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**From Science Papers to Technology Patents to
Company Financial Performance**

Presented by:
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WIPO-OECD Workshop on Statistics in the Patent Field
Geneva Sept 18, 2003

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**CHI Research is a Highly Specialized
Citation Research Consultancy**

TRACES Study: Precursor to CHI
Science Indicators since 1970's
Technology Indicators since 1980's
Linkage Indicators since 1990's

Published 140+ research papers
Featured in the New York Times, Business Week
MIT Tech. Review, and other media

Investor Tech-Line®
Financial Application of Technology Indicators

U.S. Patent No. 6,175,824
"Method and Apparatus for Choosing a Stock Portfolio, Based on
Patent Indicators"

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There are Three Kinds of Bibliometric Analysis

Science
Papers citing Papers

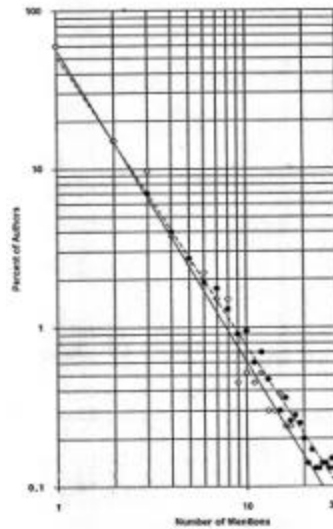
Technology
Patents citing Patents

Linkage
Patents Citing Papers
&
Stock Performance

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Publication Frequency for Authors is highly concentrated (replotted from Lotka, 1926)

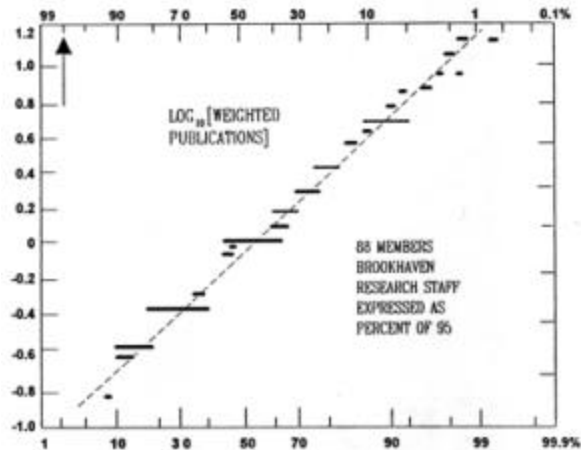


Logarithmic frequency diagram showing number of authors mentioned once, twice, etc. in Auerbach's tables (points indicated by diamonds) and in Chemical Abstracts, letters A and B (points indicated by circles).

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- High Concentration continues within organizations
(replotted from Shockley, 1957)

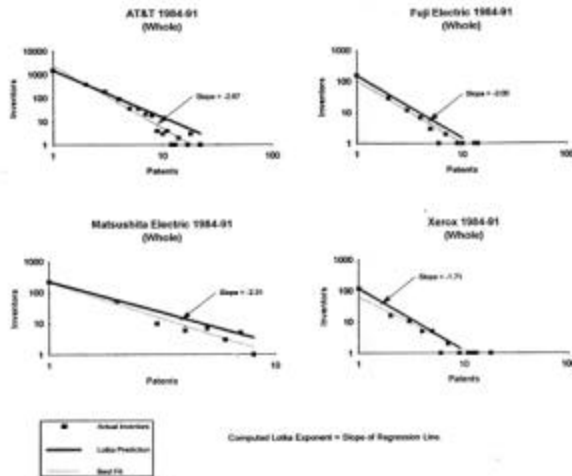


Cumulative distribution of logarithm of 'weighted' rate of publication at Brookhaven National Laboratory plotted on probability paper.

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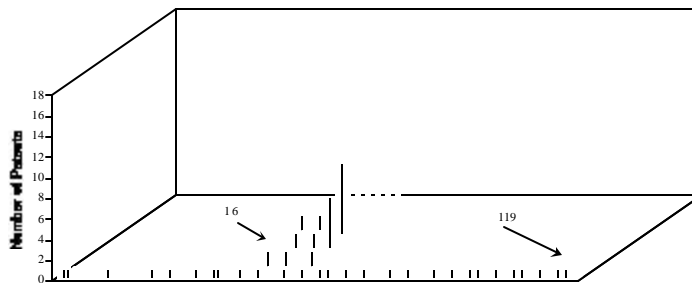
- High Concentration also occurs in patenting: Whole Patent Count Plots -- Semiconductors



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- **A Few Key Inventors Drive an Entire Lab.**
- **Xerox Semiconductor Inventors 1981-87**

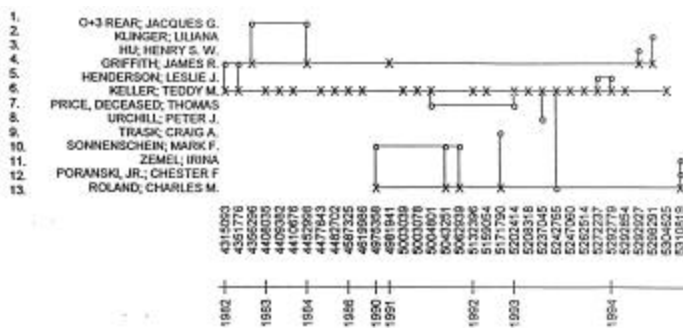


Each stick represents 1 Xerox Inventor: the height is the number of his/her patents in the 8 year period.

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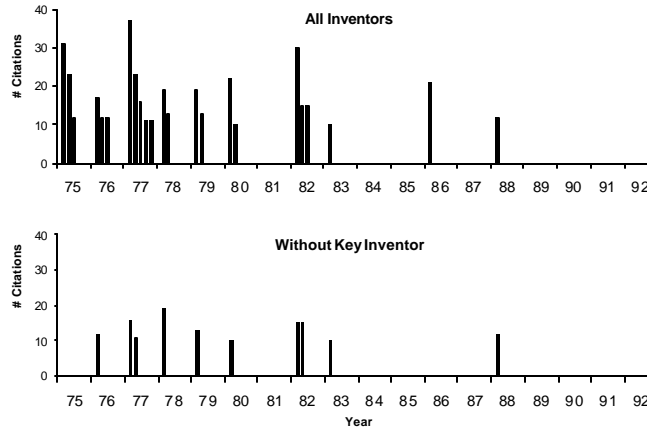
- **U.S. Naval Research Lab: Brainmap of Teddy Keller & Associates**



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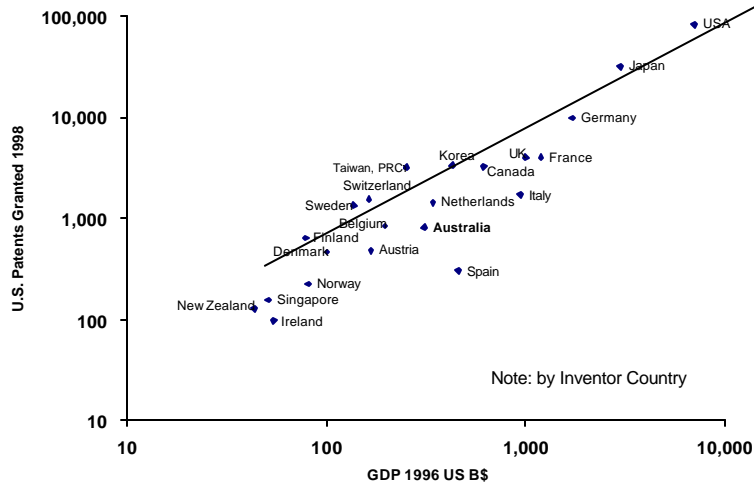
Highly Cited Patents by Year for Company X



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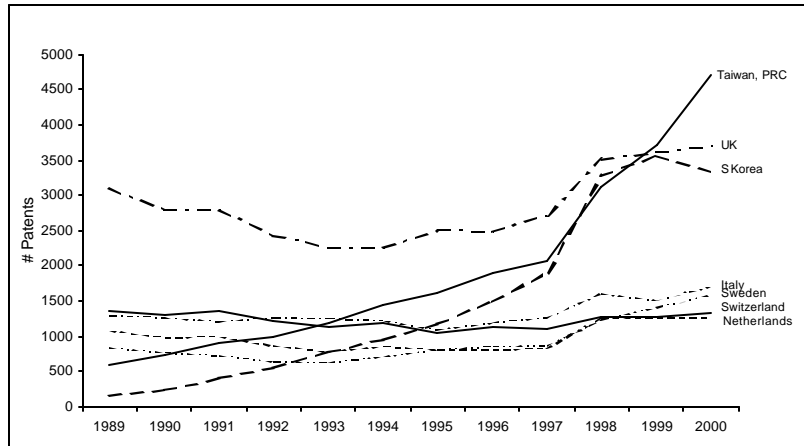
Patenting in the U.S. is Representative of International Technology



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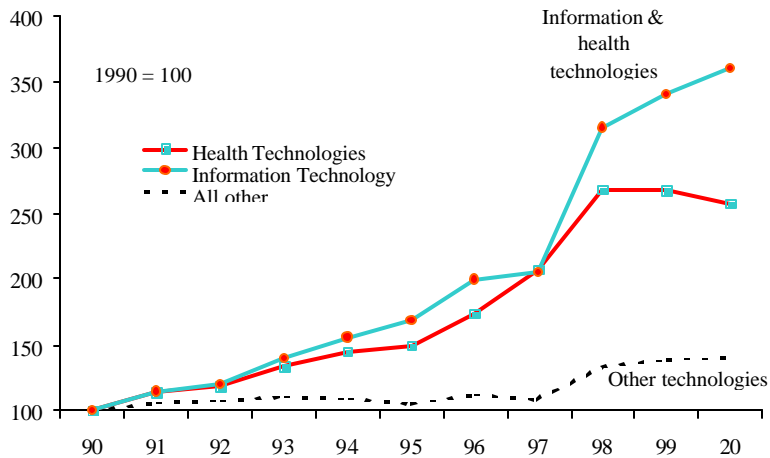
Patenting Changes with Economic Change



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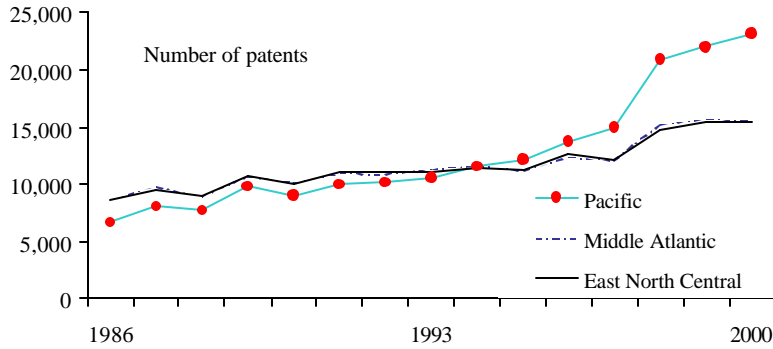
Growth in US Inventor Patenting



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• **Patenting From the Pacific Region Overtakes**
 • **the Largest East Coast Regions**

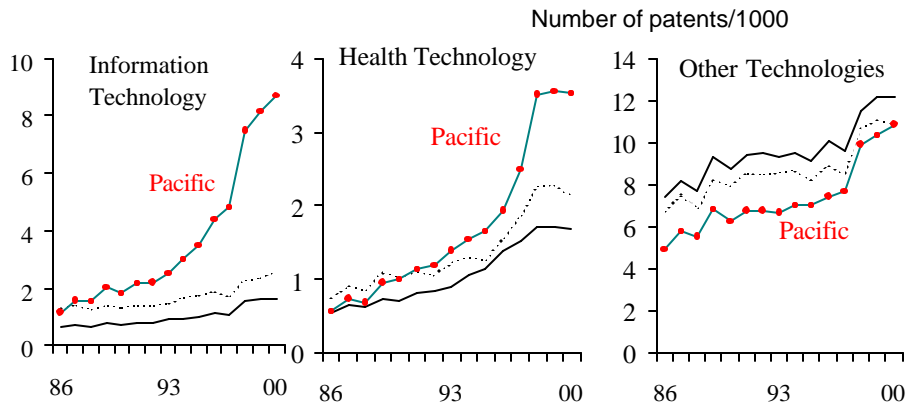


East North Central = Illinois, Indiana, Michigan, Ohio, Wisconsin
 Middle Atlantic = New Jersey, New York, Pennsylvania
 Pacific = California, Nevada, Oregon, Washington, Hawaii, Alaska

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• **Information and Health Technologies Give**
 • **the Pacific Region Its Lead**

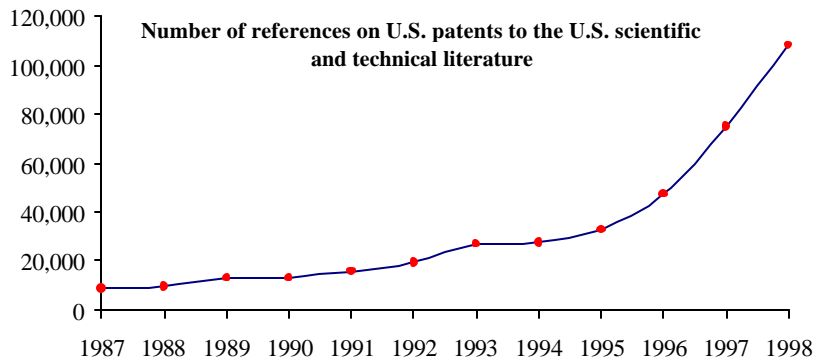


East North Central = Illinois, Indiana, Michigan, Ohio, Wisconsin
 Middle Atlantic = New Jersey, New York, Pennsylvania
 Pacific = California, Nevada, Oregon, Washington, Hawaii, Alaska

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• **The Amount of Science Cited in U.S. Patents**
 • **Quadrupled between 1994 and 1998**

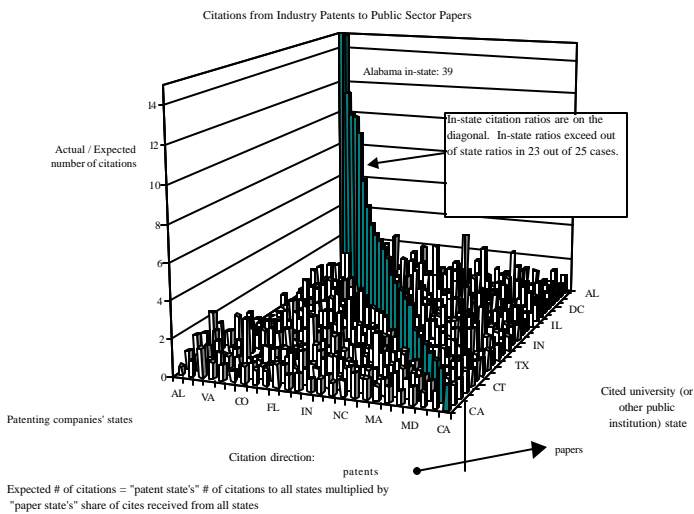


Source: Science & Engineering Indicators and CHI Research, Inc.

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• **U.S. Companies Preferentially Cite In-state**
 • **Public Sector Science in Their Patents**

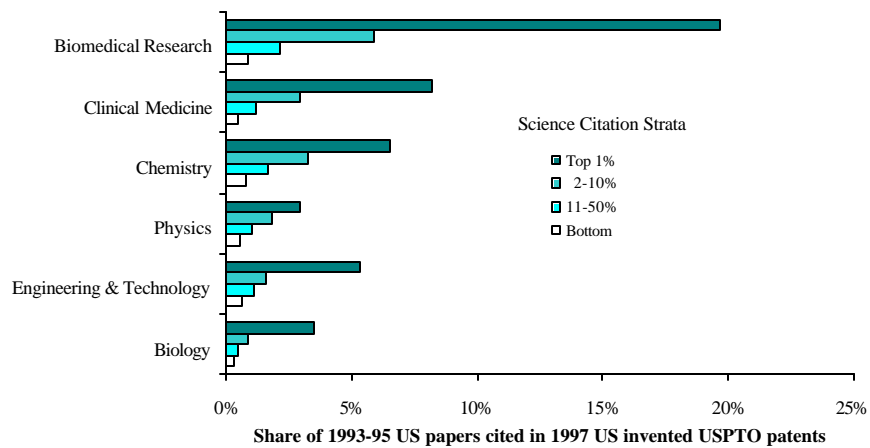


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Highly Cited Papers are Much More Likely to be Cited in Patents



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Quality Technology is Valuable

Patent citation indicators can identify
technologically strong companies
which are undervalued by the market

A portfolio built of these undervalued companies will far outperform any standard index.

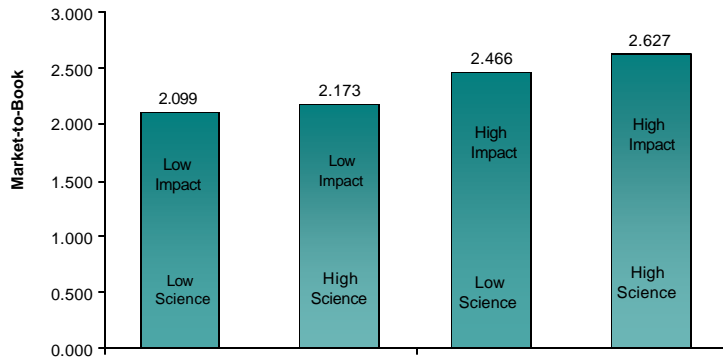
The number of patents a company has is not significant in the regression – it is the citation indicators that count.

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- **Background: 1999 Financial Analysts Journal Paper by Deng, Lev and Narin**

*Median Market-to-Book Ratios of Chemical Companies
Classified by Patent Impact & Science Linkage in
the Previous 3 Years*

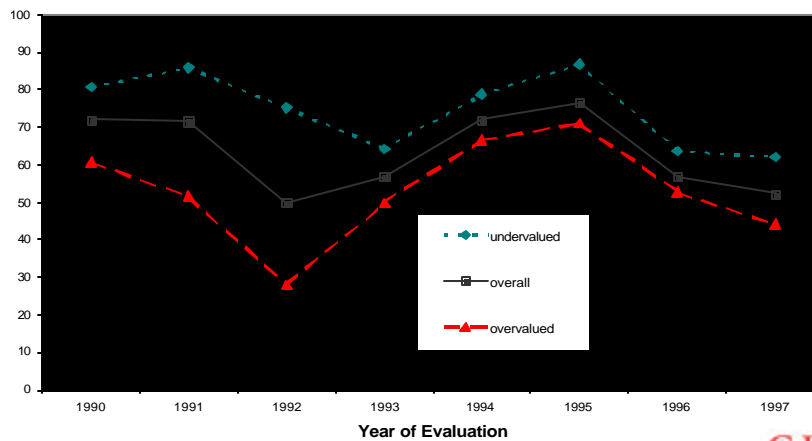


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- **Companies Undervalued Based on Patent Scores are More Likely to Experience Increased Market-to-Book.**

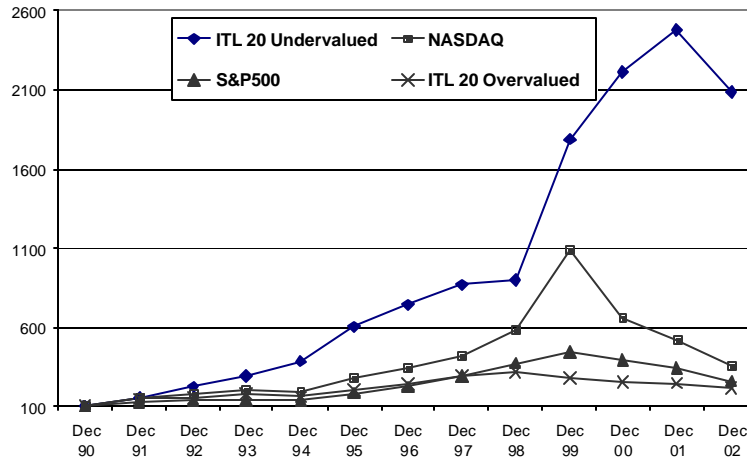
*Percent of Companies with Increased Market to Book
2 Years after Patent Evaluation*



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Investor Tech-Line® Performance

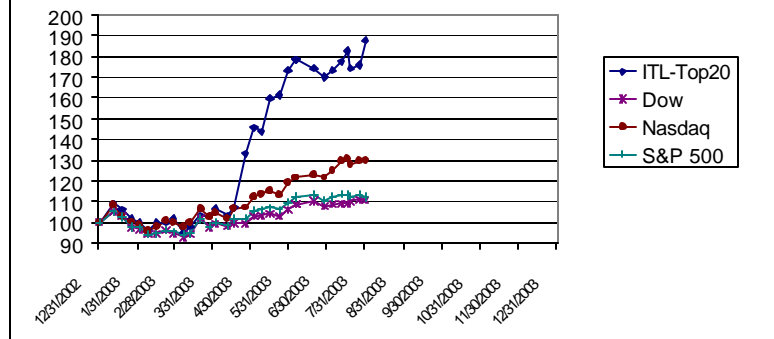


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2003 TechWatch Performance

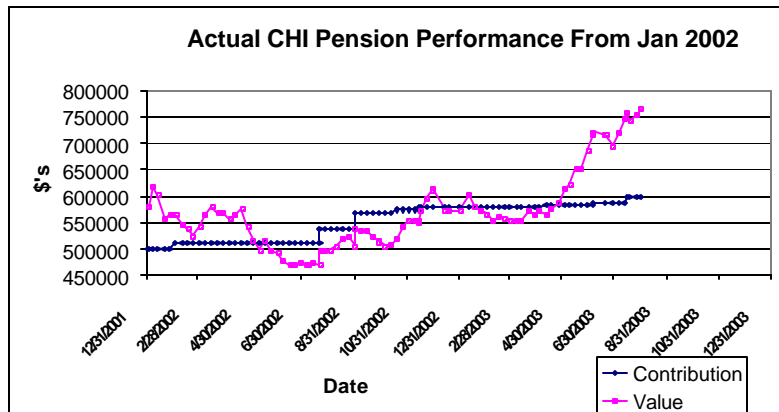
TechWatch Top 20 Performance From 12/31/02



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Real Performance With Top TechWatch Stocks



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Observations

Research Productivity is highly concentrated in key individuals

West Coast Overtaking East Coast

Public Science Impacts Locally

High Quality Science Impacts Technology

Quality Patent Portfolio Beats Market Averages

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