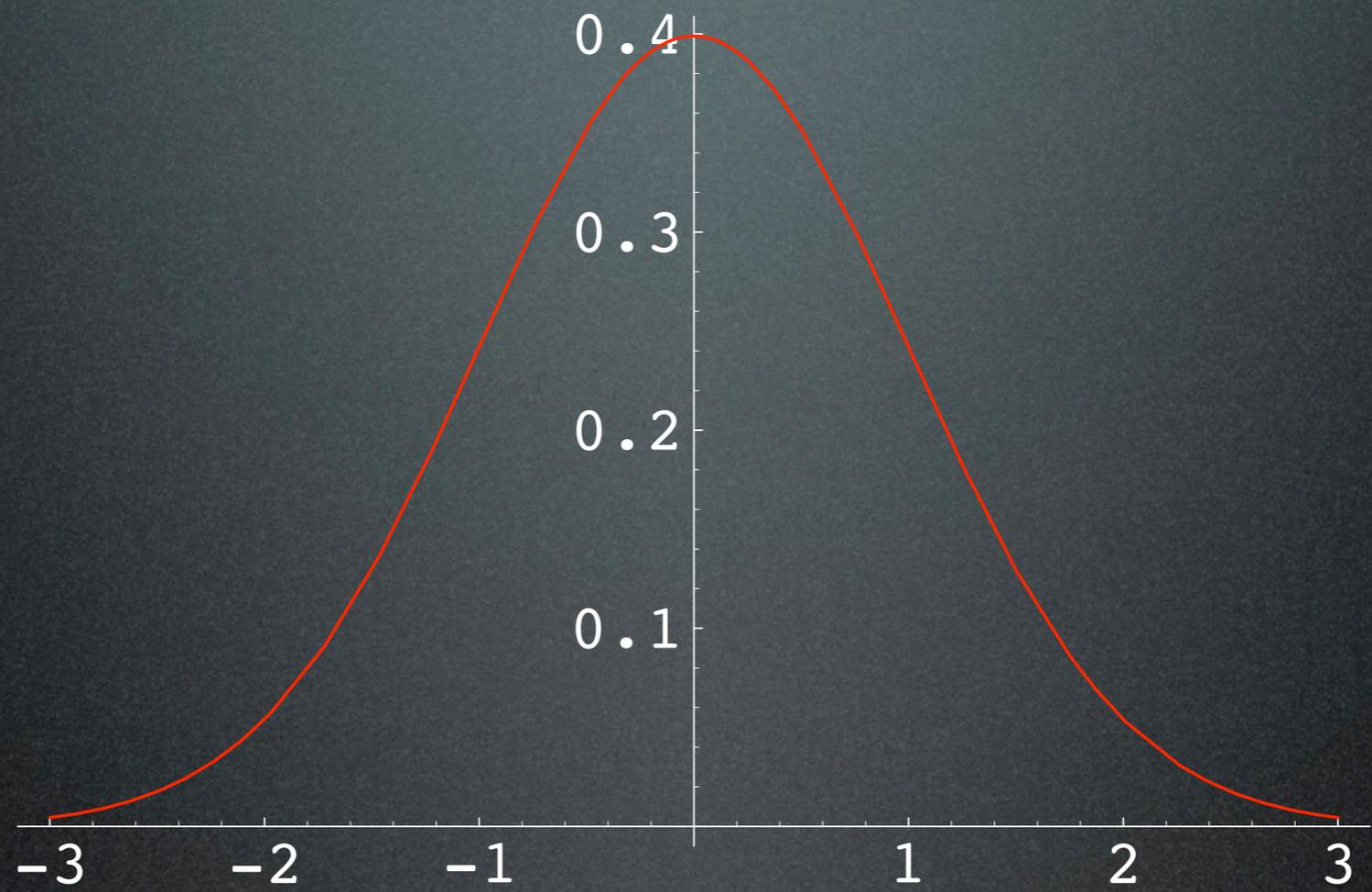
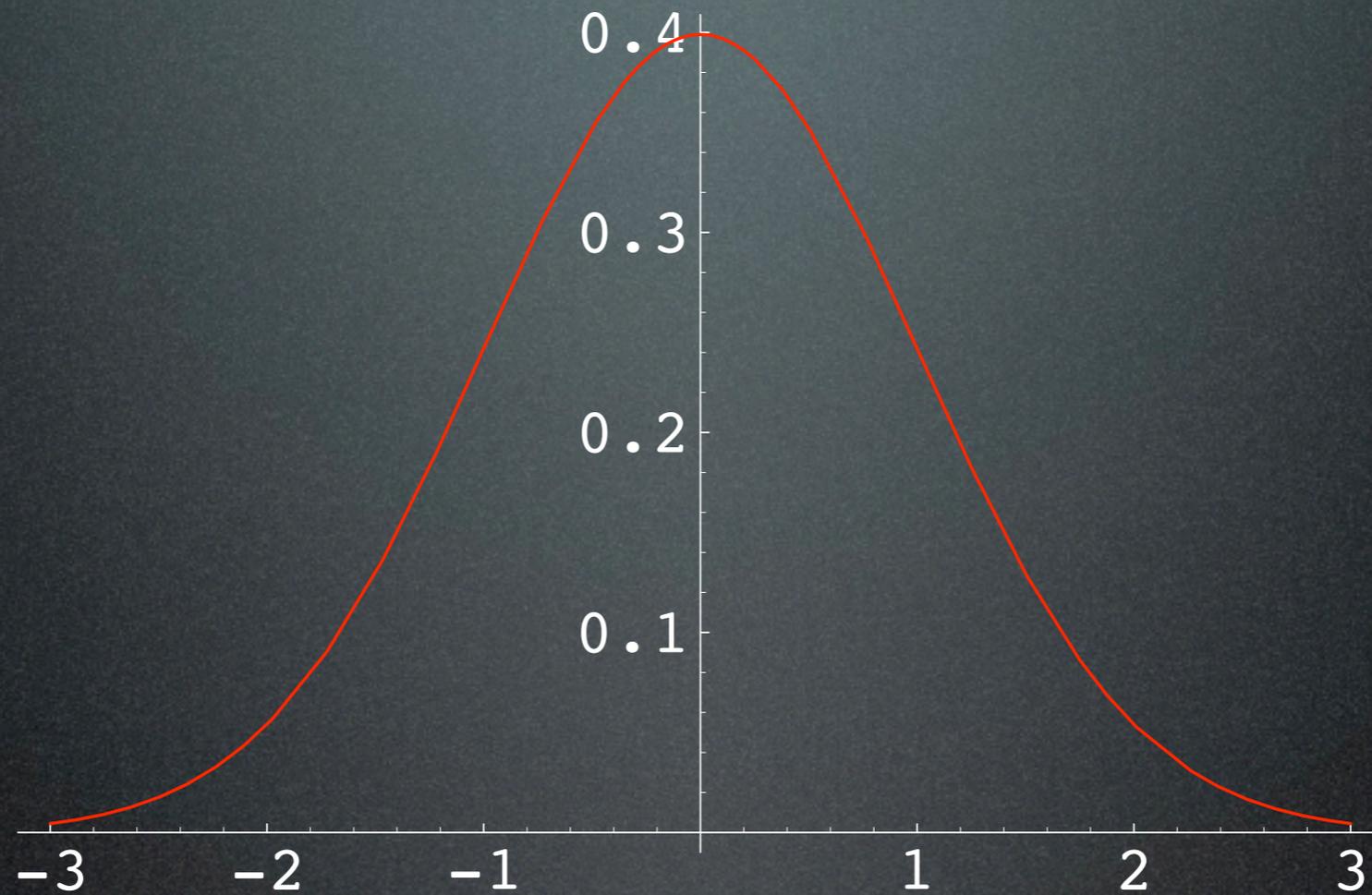


Power Laws, Longtails, & Software

Phillip J. Windley, Ph. D.

www.windley.com





Normal Distribution

Pretend Networks

What if we **simulate** networks by adding links at random nodes according to a **normal** distribution?

Pretend Networks

What if we **simulate** networks by adding links at random nodes according to a **normal** distribution?

if (avg[links/node] < 1)
then disconnected islands
else fully connected

Real Networks

Real network connection distributions follow this equation:

$$y = px^{-k}$$

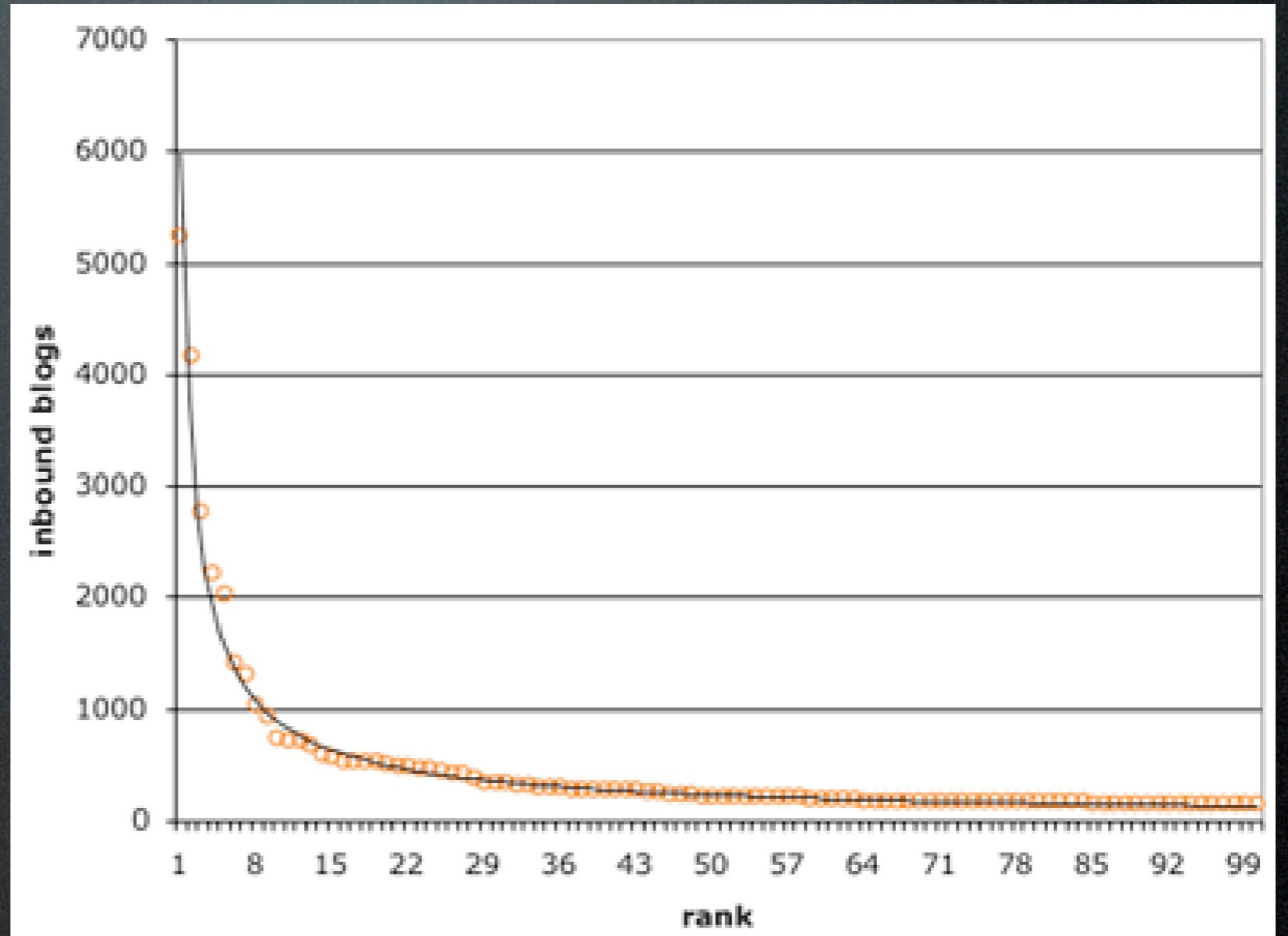
Surprise!

So do the distributions of:

- **Earthquakes** vs Richter magnitude
- **Actors** who've starred in the same films
- Journal **citations**
- **Links** between Web sites
- **Visits** to Web sites by AOL users



Clay Shirky



Blogs



Peter Denning

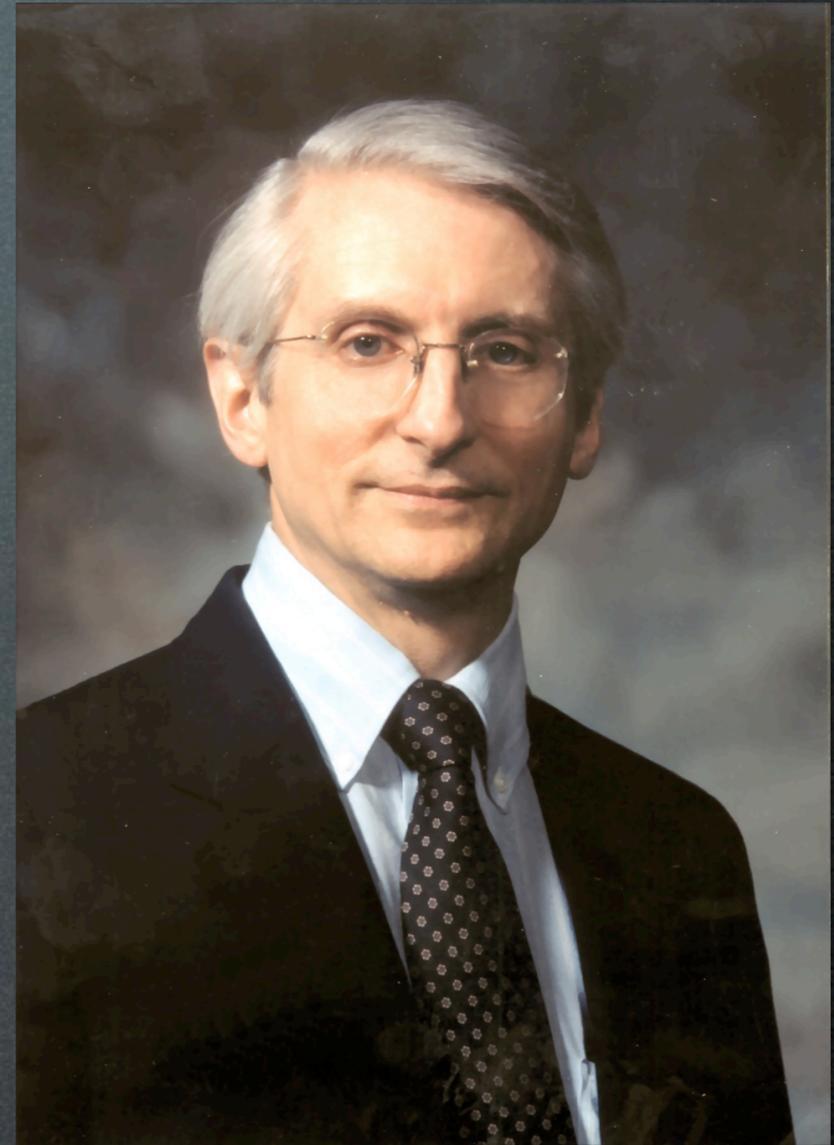
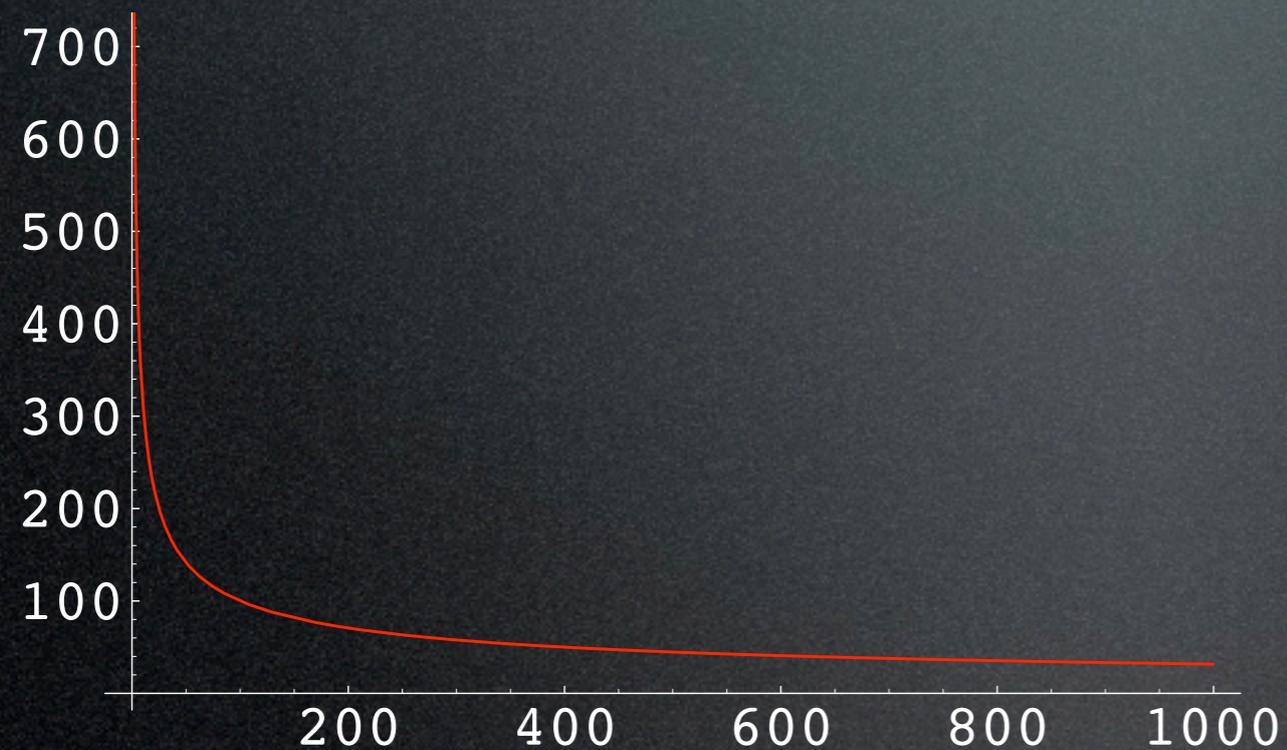
Power-law Distributions



Peter Denning

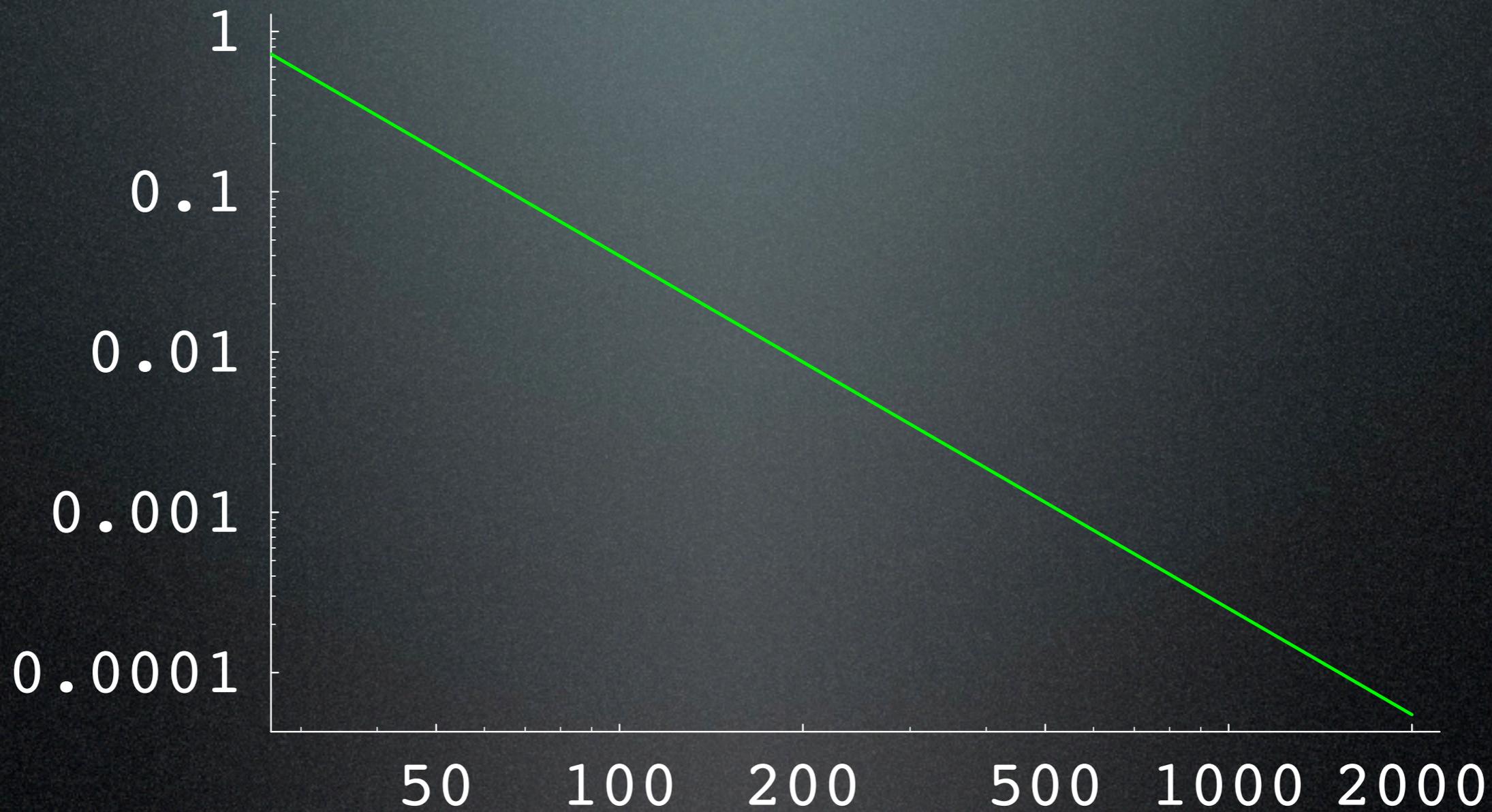
Power-law Distributions

$$k = -0.5, \alpha = 1000$$



Peter Denning

{ $k=2.2$ }



Growing Scale-Free

Two conditions:

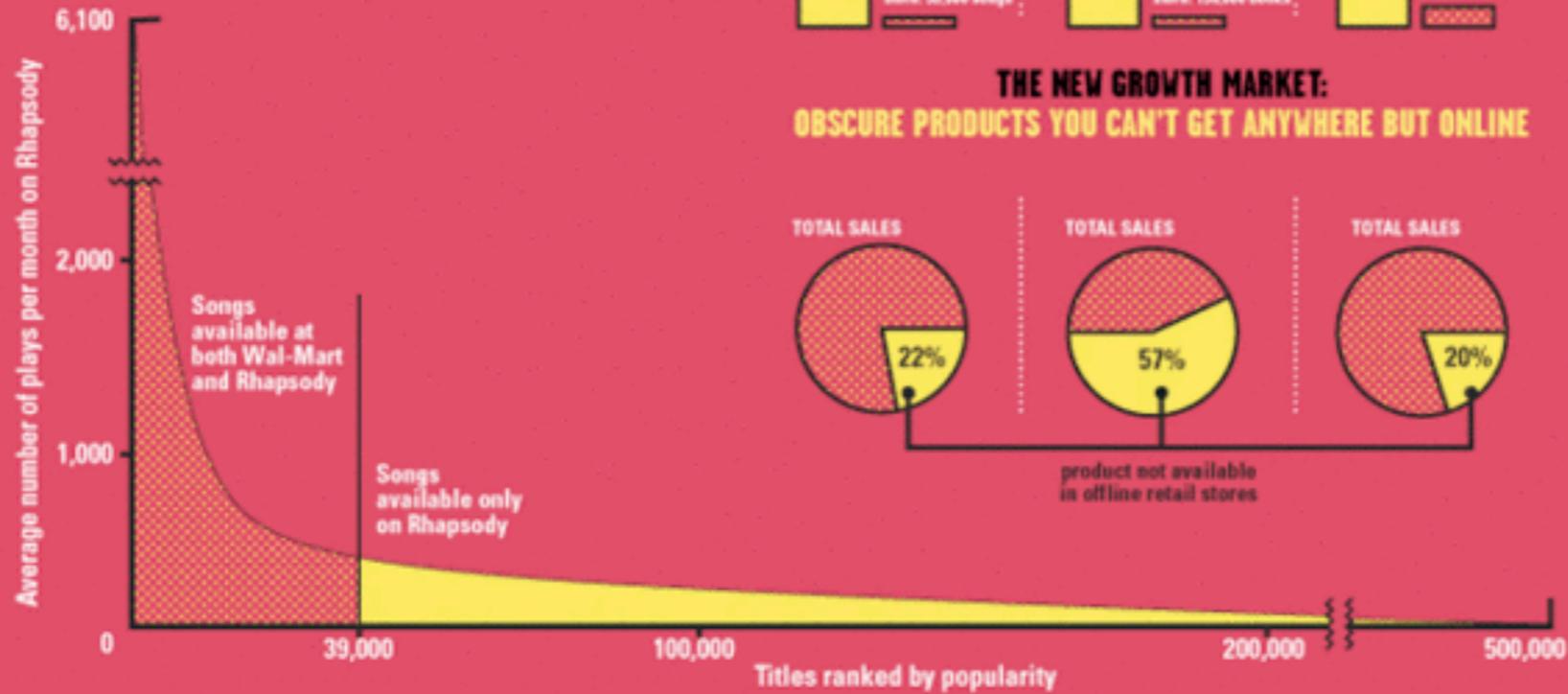
- **Growth:** New nodes appear at random times
- **Preferential connection:** probability a new node will connect with an existing node is proportional to the connectivity of that node

The Longtail



ANATOMY OF THE LONG TAIL

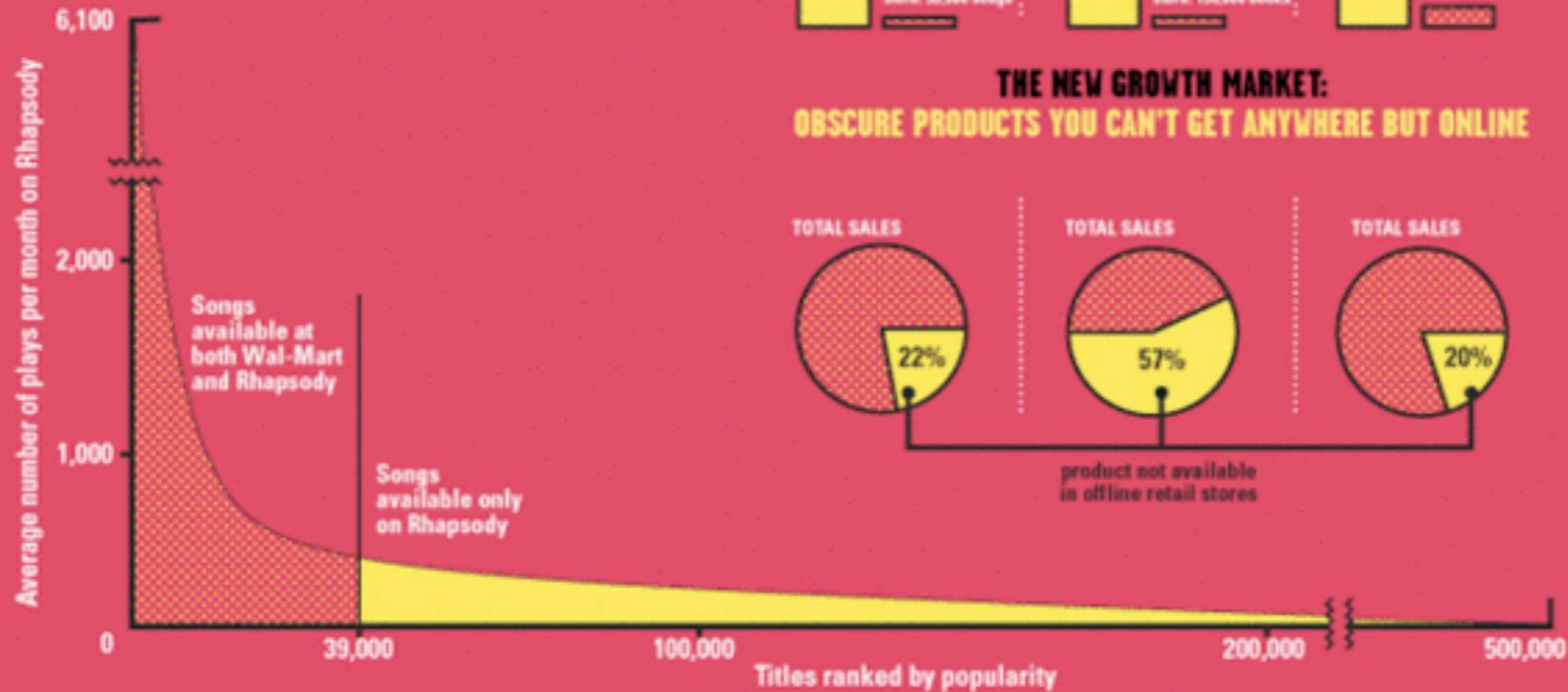
Online services carry far more inventory than traditional retailers. Rhapsody, for example, offers 19 times as many songs as Wal-Mart's stock of 39,000 tunes. The appetite for Rhapsody's more obscure tunes (charted below in yellow) makes up the so-called Long Tail. Meanwhile, even as consumers flock to mainstream books, music, and films (right), there is real demand for niche fare found only online.



Sources: Erik Brynjolfsson and Jeffrey Hu, MIT, and Michael Smith, Carnegie Mellon; Barnes & Noble; Netflix; RealNetworks

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Virtually **Free** Distribution
+ **Infinite** Shelf Space
=
New Business Models based on
Customer **Streams**

Not Just Media

- Google: advertising
- eBay: hard goods
- CapitalOne: customers
- Offshoring: services

Source: Chris Anderson

FOSS is all about the
longtail

Database Licensing

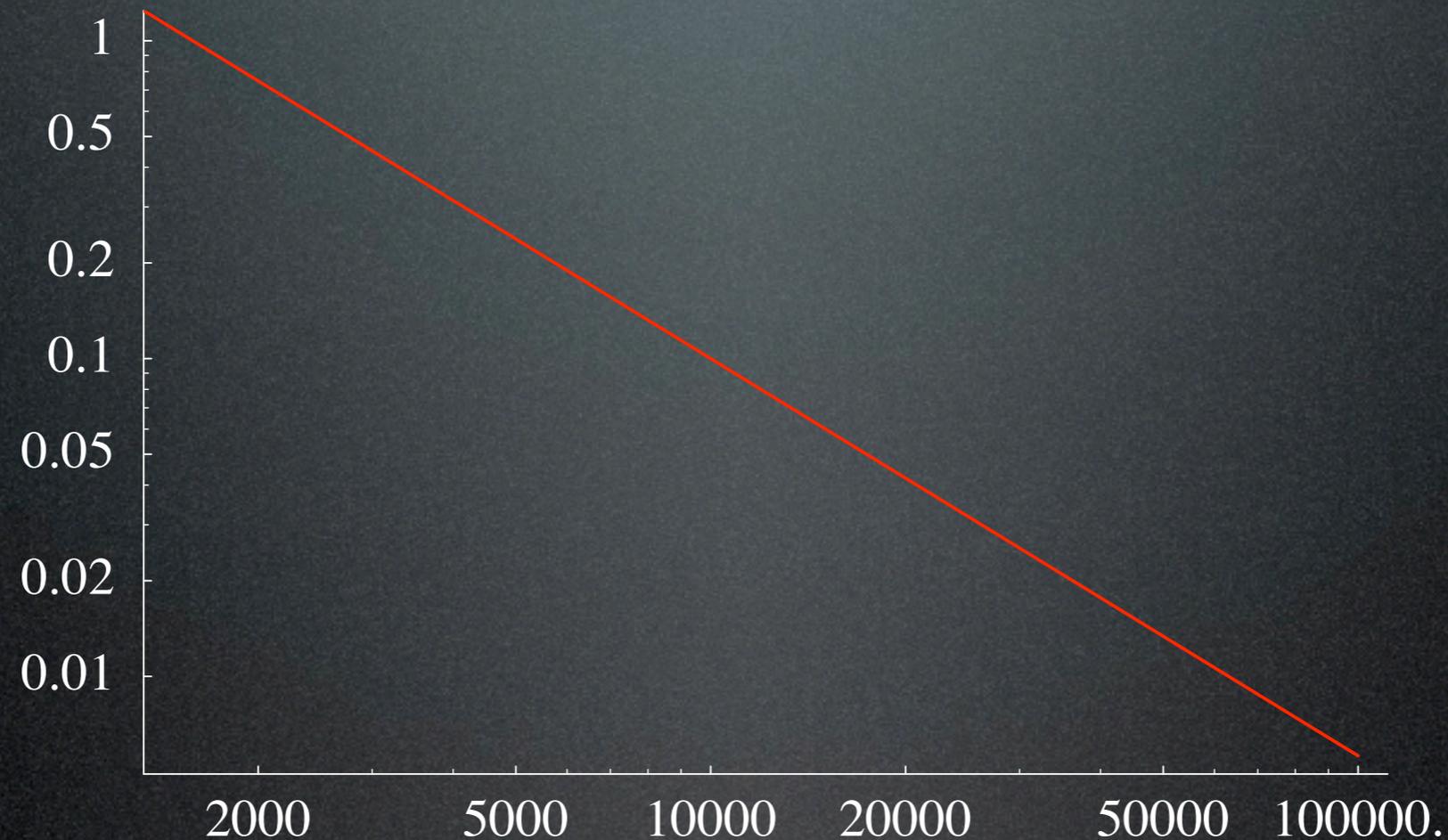
Database Licensing

{ \$ in Millions }



Database Licensing

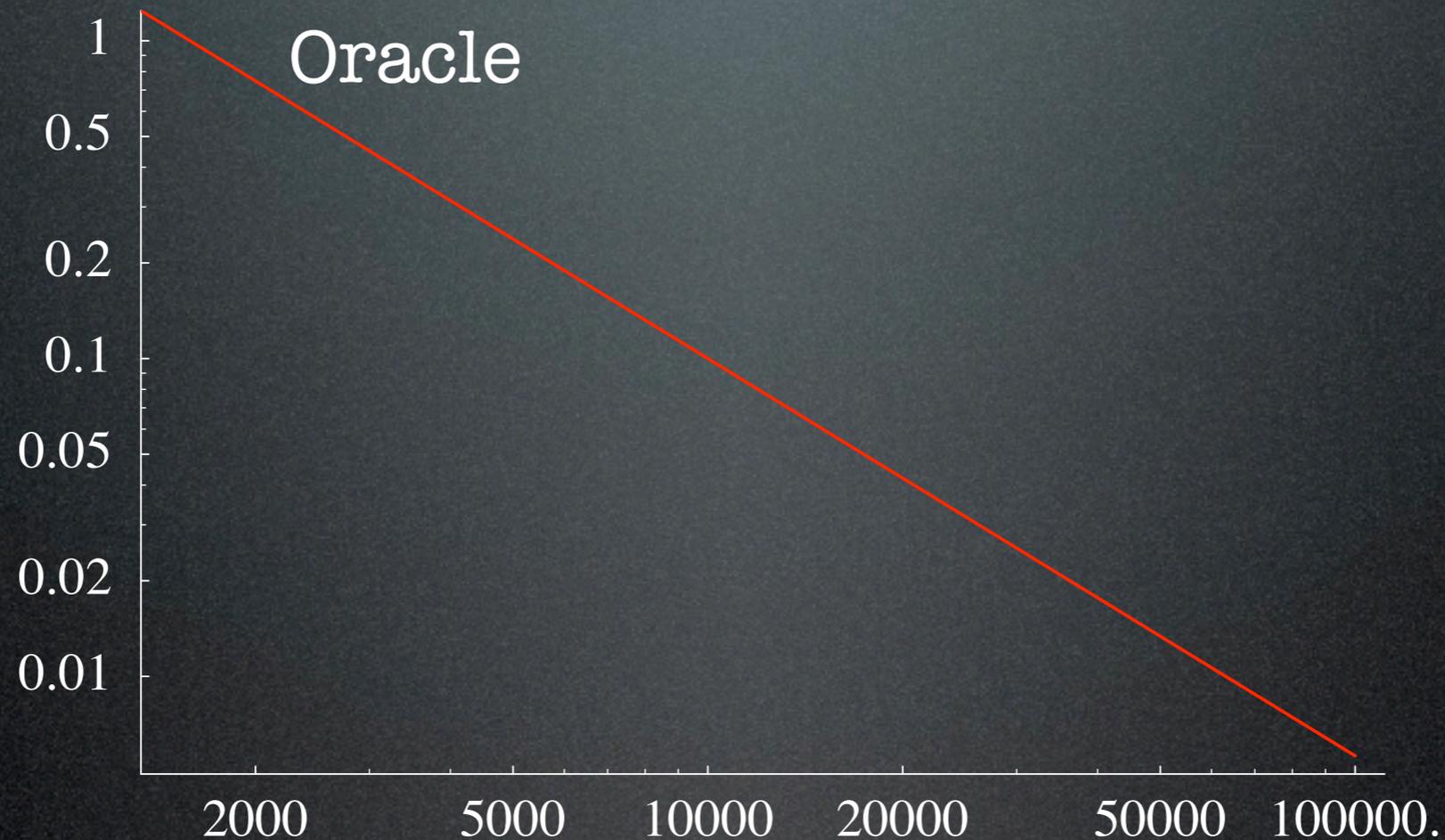
{ \$ in Millions }



An Alternate View

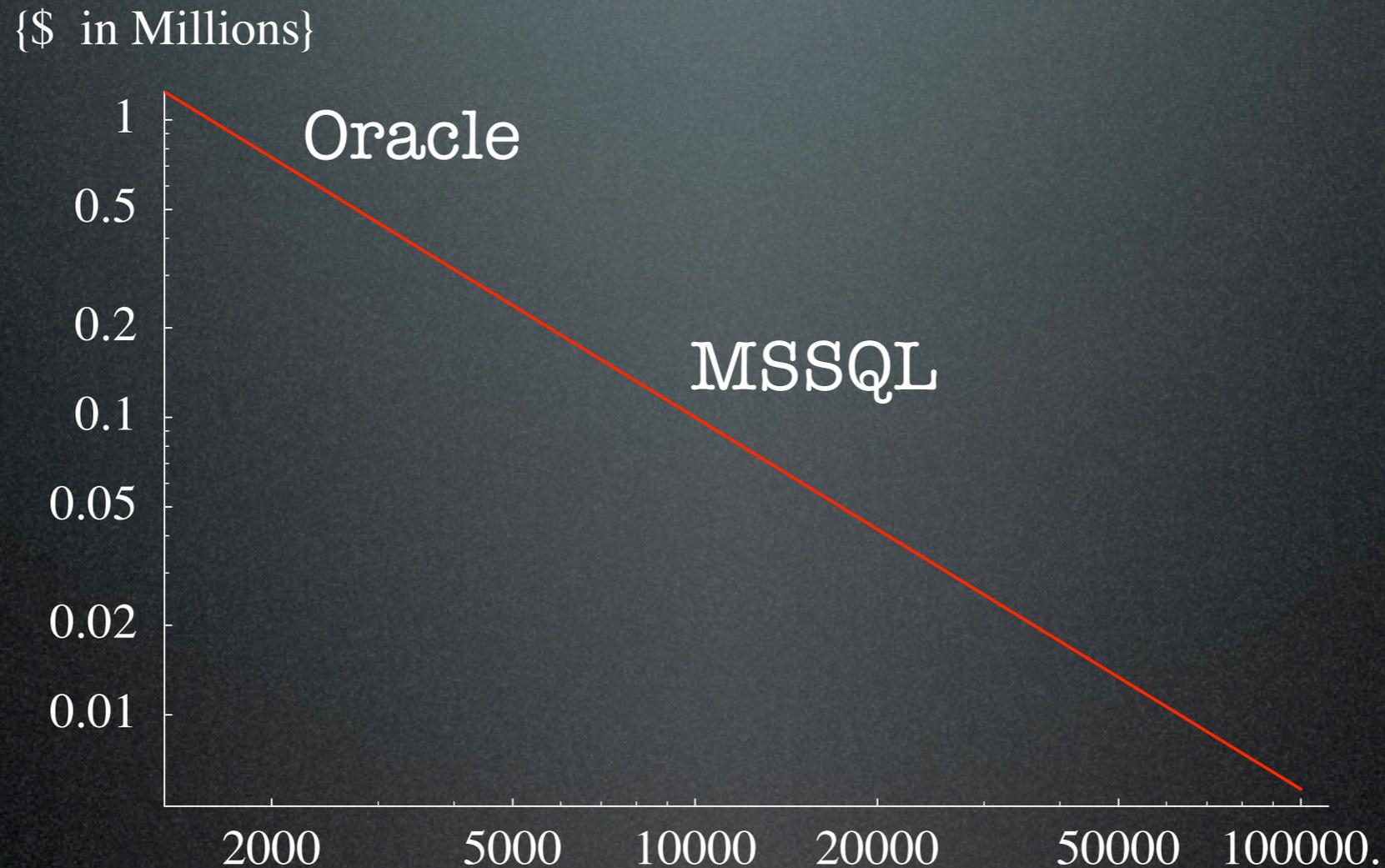
Database Licensing

{ \$ in Millions }



An Alternate View

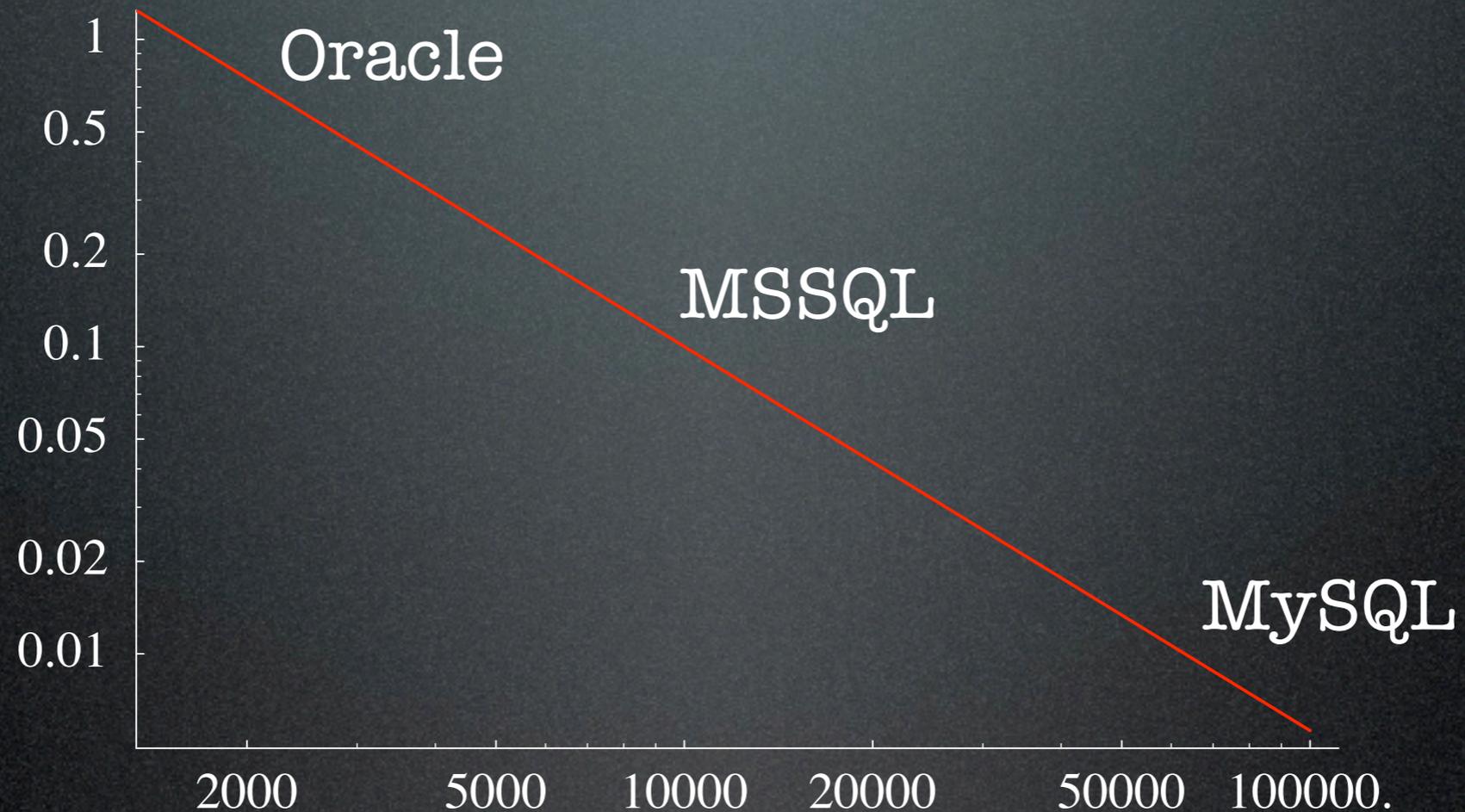
Database Licensing



An Alternate View

Database Licensing

{ \$ in Millions }



An Alternate View

Exploiting the Longtail

Exploiting the Longtail

1. **Hire** 1000 Consultants

Exploiting the Longtail

1. **Hire** 1000 Consultants
2. **Build tools** and sell them to 1000 consultants

Exploiting the Longtail

1. **Hire** 1000 Consultants
2. **Build tools** and sell them to 1000 consultants
3. Create a **self-service** system or build **mashups**

Exploiting the Longtail

	Email	Web Design
Consultants	Lotus, Groupwise	US Web
Build Tools	Eudora, Microsoft	LAMP
Mashups & Self-service	Hotmail, GMail	Wikis, Blogs

Google Maps

The image is a screenshot of the Google Maps website. At the top, the Google Maps logo is on the left, and a search bar contains the text "novell provo utah". To the right of the search bar is a "Search Maps" button. Below the search bar are three buttons: "Search the map", "Find businesses", and "Get directions".

On the left side of the page, there are two tabs: "Search Results" (which is active) and "My Maps". Below these tabs, a green arrow icon points to the location "Novell PI, Provo, UT 84606". A link "Make this my default location" is positioned below the address.

The main part of the page is a satellite map. A white information box is overlaid on the map, containing the following text: "Address: Novell PI, Provo, UT 84606". Below the address, it says "Get directions: [To here](#) - [From here](#) [Search nearby](#) - [Save to My Maps](#)". The map shows a green arrow pointing to the location. Street names visible include "S University Ave", "E 1860 S", and "Blvd". A scale bar at the bottom left indicates "500 ft". At the bottom of the map, there is a copyright notice: "© 2007 DigitalGlobe, Map data © 2007 NAVTEQ™ - Terms of Use".

Programming Meets the Longtail

Group Forming Networks

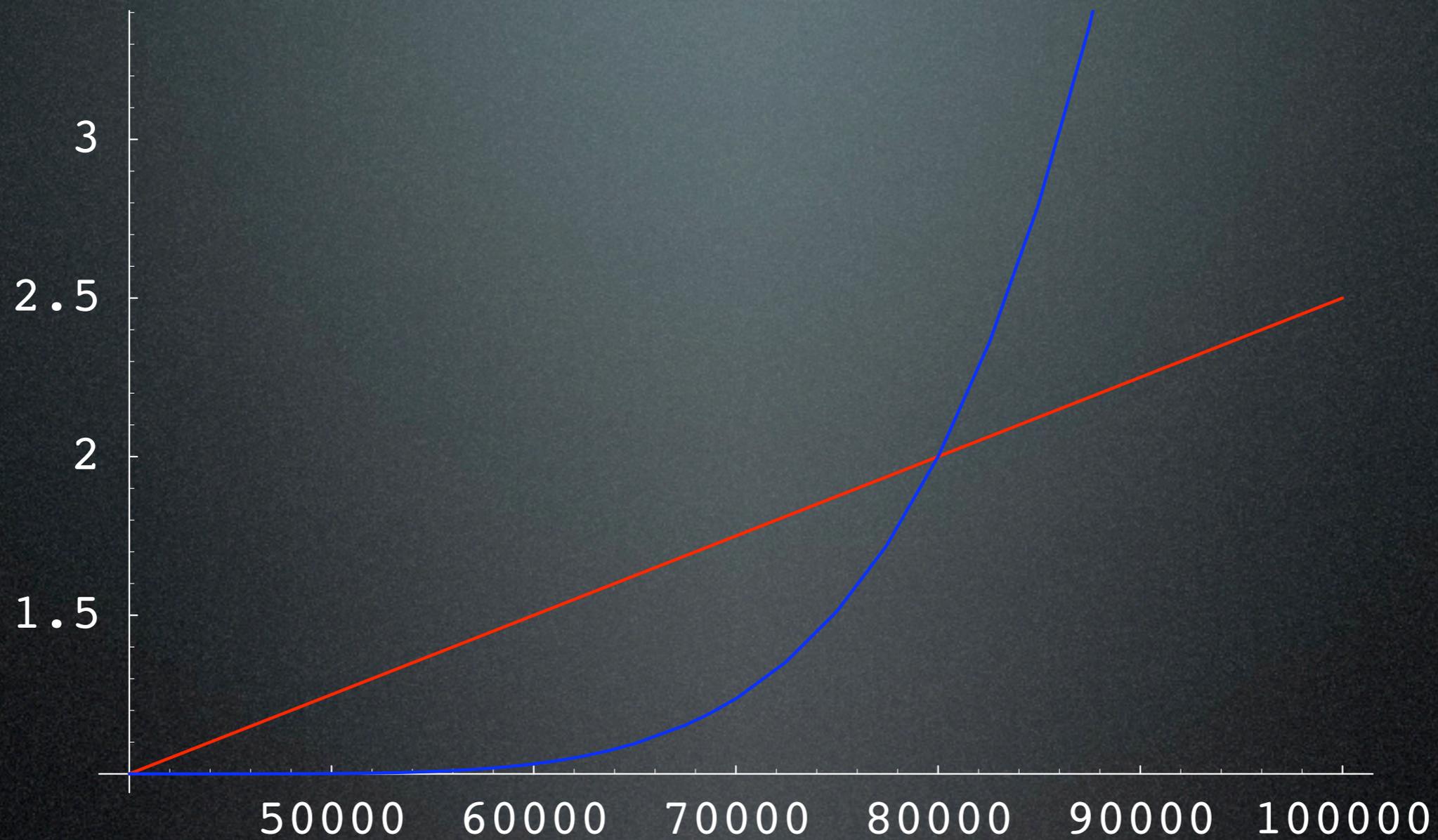
(social networking)

Network Value Is All About Connections!

- Broadcast - Sarnoff's law
 - Value proportional to N^*
- Communications - Metcalfe's law
 - Value proportional to N^2
- Group Forming Network - Reed's law
 - Value proportional to 2^N

* N is the number of nodes in the network

Other Power Law Effects

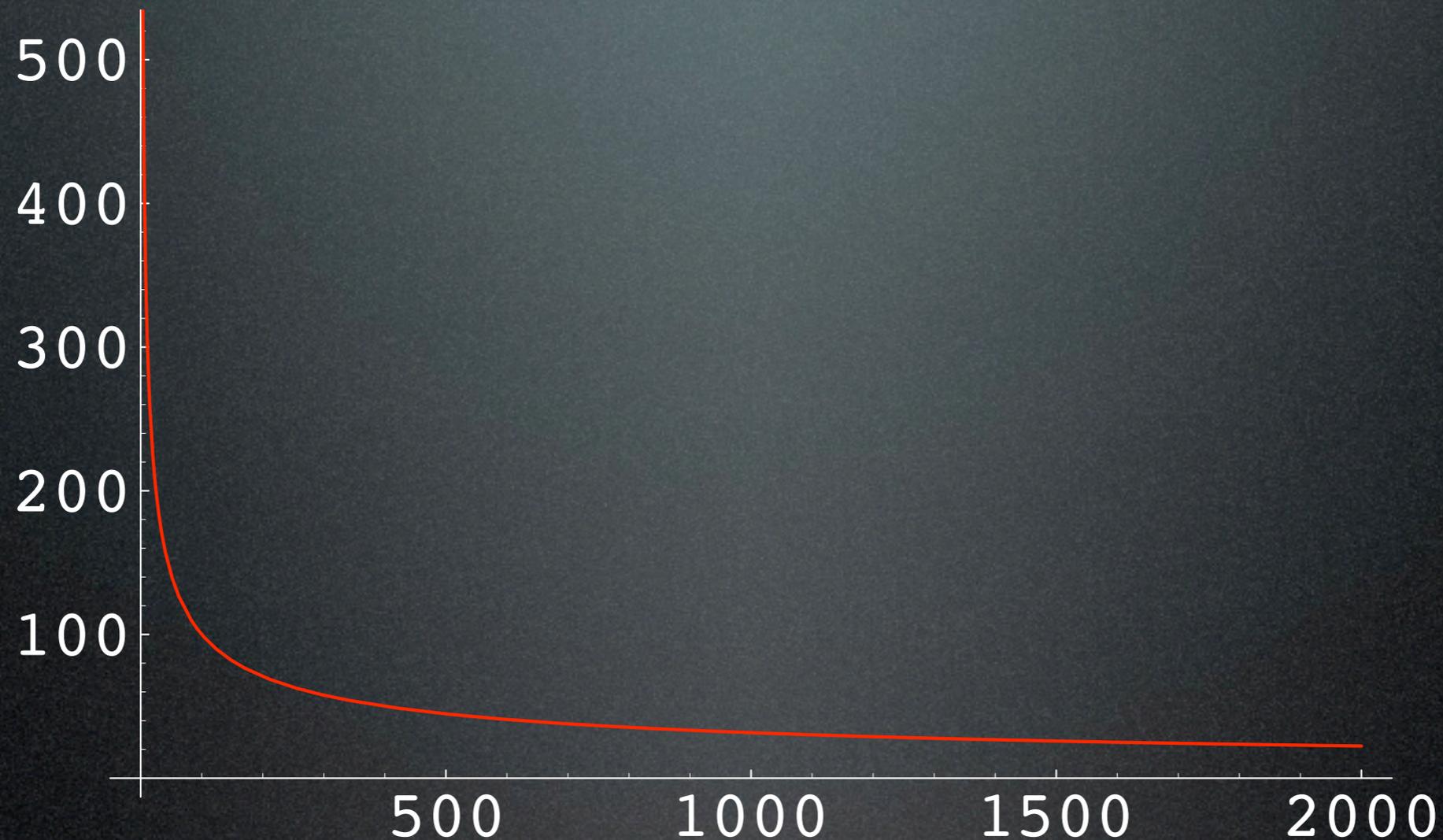


Your best programmer is **40 times** as effective as your worst

Your best programmer is 40 times as
effective as your worst

An Alternate View

{ $k = -0.5$, $p = 1000$ }

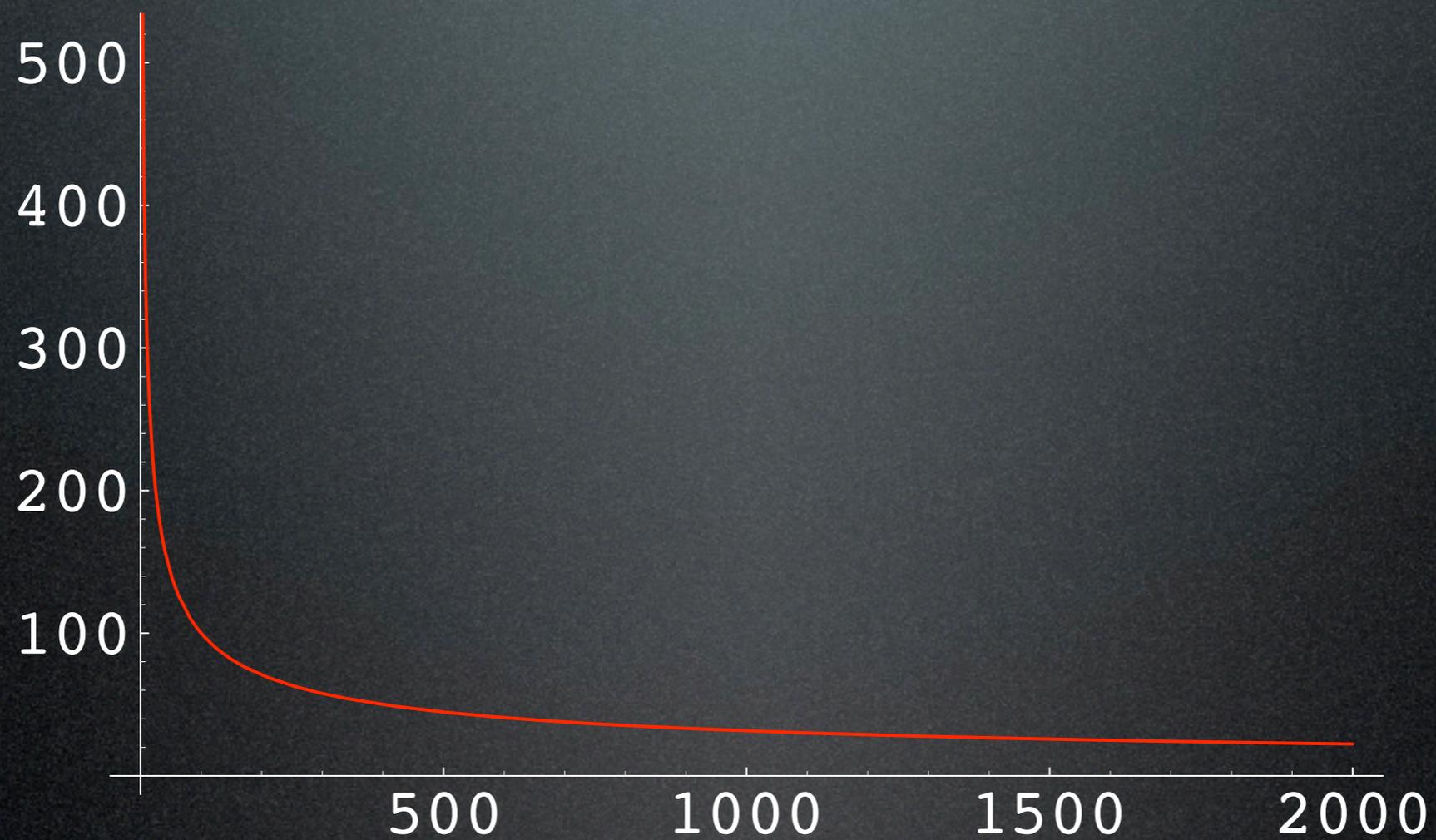


Your best programmer is **40 times** as effective as your worst

Programming Projects

Programming Projects

$\{k = -0.5, p = 1000\}$

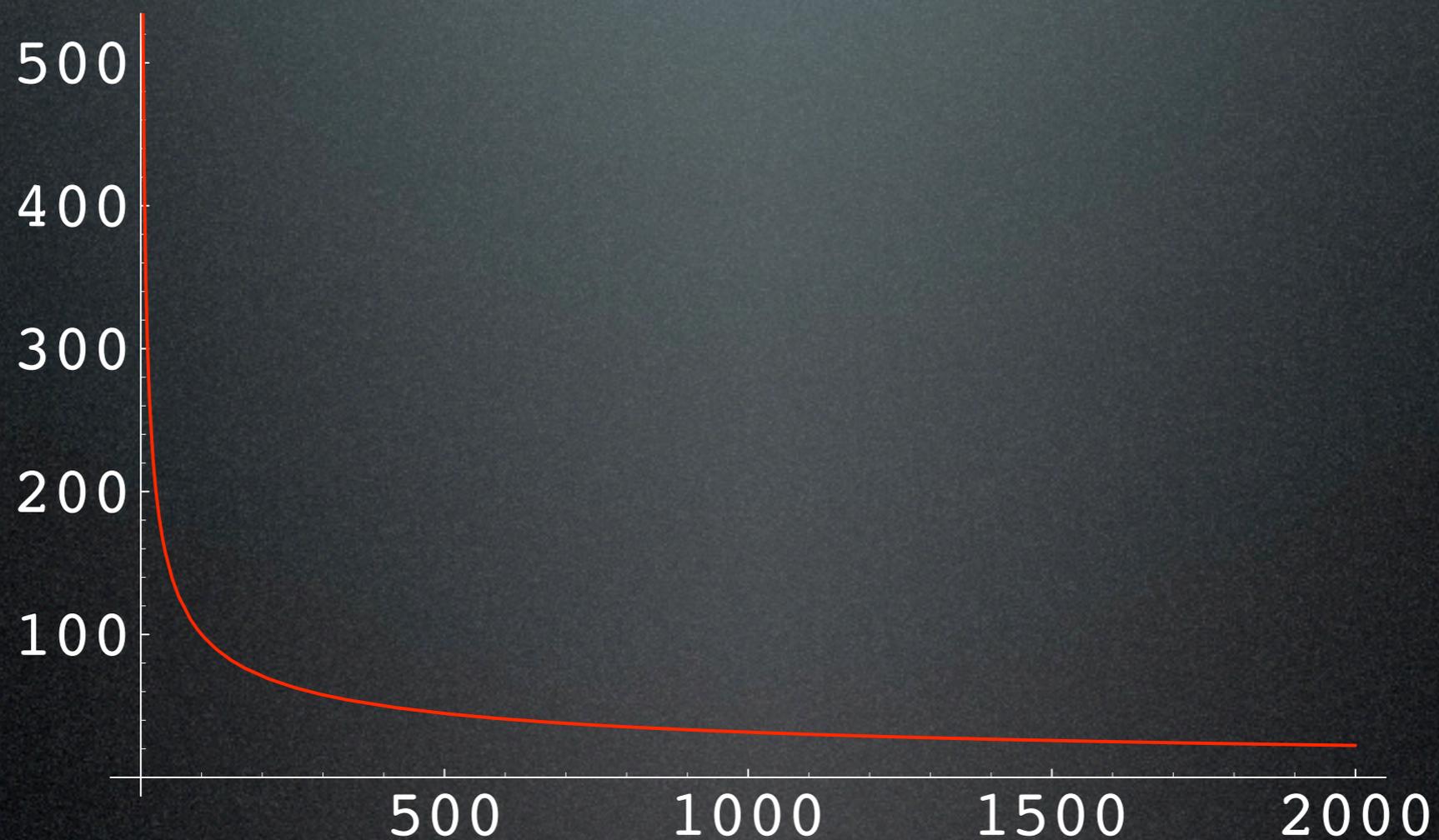


Utah High Tech Employees

2500 High Tech Firms in Utah

Utah High Tech Employees

{k=-0.5, p=1000}



2500 High Tech Firms in Utah

Big Programming



SUN CERTIFICATION

Mihal Badjonski

HAS FULFILLED ALL REQUIREMENTS AS A
SUN CERTIFIED PROGRAMMER

FOR THE JAVA™ 2 PLATFORM

On May 17, 2001

A handwritten signature in black ink, appearing to read "Scott McNealy".

Scott McNealy, President, Chairman, and CEO of Sun Microsystems, Inc.

A handwritten signature in black ink, appearing to read "Bill Richardson".

Bill Richardson, Vice President and General Manager of Sun Educational Services



Big Programming

Java is a language for accreting
programs as a series of patches
-Paul Graham

Think of your favorite language...

Think of your favorite language...

Is your language better than machine language?

Think of your favorite language...

Is your language better than machine language?

Is it better than Cobol?

Think of your favorite language...

Is your language better than machine language?

Is it better than Cobol?

Why?

Think of your favorite language...

Is your language better than machine language?

Is it better than Cobol?

Why?

Abstractions yield power!

Think of your favorite language...

Is your language better than machine language?

Is it better than Cobol?

Why?

Abstractions yield power!

Follow this argument to its logical conclusion...

Think of your favorite language...

Is your language better than machine language?

Is it better than Cobol?

Why?

Abstractions yield power!

Follow this argument to its logical conclusion...

One language must be more powerful than the rest.

Lisp

Lisp

(or Ruby, Python, Perl)

You don't have to believe me...

You don't have to believe me...

In fact, I hope you don't.

Some advice...

Don't be **afraid** to work
for small companies

Never confuse your job
with your career

Exploit
longtail
opportunities

Build a
self-service,
hosted
product

Two pizza teams

Manage programming debt

Release *early* and *often*

Don't give up your
advantages easily

Choose the most powerful
language you can

The End

Questions?

Contact me:

Phil Windley

phil@windley.org

www.windley.com

