot of trouble are penetrating holes in operating systems. It's more like the operating systems don't protect themselves very well. An argument could be made, 'Why does the network have to do that?'"

According to Cerf, the more you ask the network to examine data—to authenticate a person's identity, say, or search for viruses—the less efficiently it will move the data around. "It's really hard to have a network-level thing do this stuff, which means you have to assemble the packets into something bigger and thus violate all the protocols," Cerf says. "That takes a heck of a lot of resources." Still, Cerf sees value in the new NSF initiative. "If Dave Clark... sees some notions and ideas that would be dramatically

Whether or not the NSF comes up with a viable new Internet architecture, says Jonathan Zittrain, the growing pressures on the medium are fostering legal, corporate, and technological responses likely to make the Internet "more secure—and less interesting."

MRI: A Window on the Brain

Advances in brain imaging could lead to improved diagnosis of psychiatric ailments, better drugs, and earlier help for learning disorders.

By Paul Raeburn

When Bradley Peterson, a psychiatrist and researcher at Columbia University, offered to scan my brain with a magnetic resonance imager the size of a small Airstream trailer, I immediately said yes. I spent 10 minutes filling out a page-long checklist (I lied on the question asking whether I was claustrophobic) and another few minutes emptying my pockets and getting rid of keys, wrist-watch, and pen, which could become missiles inside the MRI's potent magnetic field.

I lay down on a narrow pallet that slid into the machine like a drawer in a morgue. The machine groaned and clanged as it peered inside my skull, then fell silent. With a gentle whir, the pallet slid out, and I relaxed. In about the time it takes to burn a few CDs on my laptop, Peterson was leaning over a screen, showing me a detailed black-and-white image of my brain.

Brain scans like the one I had are now routine, used for everything from detecting signs of stroke to searching out suspected tumors. But researchers like Peterson are pushing MRI technology further than anyone once thought it could go. In the last decade or so, MRI has been retooled to reveal not only the anatomy of the brain but also the way the brain works.

While conventional MRI scans, like the one Peterson gave me, reveal physiological structures, a variation called functional MRI (fMRI) can now also image blood flow over time, allowing researchers to see which areas of the brain are active during certain tasks. Indeed, fMRI studies over the last few years have provided researchers with startling images of the brain actually at work. A yet newer extension is MRI spectroscopy, another kind of functional imaging that monitors the activity of particular chemicals in the brain—providing different clues to brain function than fMRI does. And most recently, researchers have pioneered

an MRI technique called diffusion tensor imaging (DTI) that produces 3-D images of the frail, spidery network of wires that connects one part of the brain to another.

MRI has become, says Robert Desimone, director of the McGovern Institute for Brain Research at MIT, “the most powerful tool for studying the human brain. I liken it to the invention of the telescope for astronomers.” Desimone notes that the arrival of the telescope did not immediately revolutionize the scientific understanding of the universe. That took time, as researchers learned how to use their new tool. The same thing is happening with MRI, Desimone says. Researchers are just now beginning to realize the potential of these techniques, which were first widely used on humans about 15 years ago. “You’re seeing a lot of excitement in the field,” says Desimone.

Several technical advances have contributed to MRI's improvement. Topping the list is the development of more-powerful MRI magnets, which enable more-detailed, higher-resolution scans. What megapixels are for a digital camera, teslas, a measure of magnetic-field strength, are for MRIs: the more you have, the better the quality of the image. The newest MRIs generate magnetic fields of about seven teslas, many thousands of times stronger than Earth's magnetic field and at least twice as strong as those typically used in hospitals. (Some research centers, including the McGovern Institute, have 9.4-tesla MRI scanners for animal studies.) Another key development is a succession of ever more complex methods of computer analysis. These allow researchers to extract more and better information from scanner data and have improved not just fMRI but also MRI spectroscopy and DTI.

TIM MCGUIRE/CORBIS



Product placement

Lights, camera, brands

Product placement is rapidly blurring the line between content and advertising

NEAR the beginning of "Lost", an American television drama about a group of plane-crash survivors on a Pacific island, a silver attaché case made by Zero Halliburton takes centre stage. No matter what the characters do to try and force their way into it, only the key to the case finally reveals its contents. This is product placement to die for.

In 2004 the value of product placement in American television grew by 46%, according to PQ Media, an alternative-media research firm. Adding in films, magazines, videogames and music as well as TV, the market was worth \$3.5 billion in 2004. Leslie Moonves, chairman of CBS, a broadcast-television network, recently said that three-quarters of all scripted prime-time network programmes will soon contain paid product placement. The growth is occurring because advertisers reckon that it helps to sell their brands, and television firms are desperate for extra money as some of their traditional advertising moves to the internet and elsewhere.

When Channel 4, a British broadcaster, started showing "Lost" in August, it had to decide what to do about the attaché case, because showing products on television for money is mostly illegal in Europe. In the end, it left the incident in, reasoning that British viewers would not recognise the product, or its placement. Such dilemmas are about to disappear. The European Commission will soon alter its laws to allow product placement. It has accepted its

television producers' arguments that Europe's ban puts them at a disadvantage to Hollywood, where product placement is an important source of extra funding.

The phenomenon is not new. In the 1930s, Procter & Gamble started broadcasting "soap operas" on the radio featuring its soap powders, and tobacco brands have long used films and TV to lend glamour to smoking. But advertisers are pushing their way into content far more aggressively than ever before. This is chiefly because they doubt the effectiveness of 30-second spot advertisements. Increasingly, viewers are using personal video recorders to skip them, or are choosing to pay for content without commercials.

Even books now carry product placement, and Broadway musicals too. Newspapers are under pressure to do the same, but are mostly holding out. Last week, the American Society of Magazine Editors decided not to change its rules to allow titles to blur the line between content and ads, as many advertisers had hoped it would.

In the film industry, a lot of product-placement deals are made in return for a brand spending large sums marketing the association with the film, as well as for hard cash. Advertisers are becoming increasingly pushy. Brand owners do not just want their car in the film, complains the head of product placement at a film studio, they also demand tickets to the premiere and for the stars to be photographed in front of their brand boards.

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In television, the fastest-growing area of the market for product placement, advertisers and TV firms are trying to work out a more structured and standardised business model. Most placements are currently done on a barter basis. An advertiser will agree to lift its spend on traditional 30-second spots around a show, for instance, in return for product placement inside it.

The tricky part is working out exactly what product placement is worth. At the moment, no-one knows how to price it. So far it seems to have the biggest effect when accompanied by traditional ads. The Coca-Cola Company, for instance, found that audience recall of its ads during "American Idol", a reality show full of Coke placements, was 49% higher than during other programmes.

Oh for the wings of Dove

One of the key variables, says Alan Gould, co-CEO of IAG Research, an advertising-industry monitor, is how much other product placement there is in the show. In some there is so much "clutter" that the value to any one brand may be limited. Another important factor is whether the central character touches the product: is it thereby a "hero placement", or further in the background?

Product placement is riskier than conventional advertising. Early this year, Unilever, a consumer-goods firm, integrated its Dove body wash into "The Apprentice", and candidates competed to design a new ad campaign for the product. Unilever's executives were worried when one of the teams came up with an idea full of sexual innuendo and a gay theme.

Some people think that paid product placement is sinister, and that it should be banned, or at the very least clearly disclosed in credits at the end of a programme. German viewers, for instance, are particularly angry about it because ▶▶

► several broadcasters this year have been found to have accepted illegally money for product placement. The European Commission says it will allow product placement in fiction, but not in news or factual material, and will require that broadcasters label it clearly. America's Federal Trade Commission, on the other hand, which regulates advertising, rejected a call from a consumer group called Commercial Alert this year to require disclosure.

Most people do not mind having their content stuffed with products as long as it is skilfully done. There have been shows where it has turned viewers off, such as "The Restaurant", a reality show on NBC in 2003-04 with lots of clunky placements. Product placement is still a small source of revenue for media companies and they would immediately stop it if they thought it was damaging ratings. But the more skilled advertisers become at it, the less likely that is to occur. ■

Emirates Airline

EasyOz

Low cost is coming to long-haul flights.
Next could be low fares

UNTIL now the received wisdom in aviation was that low-cost, no-frills carriers would be mostly limited to short journeys, with a few exceptions such as JetBlue's flights from New York to the west coast of America. The argument goes that the business model just does not fit longer flights when passengers want frills, such as food and entertainment. On the cost side, long flight times and fuel bills eat away at the savings made by having swift turn-arounds at each end. Several attempts to launch long-haul low-cost airlines have failed to take off.

But low-cost, long-haul flights already exist, on Emirates Airline, a fast-growing carrier based in Dubai. True, Emirates feels more like a classy long-haul carrier, with comfortable cabins and attentive staff, and it has yet to offer rock-bottom fares. But an analysis of its costs (see chart) shows it is closer to Ryanair, Europe's leading no-frills carrier, than to British Airways (BA), Air France-KLM or Lufthansa. Goldman Sachs, an investment bank, also calculates that its profit-per-seat matches that of Ryanair, which is twice the level of Lufthansa and two-fifths more than BA.

No wonder Tim Clark, the president of Emirates, forecast earlier this year that it would be only a matter of time before "the short-haul low-cost model migrated into long haul". Writing in *Airline Business*, a trade magazine, he envisaged a version of

Wal-Mart

Be kind to be cruel

AUSTIN

The twist in a tale of seeming generosity

EVEN before the all-important Christmas shopping season starts, Wal-Mart seems to be sporting a Santa suit. Normally the world's biggest retailer is known for giving its non-unionised employees short shrift on benefits, which helps keep its operating costs low and prices cheap. But this week the company claimed to be mending a few of its ways. It is cutting health-care premiums—to as low as \$11 a month for some employees. Greener packaging and the use of renewable energy are also on the way. Oddest of all, Wal-Mart says it will start lobbying for a higher minimum wage.

What has come over the beast from Bentonville? It is still growing like crazy—it plans to open almost 300 new supercentres in its next financial year—but its image is sorely in need of treatment. Better health care, organic products on the shelves, and waterless urinals (at the experimental stage now) are clearly part of a bid to woo back middle-class customers. Many of these righteously boycott Wal-Mart because of its perceived ill-treatment of its workers. Less than half of its "associates" have health insurance; 5% have to resort to Medicaid, the increasingly cash-strapped government programme for the poor. All this was briefly forgotten last month when Wal-Mart made an extra effort (and gained good publicity) by helping

victims of the hurricanes in the southern states of America.

But wait. Lest anyone think the beast has changed entirely, the *New York Times* this week unearthed an extraordinary internal memo from Wal-Mart's executive vice-president of benefits to the board of directors advocating ways to slash benefit costs, which had been growing at the "unacceptable" rate of 15% a year. Among them: "Design all jobs to include some physical activity (eg, all cashiers do some cart gathering)". This is seen by the unions as a ruse to avoid employing the infirm. Other recommendations included making employees pay more for their spouse's health care, and cutting "investment" in profit-sharing and 401(k) retirement programmes from 4% to 3%. The rationale for the latter is that "retirement is a low-importance benefit for associates".

Unions are outraged. Chris Kofinis of WakeUpWalMart.com, a project of the United Food and Commercial Workers, calls the memo "one of the most disturbing documents I have ever read". It exposes the firm's other announcements, he says, as "cynical publicity stunts". Critics will soon have more to feast on when a stark documentary called "Wal-Mart: The High Cost of Low Price" is released on November 4th. It is unlikely to show the company in a Santa suit.

the upcoming Airbus A380 super-jumbo carrying 760 passengers, all in economy class, buying coffee and food at self-service counters and paying for access to in-flight entertainment or even gambling. The 15-20% lower operating costs promised for such huge aircraft (compared with today's Boeing 747s) could mean flights from Britain to Australia for €400 (\$480)

return. A stretched version of the A380, which the manufacturer is considering, could seat 870 passengers and provide potentially even lower fares. Already Emirates offers, for instance, flights from London, Paris and Frankfurt to Hong Kong, via Dubai, that are up to 30% cheaper than direct flights operated by BA, Air France-KLM and Lufthansa.

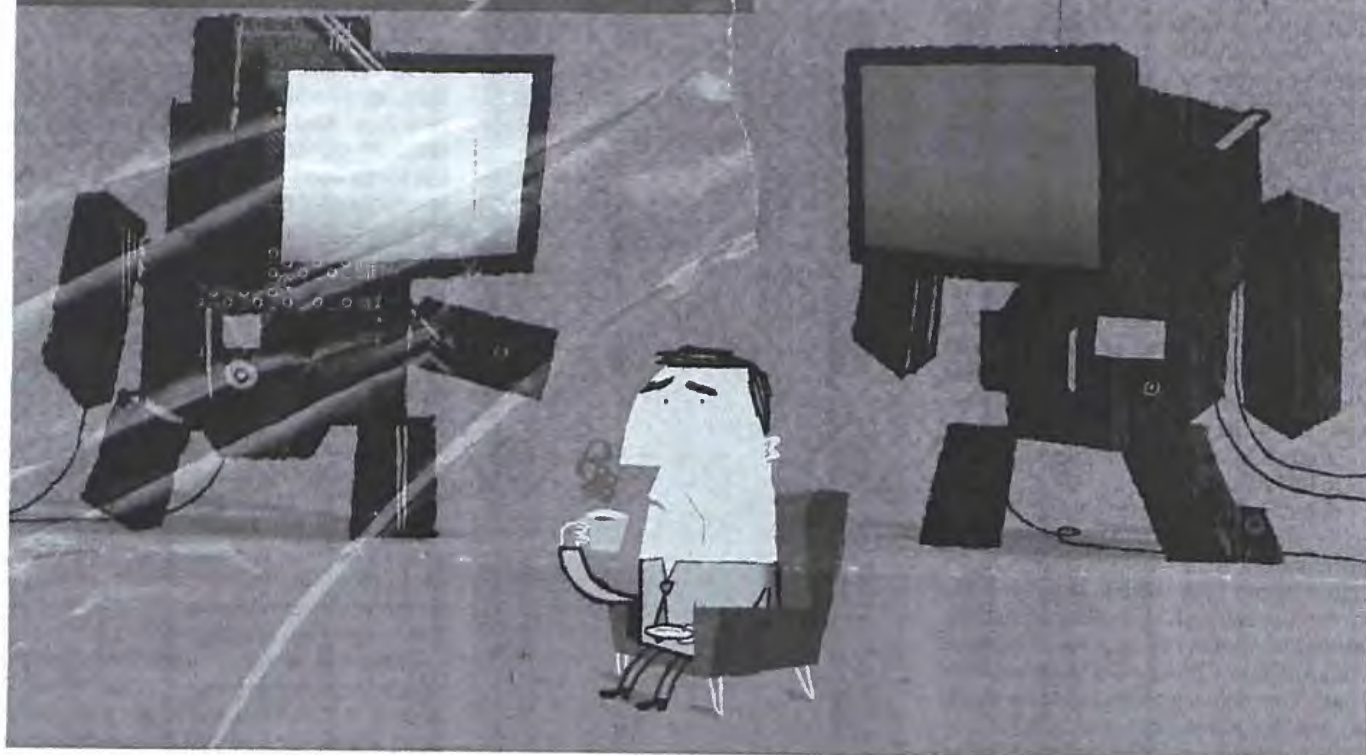
European carriers have been watching nervously as Emirates has expanded its passenger numbers by around 15% each year. Its fleet of 80 aircraft is set almost to double by 2012; it has ordered no fewer than 45 (a third of the total orders for the plane) of the A380 that is due to enter service in just over a year's time. Some industry observers wrongly put the success of Emirates down to subsidy from the government of Dubai. It does enjoy a home base where there are no corporate or income taxes and it has the implicit backing of the ruling family (which owns the carrier) when borrowing. But its real savings come from low staff costs (in Dubai there are no unions and plenty of cheap labour).

Sitting pretty

Cash cost per seat, 2004, €'000



Source: Goldman Sachs



Science fiction?

SAN FRANCISCO

Technology firms are pushing a futuristic vision of home entertainment not because consumers are desperate for it but because they themselves are

RECENTLY, at one of the fast-proliferating conferences devoted to the "digital home", John Burke, an executive at Motorola, a maker of mobile phones and digital gadgets, showed a video that presented his company's version of this vision. In the clip, a youngish man wakes up to a rock video that automatically starts playing on a screen next to his bed. He gets up to have breakfast and the rock video follows him to a screen in the kitchen. He moves into the living room and up pops the rock video on yet another screen. When he leaves his flat and gets into his car, the video starts playing on a screen in the steering wheel.

To ordinary humans this sort of thing must seem like silly—or downright frightening—marketing claptrap. In fact, even Mr Burke's audience of self-selected technophiles seemed sceptical. "Did you notice that the guy was a bachelor," said Tim Dowling, the boss of Pure Networks, a software firm in Seattle that helps users to set up and troubleshoot home-computer networks. "That alone tells you that they're out of touch. I thought: How dumb." Real people do not want to be hounded through their home and their life by some video stream, he argues; they just want help with basic headaches, such as getting

the kids' laptop, mom's Apple Macintosh and dad's Windows machine to share the family's printer.

Whether or not computer, software, consumer-electronics, telecoms, cable and internet companies are in fact out of touch with consumers may be the biggest question facing these industries today. That is because the "digital home", a concept and category hugely hyped in executive circles but still rarely heard in discussions among consumers, represents their greatest hope for revenue growth. Demand from corporate buyers of technology has barely recovered from the dotcom bust and is widely expected to be unimpressive for years. By contrast, the homes of consumers appear to technology vendors as a barely tamed analogue wilderness. Darcy Travlos, an analyst at CreditSights, a research firm, estimates the market opportunity of the digital home at \$250 billion in America alone and \$1 trillion worldwide in three to seven years.

"We view the digital home as critically important," says Craig Mundie, one of three chief technology officers at Microsoft, the world's largest software company. "The home is much more exciting than the workplace." Computers have already led

to small revolutions in boosting productivity in the office and helping people to communicate and to be creative, he says, so "we're pretty confident" that computers will have a similar effect on the way people consume entertainment. Intel, the world's largest semiconductor maker, recently reorganised itself into new business divisions including, prominently, one called "digital home". Last week it formally launched Viiv, a bundle of chips intended for use in digital-home PCs. Consumer-electronics firms such as Sony, computer-makers such as Hewlett-Packard (HP) and Apple, telecoms giants such as Verizon or SBC, cable companies such as Comcast, internet firms such as Yahoo!, networking-equipment companies such as Cisco—all agree that the digital home is where the action will be and are investing furiously to make sure they have a good chance of playing a leading role.

Their first challenge in stimulating any sort of consumer interest is the difficulty of merely explaining what the digital home is supposed to be. You might think, for instance, that the term refers to the long-established trend away from analogue and towards digital media. In music, most people have completed their migration from vinyl records and tapes to digital CDs. In films, the trend from videotapes to DVDs is not far behind. In photography, traditional film is fast being replaced by digital cameras and pictures. TV and radio broadcasters are also shifting to digital transmissions, with Britain leading the way.

Confusingly, however, that is not what vendors mean when they talk about the digital home. Instead, they invariably ►►

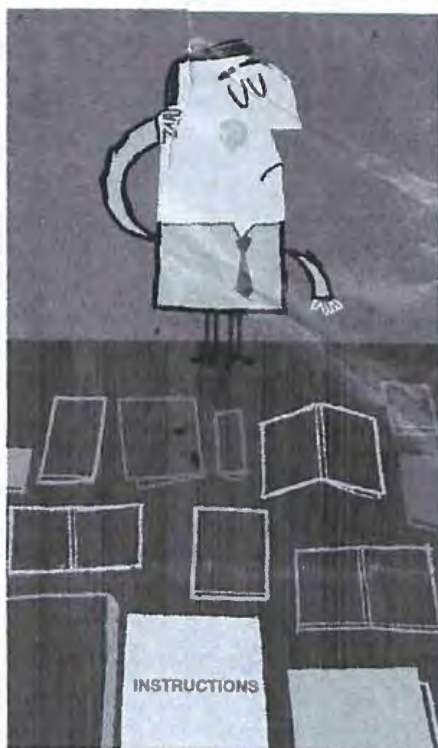
mean a home in which all sorts of electronic devices—from the personal computer (PC) to the TV set-top box, the stereo, the game console and, in some versions, even the garage door and refrigerator—are connected, both to one another and to the internet. Hence the Motorola marketing video that Mr Burke was showing. Its purpose was to illustrate what Motorola, like Microsoft, calls “seamlessness”, as digital content hops automatically between various devices and screens. The excitement, therefore, is not so much about content being digital, but about its delivery switching from physical things (such as CDs) to photons (such as wireless downloads or streaming), because this requires consumers to buy new gadgets.

Believers in this future point to encouraging statistics. Parks Associates, a research firm in Texas that specialises in the digital home (and which organised the conference at which Mr Burke gave his keynote address) surveyed a group of internet users and found that 84% of them use their PCs to store digital photos, 59% to store music, 36% for video clips and 26% for personal videos. If one includes devices other than PCs—such as TiVo, a popular digital video recorder—17% also store movies and TV shows. In theory, these people could soon avail themselves of new wireless-networking technologies, such as an emerging standard called “ultrawideband”, to pipe all this content from their collections to electronic picture frames, screens and portable devices.

Joined-up thinking

That is not at all what they want to do today, however. Another study by Parks Associates found that 89% of people with a home-computer network felt that the relatively modest goal of sharing internet access is its most important function, with printer-sharing the second priority. Worse, 27% of people who bought network gear said that they ran into problems during configuration, leading many to call the help desk of their internet service provider (who may or may not be responsible for the problem) at an estimated annual cost of \$1.4 billion to that industry. Even downloading entertainment, as opposed to buying it on discs, appears over-hyped. According to a study by the OECD, there were over 230 websites offering 1m tracks in America and Europe at the end of 2004. But these online sales accounted for less than 2% of total music revenues; even with fast growth, they are projected to rise only by 5-10% by 2008.

All this points to a huge problem with the digital-home vision: the lack, among most consumers, of any sense of crisis about the status quo in entertainment. “We don’t think many folks are looking for an electronic nerve centre in their homes,” says Pip Coburn, who runs Coburn Ven-



tures, a technology-consulting and investment firm. After all, popping in a DVD, say, is so easy and works so well. By contrast, getting a digital home up and running promises several lost weekends of fiddling with manuals and settings, and hefty expenses in new gear. According to Mr Coburn’s formula for evaluating new technologies, whereby adoption is a function of the users’ sense of crisis (ie, motivation to change) outweighing their perceived pain of switching, the digital home ranks as a clear “loser”.

This miscalculation—if that is what it is—by the large vendors stems from their history of catering to companies rather than people, says Pure Networks’ Mr Dowling (who used to be at Intel and who hired some 40 of his 60 employees from Microsoft). During the information-technology boom, the industry sold its wares mostly to chief information officers or chief technology officers with big budgets. These are customers who tend to be receptive toward buying “solutions” rather than products, and often hire consultants such as IBM Global Services to pull together hardware and software from various vendors. But “consumers don’t buy as an IT manager does,” says Mr Dowling. “They buy spur-of-the-moment and hodge podge; they buy things, not systems.” To the extent that the digital home is not a thing but a solution, he thinks, “the vendors are all fooling themselves.”

The vendors, naturally, disagree vehemently. “When you ask customers what they want, they will never tell you. You have to show them first,” says Microsoft’s Mr Mundie. That is why Microsoft has,

since 1994, had an impressive (or, to some people, intimidating) mock digital home on its campus in Redmond, Washington State, which it updates with the latest gadgets. Intel, NETGEAR, HP and most other self-respecting technology firms have similar mock-ups for display. There is, argues Motorola’s Mr Burke, a huge “need to educate consumers about the value of a connected home and lifestyle.”

Talking the same language

Outside the controlled environment of a mock home or conference demonstration, however, educating consumers tends to backfire. That is because real-world digital homes usually do not work very well. The premise of the entire vision, remember, is that heterogeneous devices talk to one another and readily transfer content to wherever the consumer wants to access it. This requires compatibility—“interoperability” in the jargon—among vendors involved in two technological categories.

The first is file formats and codecs (short for coder-decoders), which encode digital information—such as a picture, song or film—compress it for transmission and storage, and decompress it again for viewing and listening. The second is digital-rights management software, or DRM, which protects such content against piracy and unauthorised copying. DRM allows the copyright holders of content—film studios and record companies, in essence—to define such parameters as when a film or song that is downloaded “expires”, or how many times it can be copied to another device, such as a portable player.

The trouble starts here, with a bewildering list of acronyms that no ordinary consumer should ever have to know, but currently needs to know, to set up a digital home. The Moving Picture Experts Group (MPEG) is an industry body that defines widely used codecs such as MPEG-2 for video and MP3 for audio. But the big vendors prefer their own codecs—Microsoft its WM9 (short for Windows-Media-9), Apple, the market leader in online music sales, its AAC, and so on.

In DRM, the situation is even more chaotic. Microsoft pushes its Windows DRM; RealNetworks, which makes rival media software, has Helix; Sony has OpenMG; Apple likes FairPlay, and so on. The upshot is that consumers cannot mix online services, gadgets and software from different vendors and be sure that the content they have paid for actually works. Music bought online from Microsoft’s MSN or Yahoo!, for instance, does not work on Apple’s iTunes or iPod, and vice versa.

This challenge is daunting because DRM technologies should not only be compatible today, but for all eternity. Otherwise, consumers will be afraid to pay for content, and will stick with CDs and DVDs, which seem painless and safe by



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Cover: Human hand illustrated by Steven Chorney

AUGUST 9, 1995
NETSCAPE
GOES
PUBLIC!

10 YEARS THAT CHANGED THE WORLD



The Netscape founding crew, pre-IPO.

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How the Netscape IPO launched a new kind of participation – part human and part machine.

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WE ARE THE WEB

The Netscape IPO wasn't really about dot-commerce. At its heart was a new cultural force based on mass collaboration. Blogs, Wikipedia, open source, peer-to-peer – behold the power of the people.

BY KEVIN KELLY

Ten years ago, Netscape's explosive IPO ignited huge piles of money. The brilliant flash revealed what had been invisible only a moment before: the World Wide Web. As Eric Schmidt (then at Sun, now at Google) noted, the day before the IPO, nothing about the Web; the day after, everything.

Computing pioneer Vannevar Bush outlined the Web's core idea – hyperlinked pages – in 1945, but the first person to try to build out the concept was a freethinker named Ted Nelson who envisioned his own scheme in 1965. However, he had little success connecting digital bits on a useful scale, and his efforts were known only to an isolated group of disciples. Few of the hackers writing code for the emerging Web in the 1990s knew about Nelson or his hyperlinked dream machine.

At the suggestion of a computer-savvy friend, I got in touch with Nelson in 1984, a decade before Netscape. We met in a dark dockside bar in Sausalito, California. He was renting a houseboat nearby and had the air of someone with time on his hands. Folded notes erupted

from his pockets, and long strips of paper slipped from overstuffed notebooks. Wearing a ballpoint pen on a string around his neck, he told me – way too earnestly for a bar at 4 o'clock in the afternoon – about his scheme for organizing all the knowledge of humanity. Salvation lay in cutting up 3 x 5 cards, of which he had plenty.

Although Nelson was polite, charming, and smooth, I was too slow for his fast talk. But I got an *aha!* from his marvelous notion of hypertext. He was certain that every document in the world should be a footnote to some other document, and computers could make the links between them visible and permanent. But that was just the beginning! Scribbling on index cards, he sketched out complicated notions of transferring authorship back to creators and tracking payments as readers hopped along networks of documents, what he called the docuverse. He spoke of "transclusion" and "inter-twingularity" as he described the grand utopian benefits of his embedded structure. It was going to save the world from stupidity.

I believed him. Despite his quirks, it was clear to me that a hyperlinked world was inevitable – someday. But looking back now, after 10 years of living online, what surprises me about the genesis of the Web is how much was missing from Vannevar Bush's vision, Nelson's docuverse, and my own expectations. We all missed the big story. The revolution launched by Netscape's IPO was only marginally about hypertext and human knowledge. At its heart was a new kind of participation that has since developed into an emerging culture based on sharing. And the ways of participating unleashed by hyperlinks are creating a new type of thinking – part human and part machine – found nowhere else on the planet or in history.

Not only did we fail to imagine what the Web would become, we still don't see it today! We are blind to the miracle it has blossomed into. And as a result of ignoring what the Web really is, we are likely to miss what it will grow into over the next 10 years.

the promises, the louder the nays. It's not hard to find smart people saying stupid things about the Internet on the morning of its birth. In late 1994, *Time* magazine explained why the Internet would never go mainstream: "It was not designed for doing commerce, and it does not gracefully accommodate new arrivals." *Newsweek* put the doubts more bluntly in a February 1995 headline: "THE INTERNET? BAH!" The article was written by astrophysicist and Net maven Cliff Stoll, who captured the prevailing skepticism of virtual communities and online shopping with one word: "baloney."

This dismissive attitude pervaded a meeting I had with the top leaders of ABC in 1989. I was there to make a presentation to the corner office crowd about this "Internet stuff." To their credit, they realized something was happening. Still, nothing I could tell them would convince them that the Internet was not marginal, not just typing, and, most emphatically, not just teenage boys. Stephen Weiswasser,

trouble imagining an alternative to couch potatoes. *Wired* did, too. When I examine issues of *Wired* from before the Netscape IPO (issues that I proudly edited), I am surprised to see them touting a future of high production-value content – 5,000 always-on channels and virtual reality, with a side order of email sprinkled with bits of the Library of Congress. In fact, *Wired* offered a vision nearly identical to that of Internet wannabes in the broadcast, publishing, software, and movie industries: basically, TV that worked. The question was who would program the box. *Wired* looked forward to a constellation of new media upstarts like Nintendo and Yahoo!, not old-media dinosaurs like ABC.

Problem was, content was expensive to produce, and 5,000 channels of it would be 5,000 times as costly. No company was rich enough, no industry large enough, to carry off such an enterprise. The great telecom companies, which were supposed to wire up the digital revolution, were paralyzed by the uncertainties of funding the Net. In June 1994, David Quinn of British Telecom admitted to a conference of software publishers, "I'm not sure how you'd make money out of it."

The immense sums of money supposedly required to fill the Net with content sent many technocritics into a tizzy. They were deeply concerned that cyberspace would become cyburbia – privately owned and operated. Writing in *Electronic Engineering Times* in 1995, Jeff Johnson worried: "Ideally, individuals and small businesses would use the information highway to communicate, but it is more likely that the information highway will be controlled by Fortune 500 companies in 10 years." The impact would be more than commercial. "Speech in cyberspace will not be free if we allow big business to control every square inch of the Net," wrote Andrew Shapiro in *The Nation* in July 1995.

The fear of commercialization was strongest among hardcore programmers: the coders, Unix weenies, TCP/IP fans, and selfless volunteer IT folk who kept the ad hoc network running. The major administrators thought of their work as noble, a gift to humanity. They saw the Internet as an open commons, not to be undone by greed or commercialization. It's hard to believe now, but until 1991, commercial enterprise on the Internet was strictly

Senior maverick Kevin Kelly (kk@kk.org) wrote about the universe as a computer in issue 10.12.

"THE INTERNET," SAID ONE SENIOR EXEC AT ABC, "WILL BE THE CB RADIO OF THE '90s."

Any hope of discerning the state of the Web in 2015 requires that we own up to how wrong we were 10 years ago.

1995

Before the Netscape browser illuminated the Web, the Internet did not exist for most people. If it was acknowledged at all, it was mischaracterized as either corporate email (as exciting as a necktie) or a clubhouse for adolescent males (read: pimply nerds). It was hard to use. On the Internet, even dogs had to type. Who wanted to waste time on something so boring?

The memories of an early enthusiast like myself can be unreliable, so I recently spent a few weeks reading stacks of old magazines and newspapers. Any promising new invention will have its naysayers, and the bigger

a senior VP, delivered the ultimate putdown: "The Internet will be the CB radio of the '90s," he told me, a charge he later repeated to the press. Weiswasser summed up ABC's argument for ignoring the new medium: "You aren't going to turn passive consumers into active trollers on the Internet."

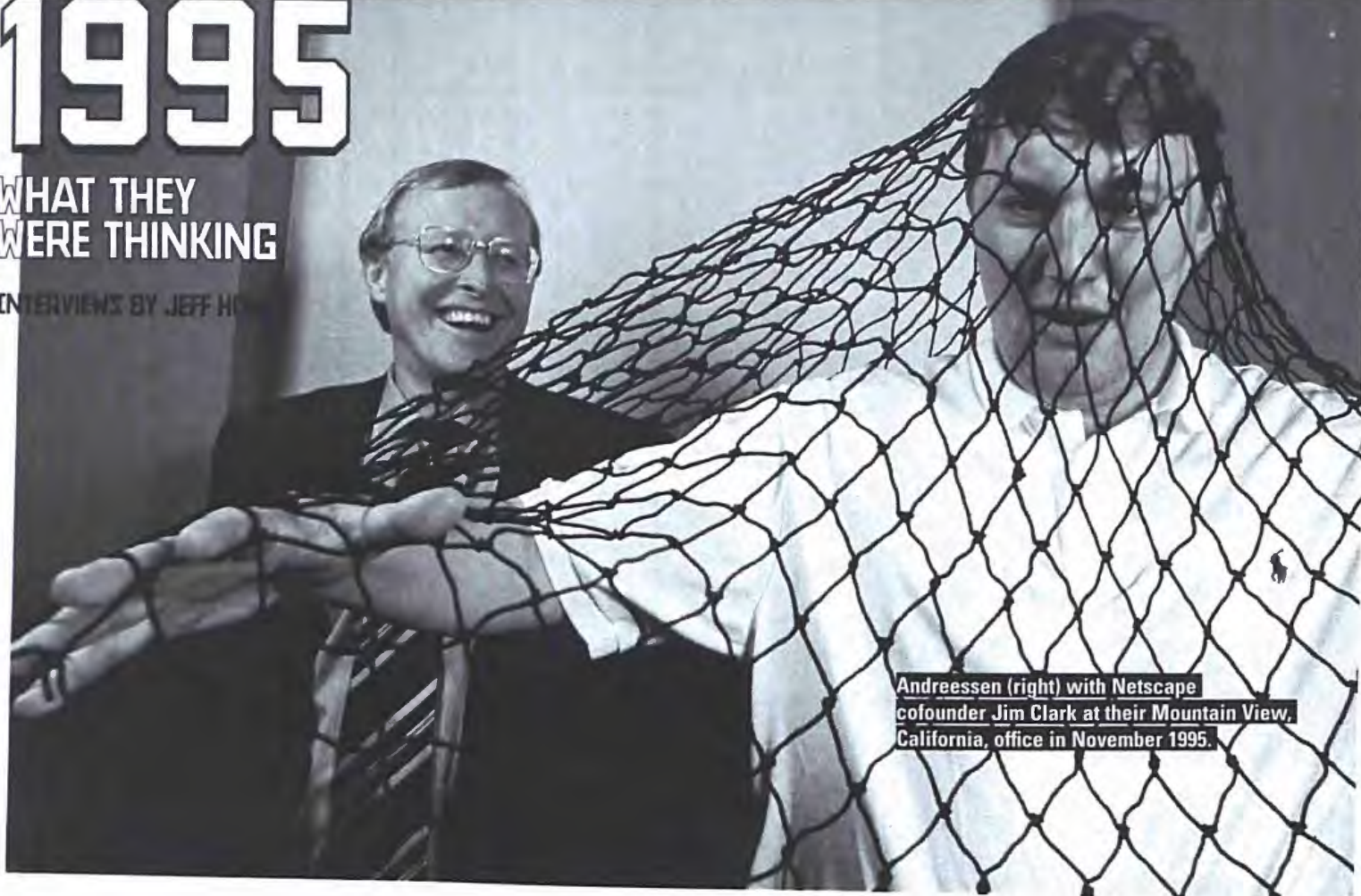
I was shown the door. But I offered one tip before I left. "Look," I said. "I happen to know that the address *www.abc.com* has not been registered. Go down to your basement, find your most technical computer guy, and have him register *www.abc.com* immediately. Don't even think about it. It will be a good thing to do." They thanked me vacantly. I checked a week later. The domain was still unregistered.

While it is easy to smile at the dodos in TV land, they were not the only ones who had

1995

WHAT THEY WERE THINKING

INTERVIEWS BY JEFF HARRIS



Andreessen (right) with Netscape cofounder Jim Clark at their Mountain View, California, office in November 1995.

THE WHIZ KID

MARC ANDREESSEN:

“It’s a lot more fun in retrospect. Startups are stressful, and Netscape was no different. The funny thing is, back then we thought the horse had already left the barn. Netscape’s predecessor, Mosaic, already had 1 million users. We thought the market might be saturated. Even as late as ’95, the Net was populated by early adopters, defense contractors, techies, and academics. It was completely unclear whether it would spread beyond that to consumers and business users. People still thought interactive TV would rule the world.”

A DECADE OF GENIUS AND MADNESS

The chair that launched a thousand bad business models: Herman Miller’s Aeron seats the Valley.



Jerry Yang and David Filo incorporate Yet Another Hierarchical Official Oracle (Yahoo!) and raise \$2 million in funding from Sequoia Capital.



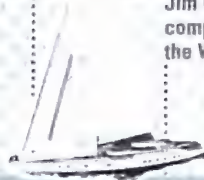
San Francisco’s Candlestick Park becomes 3Com Park, or “Stupid-Name Park” as it’s called by local radio broadcasters.

“Earth’s biggest bookstore” goes live. Founder Jeff Bezos drives Amazon orders to the post office in his ’87 Chevy Blazer.



Microsoft introduces Windows 95 and gives away crappy new browser Internet Explorer 1.0.

Jibe ho! Reportedly needing money to buy a boat, Netscape cofounder Jim Clark takes the company public, inciting the Web revolution.



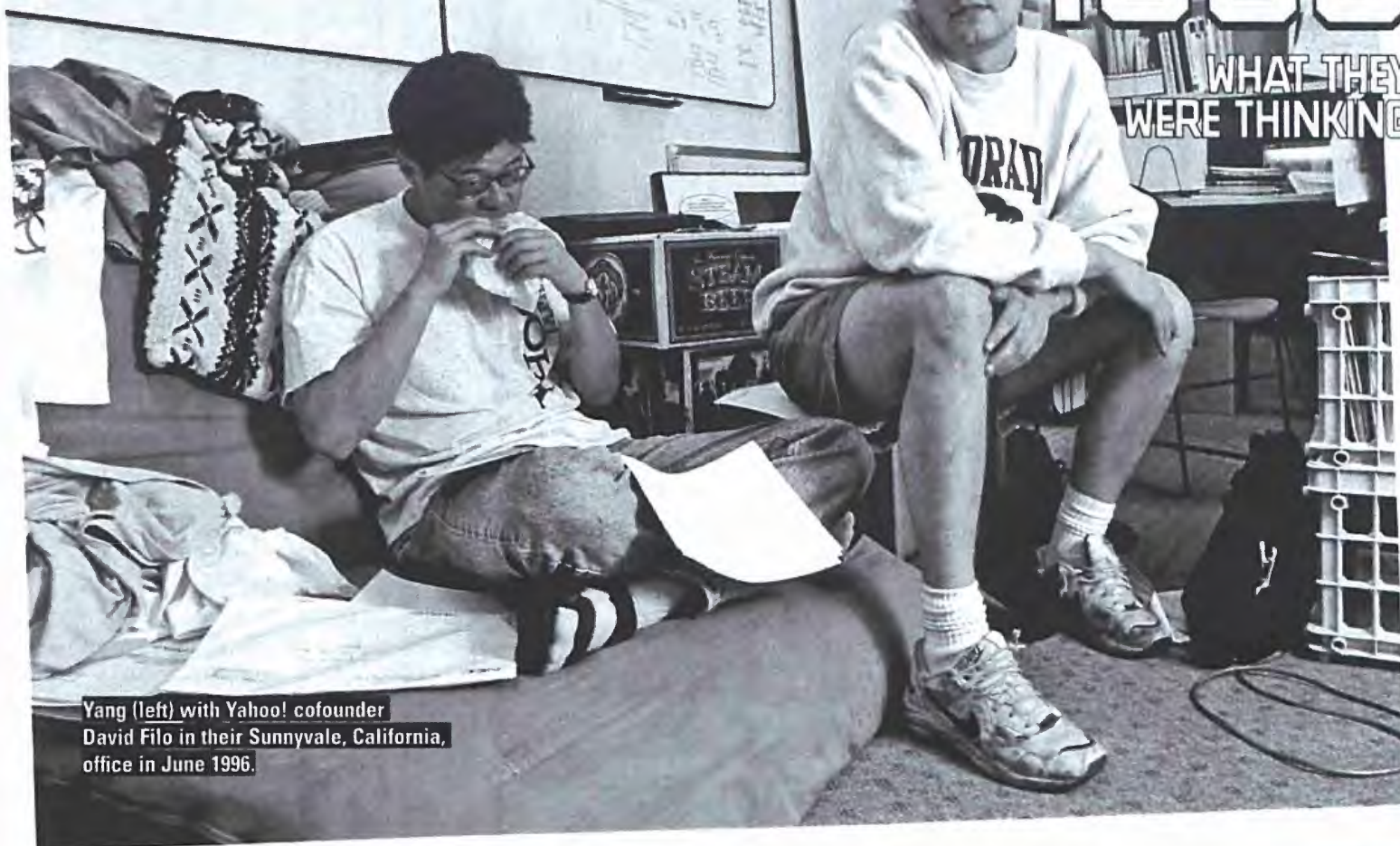
45 percent of Americans have heard of “the World Wide Web.”

AltaVista gets off the ground with 16 million indexed pages, making it the Web’s largest search engine. Ten years later, Google indexes 8 billion pages.

JAN • MAR APR • • JUL AUG • OCT • DEC

1996

WHAT THEY WERE THINKING

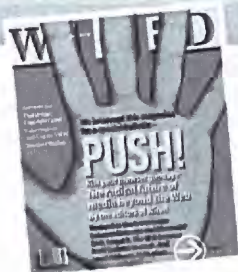


Yang (left) with Yahoo! cofounder David Filo in their Sunnyvale, California, office in June 1996.

THE GUIDES

JERRY YANG:

“When this shot was taken, it was just David and me and a handful of people in this small office in Sunnyvale. We clearly didn’t think that things would happen the way they did. We used to say, ‘Hey, if the Internet takes off and we stay the best at doing what we’re already doing’ – showing people stuff on the Internet that they would be interested in – ‘this could be huge.’”



PointCast begins beta testing a screensaver that delivers data from the Internet to your desktop, heralding the abbreviated age of “push.”

Palm Computing rolls out the Palm Pilot. At \$349, the high-end model has 512K of memory and no backlight.

Bill Gross founds dotcom incubator Idealab, burning through \$800 million in eight months. Over the next eight years, it spawns 50 companies.

Polaroid’s first 1-megapixel digicam hits. The price tag: a cool \$3,695.



Yahoo! raises \$35 million in its IPO, as shares triple on the first day of trading. Market cap hits \$1 billion.

Browser wars: Netscape’s share of the market peaks at 87 percent; Explorer begins its climb from 4 percent.

Unabomber Theodore Kaczynski is arrested. In his manifesto, he blames computers and technology for society’s woes.

82 PERCENT

of Americans have heard of the Web, up from 45 percent in 1995.



Alan Greenspan warns of “irrational exuberance” in the stock market. Nobody cares.



EBay’s AuctionWeb receives its millionth bid and shortens name to just eBay.



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1997

WHAT THEY WERE THINKING



Bezos (right), founder and CEO of Amazon.com, delivering a package in Tokyo in October 1997.

JEFF BEZOS:

THE MERCHANT KING

“This man was our millionth customer, and I had flown to Japan with a few of my employees to hand-deliver his books. He ordered Andrew Morton’s *Diana: Her True Story in Her Own Words* and *Windows NT: An Administrator’s Bible*, which is a pretty funny combination, I guess. He was incredibly gracious and kind, and the whole thing got carried on Japanese news stations. If you look closely at the photo, you can see that all of our employees signed the box. The symbolism was important – we were celebrating our millionth customer, not our millionth dollar. In 1997, our success was anything but assured. That was the year *Amazon-dot-toast* was coined. When I think back, I’m amazed how quickly we’ve grown. We celebrate our 10th anniversary July 16, which coincidentally is the same day *Harry Potter and the Half-Blood Prince* (book 6) comes out. Based on preorders, we expect to generate more sales on that book on that day than we did in our entire first year.”



Dr. Koop’s wild ride: Former surgeon general founds drkoop.com. Company launches, goes public, hits billion-dollar market cap, goes kaput.

First webcast of presidential inauguration.



Heaven’s Gate cult of Web designers details UFO beliefs on Internet, then commits mass suicide.



He got rooked: Grandmaster Garry Kasparov loses chess match to IBM’s Deep Blue.

NASA’s Web site for Pathfinder’s Martian journey attracts a record 46 million hits in one day. (When the Mars rover lands in 2004, Nasa.gov gets 404 million hits.)



\$150,000

Amount paid for business.com domain. Two years later, it resells for a record \$7.5 million.

Couch Couch revolution: TiVo launches, quietly begins work on first personal video recorder.



Usenet poster Jorn Barger coins weblog to describe his online journal.

JAN ■ MAR ■ MAY ■ JUL ■ AUG ■ ■ ■ DEC

prohibited. Even then, the rules favored public institutions and forbade "extensive use for private or personal business."

In the mid-1980s, when I was involved in the WELL, an early nonprofit online system, we struggled to connect it to the emerging Internet but were thwarted, in part, by the "acceptable use" policy of the National Science Foundation (which ran the Internet backbone). In the eyes of the NSF, the Internet was funded for research, not commerce. At first this restriction wasn't a problem for online services, because most providers, the WELL included, were isolated from one another. Paying customers could send email within the system – but not outside it. In 1987, the WELL fudged a way to forward outside email through the Net without confronting the acceptable use policy, which our organization's own techies were reluctant to break. The NSF rule reflected a lingering sentiment that the Internet would be devalued, if not trashed, by opening it up to commercial interests. Spam was already a problem (one every week!).

This attitude prevailed even in the offices of *Wired*. In 1994, during the first design meetings for *Wired*'s embryonic Web site, HotWired, programmers were upset that the innovation we were cooking up – what are now called clickthrough ad banners – subverted the great social potential of this new territory. The Web was hardly out of diapers, and already they were being asked to blight it with billboards and commercials. Only in May 1995, after the NSF finally opened the floodgates to ecommerce, did the geek elite begin to relax.

Three months later, Netscape's public offering took off, and in a blink a world of DIY possibilities was born. Suddenly it became clear that ordinary people could create material anyone with a connection could view. The burgeoning online audience no longer needed ABC for content. Netscape's stock peaked at \$75 on its first day of trading, and the world gasped in awe. Was this insanity, or the start of something new?

2005

The scope of the Web today is hard to fathom. The total number of Web pages, including those that are dynamically created upon request and document files available through links, exceeds 600 billion. That's 100 pages per person alive.

How could we create so much, so fast,

so well? In fewer than 4,000 days, we have encoded half a trillion versions of our collective story and put them in front of 1 billion people, or one-sixth of the world's population. That remarkable achievement was not in anyone's 10-year plan.

The accretion of tiny marvels can numb us to the arrival of the stupendous. Today, at any Net terminal, you can get: an amazing variety of music and video, an evolving encyclopedia, weather forecasts, help wanted ads, satellite images of anyplace on Earth, up-to-the-minute news from around the globe, tax forms, TV guides, road maps with driving directions, real-time stock quotes, telephone numbers, real estate listings with virtual walk-throughs, pictures of just about anything, sports scores, places to buy almost anything, records of political contributions, library catalogs, appli-

firms in the entire world to fund such a cornucopia. The success of the Web at this scale was impossible.

But if we have learned anything in the past decade, it is the plausibility of the impossible.

Take eBay. In some 4,000 days, eBay has gone from marginal Bay Area experiment in community markets to the most profitable spinoff of hypertext. At any one moment, 50 million auctions race through the site. An estimated half a million folks make their living selling through Internet auctions. Ten years ago I heard skeptics swear nobody would ever buy a car on the Web. Last year eBay Motors sold \$11 billion worth of vehicles. EBay's 2001 auction of a \$4.9 million private jet would have shocked anyone in 1995 – and still smells implausible today.

Nowhere in Ted Nelson's convoluted

A SIMPLE LINK, IT TURNS OUT, IS THE MOST POWERFUL INVENTION OF THE DECADE.

ance manuals, live traffic reports, archives to major newspapers – all wrapped up in an interactive index that really works.

This view is spookily godlike. You can switch your gaze of a spot in the world from map to satellite to 3-D just by clicking. Recall the past? It's there. Or listen to the daily complaints and travails of almost anyone who blogs (and doesn't everyone?). I doubt angels have a better view of humanity.

Why aren't we more amazed by this fullness? Kings of old would have gone to war to win such abilities. Only small children would have dreamed such a magic window could be real. I have reviewed the expectations of waking adults and wise experts, and I can affirm that this comprehensive wealth of material, available on demand and free of charge, was not in anyone's scenario. Ten years ago, anyone silly enough to trumpet the above list as a vision of the near future would have been confronted by the evidence: There wasn't enough money in all the investment

sketches of hypertext transclusion did the fantasy of a global flea market appear. Especially as the ultimate business model! He hoped to franchise his Xanadu hypertext systems in the physical world at the scale of a copy shop or café – you would go to a store to do your hypertexting. Xanadu would take a cut of the action.

Instead, we have an open global flea market that handles 1.4 billion auctions every year and operates from your bedroom. Users do most of the work; they photograph, catalog, post, and manage their own auctions. And they police themselves; while eBay and other auction sites do call in the authorities to arrest serial abusers, the chief method of ensuring fairness is a system of user-generated ratings. Three billion feedback comments can work wonders.

What we all failed to see was how much of this new world would be manufactured by users, not corporate interests. Amazon.com customers rushed with surprising speed

and intelligence to write the reviews that made the site's long-tail selection usable. Owners of Adobe, Apple, and most major software products offer help and advice on the developer's forum Web pages, serving as high-quality customer support for new buyers. And in the greatest leverage of the common user, Google turns traffic and link patterns generated by 2 billion searches a month into the organizing intelligence for a new economy. This bottom-up takeover was not in anyone's 10-year vision.

No Web phenomenon is more confounding than blogging. Everything media experts knew about audiences – and they knew a lot – confirmed the focus group belief that audiences would never get off their butts and start making their own entertainment. Everyone knew writing and reading were dead; music was too much trouble to make when you could sit back and listen; video production was simply out of reach of amateurs. Blogs and other participant media would never happen, or if they happened they would not draw an audience, or if they drew an audience they would not matter. What a shock, then, to witness the near-instantaneous rise of 50 million blogs, with a new one appearing every two seconds. There – another new blog! One more person doing what AOL and ABC – and almost everyone else – expected only AOL and ABC to be doing. These user-created channels make no sense economically. Where are the time, energy, and resources coming from?

The audience.

I run a blog about cool tools. I write it for my own delight and for the benefit of friends. The Web extends my passion to a far wider group for no extra cost or effort. In this way, my site is part of a vast and growing gift economy, a visible underground of valuable creations – text, music, film, software, tools, and services – all given away for free. This gift economy fuels an abundance of choices. It spurs the grateful to reciprocate. It permits easy modification and reuse, and thus promotes consumers into producers.

The open source software movement is another example. Key ingredients of collaborative programming – swapping code, updating instantly, recruiting globally – didn't work on a large scale until the Web was woven. Then software became something you could join, either as a beta tester or as a coder on an open source project. The clever

"view source" browser option let the average Web surfer in on the act. And anyone could rustle up a link – which, it turns out, is the most powerful invention of the decade.

Linking unleashes involvement and interactivity at levels once thought unfashionable or impossible. It transforms reading into navigating and enlarges small actions into powerful forces. For instance, hyperlinks made it much easier to create a seamless, scrolling street map of every town. They made it easier for people to refer to those maps. And hyperlinks made it possible for almost anyone to annotate, amend, and improve any map embedded in the Web. Cartography has gone from spectator art to participatory democracy.

The electricity of participation nudges ordinary folks to invest huge hunks of energy and time into making free encyclopedias, creating public tutorials for changing a flat tire, or cataloging the votes in the Senate. More and more of the Web runs in this mode. One study found that only 40 percent of the Web is commercial. The rest runs on duty or passion.

Coming out of the industrial age, when

tion's data becomes part of the commons and an invitation to participate. People who take advantage of these capabilities are no longer customers; they're the company's developers, vendors, skunk works, and fan base.

A little over a decade ago, a phone survey by *Macworld* asked a few hundred people what they thought would be worth \$10 per month on the information superhighway. The participants started with uplifting services: educational courses, reference books, electronic voting, and library information. The bottom of the list ended with sports statistics, role-playing games, gambling, and dating. Ten years later what folks actually use the Internet for is inverted. According to a 2004 Stanford study, people use the Internet for (in order): playing games, "just surfing," shopping ... the list ends with responsible activities like politics and banking. (Some even admitted to porn.) Remember, shopping wasn't supposed to happen. Where's Cliff Stoll, the guy who said the Internet was baloney and online catalogs humbug? He has a little online store where he sells handcrafted Klein bottles.

**TODAY LESS THAN HALF
THE WEB IS COMMERCIAL.
THE REST RUNS ON
PASSION AND DUTY.**

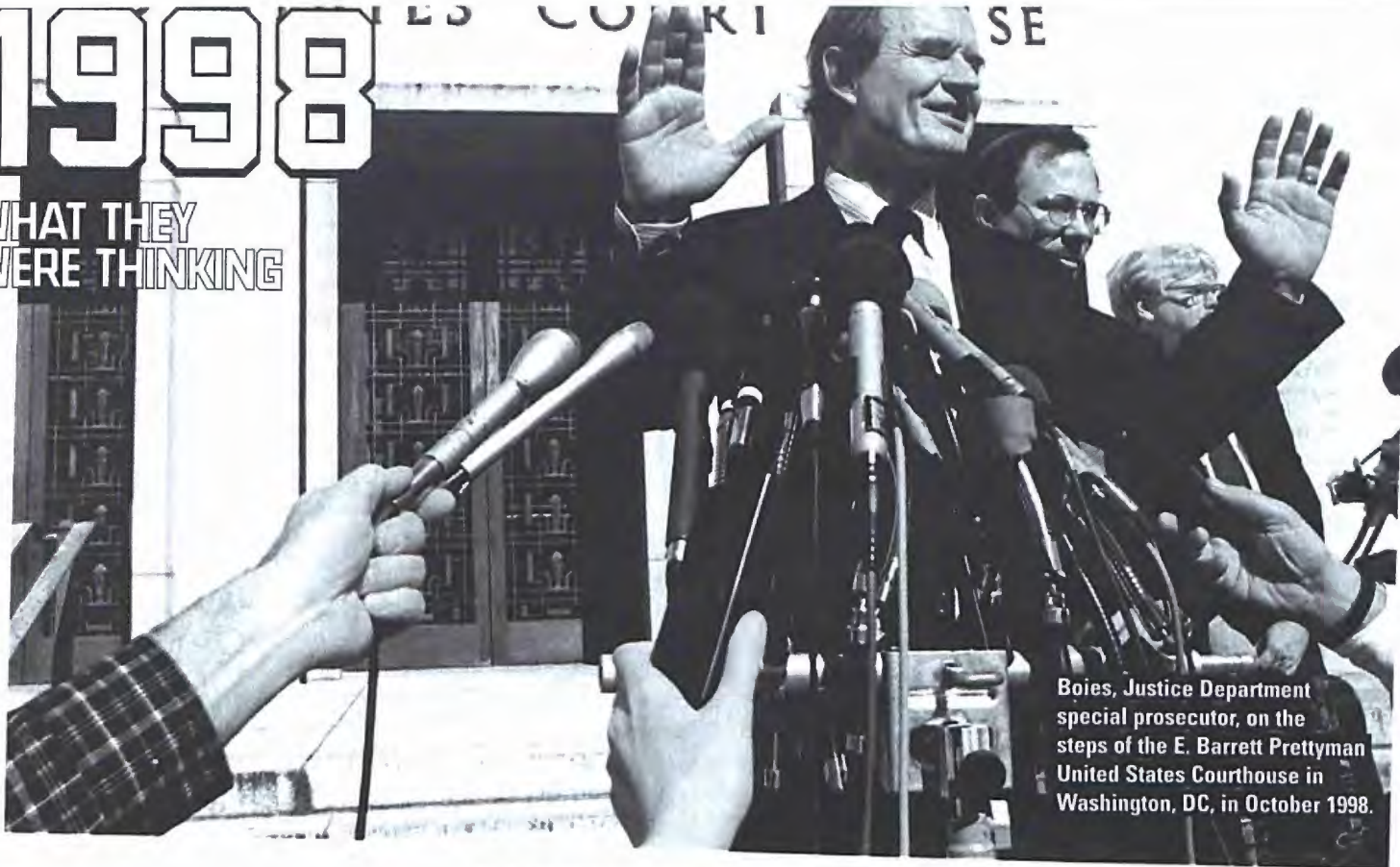
mass-produced goods outclassed anything you could make yourself, this sudden tilt toward consumer involvement is a complete Lazarus move: "We thought that died long ago." The deep enthusiasm for making things, for interacting more deeply than just choosing options, is the great force not reckoned 10 years ago. This impulse for participation has upended the economy and is steadily turning the sphere of social networking – smart mobs, hive minds, and collaborative action – into the main event.

When a company opens its databases to users, as Amazon, Google, and eBay have done with their Web services, it is encouraging participation at new levels. The corpora-

The public's fantasy, revealed in that 1994 survey, began reasonably with the conventional notions of a downloadable world. These assumptions were wired into the infrastructure. The bandwidth on cable and phone lines was asymmetrical: Download rates far exceeded upload rates. The dogma of the age held that ordinary people had no need to upload; they were consumers, not producers. Fast-forward to today, and the poster child of the new Internet regime is BitTorrent. The brilliance of BitTorrent is in its exploitation of near-symmetrical communication rates. Users upload stuff while they are downloading. It assumes participation, not mere consumption. Our communication infrastructure 132

1998

WHAT THEY
WERE THINKING



Boies, Justice Department special prosecutor, on the steps of the E. Barrett Prettyman United States Courthouse in Washington, DC, in October 1998.

DAVID BOIES:

■ This would've been the second day of the Microsoft antitrust trial. I made that hand gesture as a matter of instinct, really. Daniel Okrent, writing in *Time*, called it 'shaking the invisible box.' But I remember that what I was trying to do with it here was say, 'Slow down. It's way too early to say where this is going.' Our witnesses during those first days, especially [then Netscape CEO] Jim Barksdale, were very effective. Microsoft was losing a lot of credibility because each day they would come out and proclaim, 'Another great day for Microsoft,' which became a running joke. But this wasn't going to be an easy case. We had to show egregious monopolistic practices and undercut the credibility of their witnesses. I was thinking about what we were going to do when their witnesses came on. That was going to be the challenge of the cross-examination: to get somebody who has every incentive to tell a story that is not helpful to you to reveal the truth. ■

THE MICROSOFT SLAYER



Reed Hastings and 234,000 letter carriers challenge Blockbuster with the online video-rental service Netflix.

King of all media: Web users now spend more time surfing the Internet than watching TV.

10
PERCENT

Amount of all email that's spam. In 2003, as that figure reaches 50 percent, Congress passes the CAN SPAM Act. The 2005 number: 87 percent.

Embrace, extend, and hire a bunch of lawyers: DOJ and 20 state attorneys general charge Microsoft with illegal monopolistic practices.



The Starr Report, filled with lurid Monica Lewinsky details, is released online, making for what's called the busiest day in Internet history so far.

Yahoo! wannabe Google opens for business in a garage in Menlo Park, California.

Google



Stock analyst Henry Blodget sets a \$400 price target on Amazon shares. A year later, it tops out at \$600.

The final 21 unwired countries (from Afghanistan to Western Sahara) come online. The Web is now global.

Battered Netscape bows out of browser war, agrees to sell to AOL for \$4.2 billion.

MAR

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MAY

SEP

NOV

DEC

1999

WHAT THEY WERE THINKING



The sock puppet, created by Smiley, co-creative director of TBWA/Chiat/Day, San Francisco.

THE ICON

ROB SMILEY:

“These were boom times. We’d get these calls. Companies would have \$30 million to spend on advertising – even though they had only two employees, no product, and no business plan. We presented Pets.com with three ideas, and the client chose the sock puppet, which was actually really courageous. When we ran focus groups, half the audience loved it and thought the puppet ad was the funniest they’d ever seen. The other half just *hated* it. Everyone talks about how much money the company spent on advertising, but what about the free publicity? The puppet got on talk shows. It was even in the Macy’s Thanksgiving Day Parade, and Al Roker was quoting the commercials. After the company went bankrupt, the puppet was its most valuable asset and became the only ad character in history to be sold to another company. The reason it stands for dotcom excess is that it was so successful. What bell-bottoms were to the ’70s, the sock puppet was to the dotcom era.”

13.6
MILLION

Miles of fiber-optic cable are deployed in North America this year.

Netscape introduces RSS, a tool for customizing homepages, unwittingly kicking off the blogging revolution.

Armageddon cometh: Gartner Group predicts global Y2K investment will reach \$1.5 trillion.

The Melissa virus – named for an exotic dancer – infects more than 1 million PCs in one night, causing \$80 million in damages.



Mark Cuban agrees to sell Broadcast.com to Yahoo! for \$5.7 billion and uses part of the proceeds to buy the NBA’s Dallas Mavericks.



Actors Noah Wylie and Anthony Michael Hall geek out as Steve Jobs and Bill Gates in the TV movie *Pirates of Silicon Valley*.



Amazon founder Jeff Bezos is named *Time* magazine’s “Person of the Year.”

Road rage: Bay Area commuters spend 52,000 hours in traffic daily, four times as much as they did in 1995.

Pixelon.com (who?) throws a \$10 million bash in Las Vegas to celebrate a \$23 million round of venture funding. Headline acts include Kiss, the Who.



JAN

MAR

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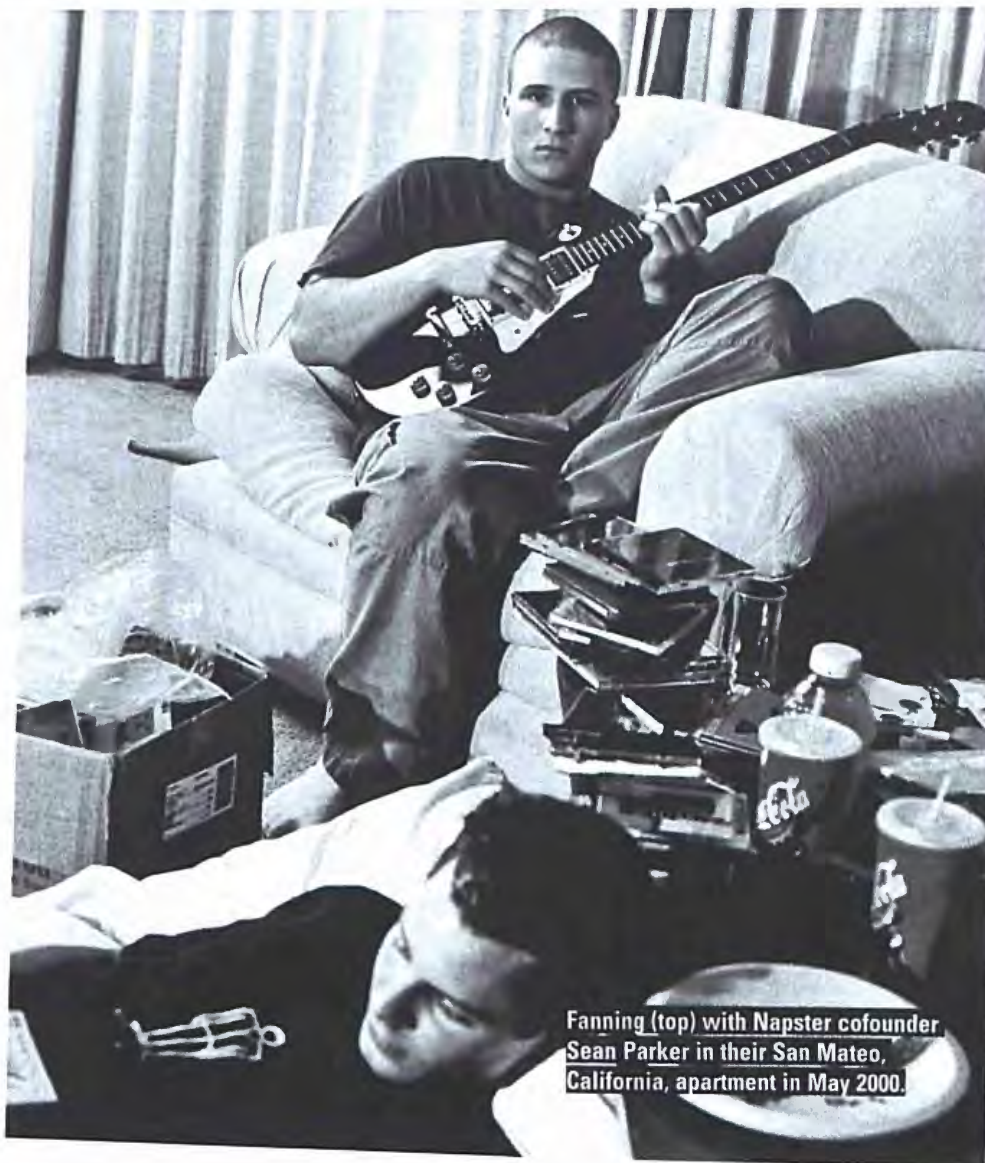
2000

WHAT THEY WERE THINKING

THE MUSIC SWAPPER

SHAWN FANNING:

“This was such a weird time for us. We were living in San Mateo, about a block from the Napster offices. *Rolling Stone* had come to photograph. At that point, Napster had already experienced massive growth, but it didn't seem real. Then the mainstream press came around, and it was just a whirlwind, total craziness. The amount of exposure made me really nervous. The funny thing about this photo is that the whole thing is contrived. We actually *were* total slob, but this was the first time anyone had come to the house, so we'd picked the place up. Then they wanted to contrive this whole mess to make us into stereotypical geeks, I guess. They were actually like, 'Here, hold this guitar.' The reason Sean Parker looks asleep is because he actually was. I remember we really just wanted it to be over so we could go back to work. If you think about computer programming, it's as antisocial as it gets. If you're a musician or actor, you know that if you're successful, some level of fame goes along with that. You're prepared. But how often does that happen to a programmer?”



Fanning (top) with Napster cofounder Sean Parker in their San Mateo, California, apartment in May 2000.



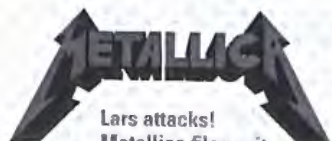
Seventeen dotcoms spend \$2.2 million each for 30-second ads during the Super Bowl. By year's end, three are dead.

Dow Jones Industrial Average tops out at 11,722.98.

AOL announces plans to buy Time Warner. Steve Case gives Gerald Levin a \$160 billion manhug.



The bubble springs a leak. Nasdaq peaks at 5,048.62, then sinks 74 percent in 30 months.



Lars attacks! Metallica files suit against Napster, alleging that Shawn Fanning & Co. encouraged users to share the band's music illegally.

\$105 BILLION

Amount of venture capital invested in 2000, up from \$8 billion in 1995.

Average Silicon Valley tech worker's income tops out at \$80,000 – but median home price reaches \$530,000. Salaries begin to drop; housing costs don't.

The June issues of *Business 2.0*, *eCompany Now*, *The Industry Standard*, *Red Herring*, *Upside*, and *Wired* together tip the scales at 10 pounds. Within three years, four of the six magazines are gone.



Pets.com is the first publicly held dotcom to bite the dust. Woof!

JAN • MAR APR • JUN • DEC

THE BIRTH OF GOOGLE

Larry thought Sergey was arrogant. Sergey thought Larry was obnoxious. But their obsession with backlinks just might be the start of something big.

BY JOHN BATTELLE

It began with an argument. When he first met Larry Page in the summer of 1995, Sergey Brin was a second-year grad student in the computer science department at Stanford University. Gregarious by nature, Brin had volunteered as a guide of sorts for potential first-years – students who had been admitted, but were still deciding whether to attend. His duties included showing recruits the campus and leading a tour of nearby San Francisco. Page, an engineering major from the University of Michigan, ended up in Brin's group.

It was hardly love at first sight. Walking up and down the city's hills that day, the two clashed incessantly, debating, among other things, the value of various approaches to urban planning. "Sergey is pretty social; he likes meeting people," Page recalls, contrasting that quality with his own reticence. "I thought he was pretty obnoxious. He had really strong opinions about things, and I guess I did, too."

"We both found each other obnoxious," Brin counters when I tell him of Page's

response. "But we say it a little bit jokingly. Obviously we spent a lot of time talking to each other, so there was something there. We had a kind of bantering thing going." Page and Brin may have clashed, but they were clearly drawn together – two swords sharpening one another.

When Page showed up at Stanford a few months later, he selected human-computer interaction pioneer Terry Winograd as his adviser. Soon thereafter he began searching for a topic for his doctoral thesis. It was an important decision. As Page had learned from his father, a computer science professor at Michigan State, a dissertation can frame one's entire academic career. He kicked around 10 or so intriguing ideas, but found himself attracted to the burgeoning World Wide Web.

Page didn't start out looking for a better way to search the Web. Despite the fact that Stanford alumni were getting rich founding Internet companies, Page found the Web interesting primarily for its mathematical characteristics. Each computer was a node, and each link on

a Web page was a connection between nodes – a classic graph structure. "Computer scientists love graphs," Page tells me. The World Wide Web, Page theorized, may have been the largest graph ever created, and it was growing at a break-neck pace. Many useful insights lurked in its vertices, awaiting discovery by inquiring graduate students. Winograd agreed, and Page set about pondering the link structure of the Web.

CITATIONS AND BACK RUBS

It proved a productive course of study. Page noticed that while it was trivial to follow links from one page to another, it was nontrivial to discover links back. In other words, when you looked at a Web page, you had no idea what pages were linking back to it. This bothered Page. He thought it would be very useful to know who was linking to whom.

Why? To fully understand the answer to that question, a minor detour into the world of academic publishing is in order. For professors – particularly those in the

2001

WHAT THEY WERE THINKING

THE STOCK PICKER

MARY MEEKER:

■ The Internet Summit always drew a who's who of the tech industry, but the atmosphere in 2001 was downbeat: The economy was cooling, and the value of Internet companies had plummeted. Naturally, I was nervous about my presentation. My team and I had just spent six months trying to figure out if we'd been flat-out wrong about our predictions of continued growth for the Internet sector. We'd recently posted 350 pages of research on the Web arguing that, in the long term, we would be proved correct. But I couldn't pinpoint when we'd see real revenue growth, which was the question on everyone's lips that day. I wound up comparing the Internet bubble to other big bangs of the past – like the California gold rush and the invention of the automobile. I told the audience that it might take 18 months for the industry to work through the excesses of the boom years and return to normal. I also told them to remember what normal means. Historically, 5 percent of tech companies created 90 percent of the wealth. ■

Meeker, Morgan Stanley analyst, at the Internet Summit in Carlsbad, California, in July 2001.

Inside.com breaks news with the Segway scooter, which Steve Jobs, Jeff Bezos, and John Doerr consider world-changing. It hits the market; world remains the same.



Couldn't deliver: Webvan declares bankruptcy after eating through \$1.2 billion.



VC John Doerr apologizes for referring to the Internet as "the largest legal creation of wealth in the history of the planet" and neglects to return his winnings.

The twin towers fall. A week later, the NYSE reopens and the Dow goes on to suffer the worst five-day slide since the Great Depression.

New economy poster child Enron files for bankruptcy.



Napster is ordered to stop distributing copyrighted music. A file-sharing boom ensues.

17,554 dotcom employees get pink slips. Most become real estate agents.

US Court of Appeals overturns lower court order to break up Microsoft.



JAN

FEB

APR

JUN

JUL

SEP

DEC

\$2.4
BILLION

Amount of damage caused by the Code Red computer worm.

hard sciences like mathematics and chemistry – nothing is as important as getting published. Except, perhaps, being cited.

Academics build their papers on a carefully constructed foundation of citation: Each paper reaches a conclusion by citing previously published papers as proof points that advance the author's argument. Papers are judged not only on their original thinking, but also on the number of papers they cite, the number of papers that subsequently cite them back, and the perceived importance of each citation. Citations are so important that there's even a branch of science devoted to their study: bibliometrics.

Fair enough. So what's the point? Well, it was Tim Berners-Lee's desire to improve this system that led him to create the World Wide Web. And it was Larry Page and Sergey Brin's attempts to reverse engineer Berners-Lee's World Wide Web that led to Google. The needle that threads these efforts together is citation – the practice of pointing to other people's work in order to build up your own.

Page began building out his crawler.

The idea's complexity and scale lured Brin to the job. A polymath who had jumped from project to project without settling on a thesis topic, he found the premise behind BackRub fascinating. "I talked to lots of research groups" around the school, Brin recalls, "and this was the most exciting project, both because it tackled the Web, which represents human knowledge, and because I liked Larry."

THE AUDACITY OF RANK

In March 1996, Page pointed his crawler at just one page – his homepage at Stanford – and let it loose. The crawler worked outward from there.

Crawling the entire Web to discover the sum of its links is a major undertaking, but simple crawling was not where BackRub's true innovation lay. Page was naturally aware of the concept of ranking in academic publishing, and he theorized that the structure of the Web's graph would reveal not just *who* was linking to whom, but more critically, the

Russian-born son of a NASA scientist and a University of Maryland math professor, emigrated to the US with his family at the age of 6. By the time he was a middle schooler, Brin was a recognized math prodigy. He left high school a year early to go to UM. When he graduated, he immediately enrolled at Stanford, where his talents allowed him to goof off. The weather was so good, he told me, that he loaded up on nonacademic classes – sailing, swimming, scuba diving. He focused his intellectual energies on interesting projects rather than actual course work.

Together, Page and Brin created a ranking system that rewarded links that came from sources that were important and penalized those that did not. For example, many sites link to IBM.com. Those links might range from a business partner in the technology industry to a teenage programmer in suburban Illinois who just got a ThinkPad for Christmas. To a human observer, the business partner is a more important link in terms of IBM's place in the world. But how



**THEY BEGGED. THEY
BORROWED. THEY BUILT
A COMPUTATIONAL
FRANKENSTEIN.**

Which brings us back to the original research Page did on such backlinks, a project he came to call BackRub.

He reasoned that the entire Web was loosely based on the premise of citation – after all, what is a link but a citation? If he could divine a method to count and qualify each backlink on the Web, as Page puts it "the Web would become a more valuable place."

At the time Page conceived of BackRub, the Web comprised an estimated 10 million documents, with an untold number of links between them. The computing resources required to crawl such a beast were well beyond the usual bounds of a student project. Unaware of exactly what he was getting into,

importance of who linked to whom, based on various attributes of the site that was doing the linking. Inspired by citation analysis, Page realized that a raw count of links to a page would be a useful guide to that page's rank. He also saw that each link needed its own ranking, based on the link count of its originating page. But such an approach creates a difficult and recursive mathematical challenge – you not only have to count a particular page's links, you also have to count the links attached to the links. The math gets complicated rather quickly.

Fortunately, Page was now working with Brin, whose prodigious gifts in mathematics could be applied to the problem. Brin, the

might an algorithm understand that fact?

Page and Brin's breakthrough was to create an algorithm – dubbed PageRank after Page – that manages to take into account both the number of links into a particular site and the number of links into each of the linking sites. This mirrored the rough approach of academic

From The Search: How Google and Its Rivals Rewrote the Rules of Business and Transformed Our Culture, copyright © by John Battelle, to be published in September by Portfolio, a member of Penguin Group (USA), Inc. Battelle (battellemedia.com) was one of the founders of Wired.

2002

WHAT THEY WERE THINKING

THE IPOD EVANGELIST

STEVE JOBS:

“We’d decided that the iPod was too big to keep in the Mac universe, which turned out to be the right decision. A little less than a year after this photo was taken, we shipped our millionth iPod, which wouldn’t have been possible without the Windows market. This MacWorld was also memorable because it was the culmination of an intense period of development for us. When hard times came to the tech sector, we went to our investors and said, ‘We’re going to spend more on R&D and innovate our way out of this downturn.’ We did, but it was rough. I remember the summer after the crash just about every company in the Valley canceled its intern program. Interns coming from the East Coast were getting off the plane only to be told, ‘We’re sorry, your job’s been canceled.’ We were the only large company in the Valley that year to keep its intern program, and that was indicative of our approach. The kinds of products that emerged the year this shot was taken – the new iPod and iTunes and applications like Final Cut Pro and the iLife suite – germinated during that period of uncertainty.”

Jobs, Apple CEO, introducing the iPod for Windows at MacWorld Expo in New York City in July 2002.

**\$135
MILLION**

Approximate GDP of Norrath, which makes the fictional *EverQuest* world the 220th-richest country in the world, ahead of Anguilla.

544 million people around the globe now use the Internet.

Programmer Bram Cohen unveils BitTorrent at a hacker conference in San Francisco. File-sharing becomes Hollywood’s problem.



Nerd love: Nearly 6 million people visit Match.com in a single month. Total revenue for online personals jumps sixfold in a year.



Proforma nation: Adelphia, Tyco, Global Crossing, Citigroup, and Qwest are probed for accounting irregularities as the year of the corporate scandal mercifully comes to an end.

WORLD.COM

SEC files fraud charges against WorldCom after the company admits to inflating profits by \$3.9 billion; 17,000 people lose their jobs.

Explorer’s market share peaks at 96 percent. Bill Gates rests.



Nasdaq drops to 1,114.11, its lowest point in six years.

JAN

FEB

JUN

OCT

DEC

2003

WHAT THEY WERE THINKING



Dean, presidential candidate, at his Burlington, Vermont, headquarters in July 2003.

THE CANDIDATE

HOWARD DEAN:

“Dick Cheney was holding a \$2,000-a-plate fundraising lunch, so we asked Americans all over the country to join me the same day for a lunch in front of their computers. It sparked a huge response, and, amazingly, the online contributions from that day matched what Cheney made from his fundraiser. It showed that our campaign, and that of other Democrats, could remain competitive thanks to a growing base of people donating small amounts. A lot of people talked about how our campaign revolutionized the use of the Internet to raise money. But the Internet isn’t magic, it’s just a tool that can be used to do things differently. We treated it as a community, and we grew the community into something that has lasted long after the campaign ended. The Internet let us build that community in real time, on a massive scale, and that lunch helped us do that. The turkey sandwich wasn’t bad either.”

**\$750
MILLION**

Amount paid by Microsoft to settle an antitrust lawsuit filed by the Netscape division of AOL.



Busted! Valley investment banker Frank Quattrone is indicted for obstruction of justice and witness tampering.

File-sharing tool Kazaa becomes the most downloaded software in history.

Bay Area unemployment reaches 6.9 percent, nearly triple what it was three years ago.

Hoping to identify and sue some 900 alleged file-traders, the RIAA subpoenas Internet service providers.

Mobile madness: With 520 million units sold worldwide, cell phones log record year.

Comdex is dead. Annual computer trade show is canceled just three years after attracting crowds of more than 200,000.

Tennessee parents blame *Grand Theft Auto* for a shooting spree that killed their son, and go after Rockstar Games and Sony for \$246 million.



Hard disk storage drops below \$1 per gigabyte. 1998 price: \$43.

China tries to stymie news of killer SARS virus, but information leaks on the Internet and is passed around by email and SMS.

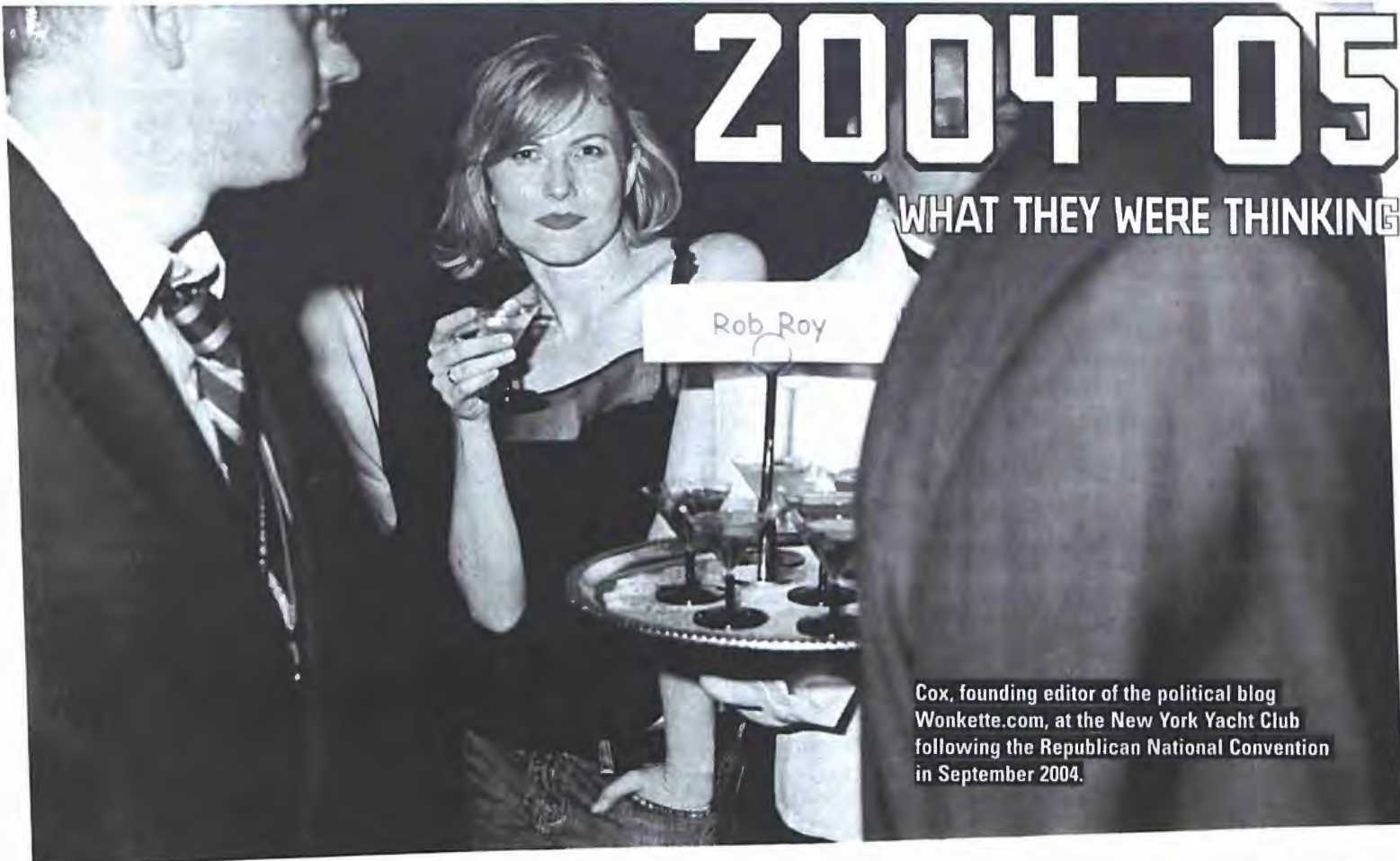


Starbucks offers over-priced Wi-Fi to go with its overpriced coffee.

JAN FEB ■ MAY JUN JUL ■ SEP ■ NOV DEC

2004-05

WHAT THEY WERE THINKING



Cox, founding editor of the political blog Wonkette.com, at the New York Yacht Club following the Republican National Convention in September 2004.

THE CELEBRITY BLOGGER

ANA MARIE COX:

■ That whole evening was surreal. This was the first year the political parties allowed bloggers to attend the conventions, and this shot was of me at a party thrown by the Distilled Spirits Council of the United States – my favorite lobby of all time. I was totally reveling in the moment. I was a blogger, and here I was at the New York Yacht Club drinking free booze surrounded by all these well-connected young Republicans. I felt incredibly conspicuous in Levis and this shirt I'd literally cut the sleeves off of 30 minutes before because I'd decided they were too frilly. This was a ridiculous period – there were more stories about bloggers covering the convention than there were things for us to write about. Conventions are such incredibly stage-managed things that reporters are starving for anything they can claim is different from four years ago. So it became 'Bloggers are here!' I'm sure that as soon as they can figure out how to get podcasters on TV, bloggers will disappear. ■

8.6
MILLION

Number of Americans trading songs online at any given time – double the 2003 figure.

Blog startup Gawker Media launches third site, Wonkette.

Silicon Bolly: The House of Representatives holds hearings on Indian outsourcing. More than 3 million domestic IT jobs are predicted to go offshore by 2015.



Jon Stewart's *Crossfire* appearance reaches a bigger audience online than on TV – and sends Tucker Carlson packing.

Just one more bubble: Google raises \$1.7 billion in its IPO.

Mother of God: Virgin Mary grilled cheese sells for \$28,000 on eBay.



It's baaaack. Next-gen Mozilla browser Firefox launches.



IBM sells its PC division to Chinese IT power Lenovo.

Gawker Media launches its 13th site, a gambling blog called Oddjack. Somewhere on the horizon, a blog IPO looms.

Justices 9, Grokster 0: The Supreme Court rules that P2P firms can be sued for encouraging users to swap copyrighted content.

JAN • • • • • AUG • • • • • OCT NOV DEC • • • • • JUN

citation-counting. It worked. In the example above, let's assume that only a few sites linked to the teenager's site. Let's further assume the sites that link to the teenager's are similarly bereft of links. By contrast, thousands of sites link to Intel, and those sites, on average, also have thousands of sites linking to them. PageRank would rank the teen's site as less important than Intel's – at least in relation to IBM.

This is a simplified view, to be sure, and Page and Brin had to correct for any number of mathematical culs-de-sac, but the long and the short of it was this: More popular sites rose to the top of their annotation list, and less popular sites fell toward the bottom.

As they fiddled with the results, Brin and Page realized their data might have implications for Internet search. In fact, the idea of applying BackRub's ranked page results to search was so natural that it didn't even occur to them that they had made the leap. As it was, BackRub already worked like a search engine – you gave it a URL, and it gave you a list of backlinks ranked by importance. "We realized that we had a querying tool," Page recalls. "It gave you a good overall ranking of pages and ordering of follow-up pages."



Page and Brin noticed that BackRub's results were superior to those from existing search engines like AltaVista and Excite, which often returned irrelevant listings. "They were looking only at text and not considering this other signal," Page recalls. That signal is now better known as PageRank. To test whether it worked well in a search application, Brin and Page hacked together a BackRub search tool. It searched only the words in page titles and applied PageRank to sort the results by relevance, but its results were so far superior to the usual search engines – which ranked mostly on keywords – that Page and Brin knew they were onto something big.

Not only was the engine good, but Page and Brin realized it would scale as the Web scaled. Because PageRank worked by analyzing links, the bigger the Web, the better the engine. That fact inspired the founders to name their new engine Google, after googol, the term for the numeral 1 followed by 100 zeroes. They released the first version of Google on the Stanford Web site in August 1996 – one year after they met.

Among a small set of Stanford insiders, Google was a hit. Energized, Brin and Page began improving the service, adding full-text search and more and more pages to the index. They quickly discovered that search engines require an extraordinary amount of computing resources. They didn't have the money to buy new computers, so they begged and borrowed Google into existence – a hard drive from the network lab, an idle CPU from the computer science loading docks. Using Page's dorm room as a machine lab, they fashioned a computational Frankenstein from spare parts, then jacked the whole thing into Stanford's broadband campus network. After filling Page's room with equipment, they converted Brin's dorm room

A COMPANY EMERGES

As Brin and Page continued experimenting, BackRub and its Google implementation were generating buzz, both on the Stanford campus and within the cloistered world of academic Web research.

One person who had heard of Page and Brin's work was Cornell professor Jon Kleinberg, then researching bibliometrics and search technologies at IBM's Almaden center in San Jose. Kleinberg's hubs-and-authorities approach to ranking the Web is perhaps the second-most-famous approach to search after PageRank. In the summer of 1997, Kleinberg visited Page at Stanford to compare notes. Kleinberg had completed an early draft of his seminal paper, "Authoritative Sources," and Page showed him an early working version of Google. Kleinberg encouraged Page to publish an academic paper on PageRank.

Page told Kleinberg that he was wary of publishing. The reason? "He was concerned that someone might steal his ideas, and with PageRank, Page felt like he had the secret formula," Kleinberg told me. (Page and Brin eventually did publish.)

**THE PROJECT WAS
GROWING SO FAST
IT CRASHED THE
STANFORD NETWORK.**

into an office and programming center.

The project grew into something of a legend within the computer science department and campus network administration offices. At one point, the BackRub crawler consumed nearly half of Stanford's entire network bandwidth, an extraordinary fact considering that Stanford was one of the best-networked institutions on the planet. And in the fall of 1996 the project would regularly bring down Stanford's Internet connection.

"We're lucky there were a lot of forward-looking people at Stanford," Page recalls. "They didn't hassle us too much about the resources we were using."

On the other hand, Page and Brin weren't sure they wanted to go through the travails of starting and running a company. During Page's first year at Stanford, his father died, and friends recall that Page viewed finishing his PhD as something of a tribute to him. Given his own academic upbringing, Brin, too, was reluctant to leave the program.

Brin remembers speaking with his adviser, who told him, "Look, if this Google thing pans out, then great. If not, you can return to graduate school and finish your thesis." He chuckles, then adds: "I said, 'Yeah, OK, why not? I'll just give it a try.'" ■ ■ ■