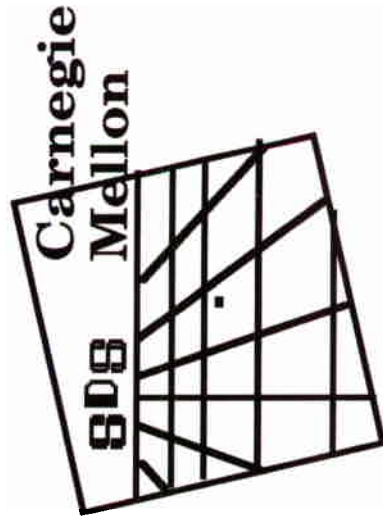
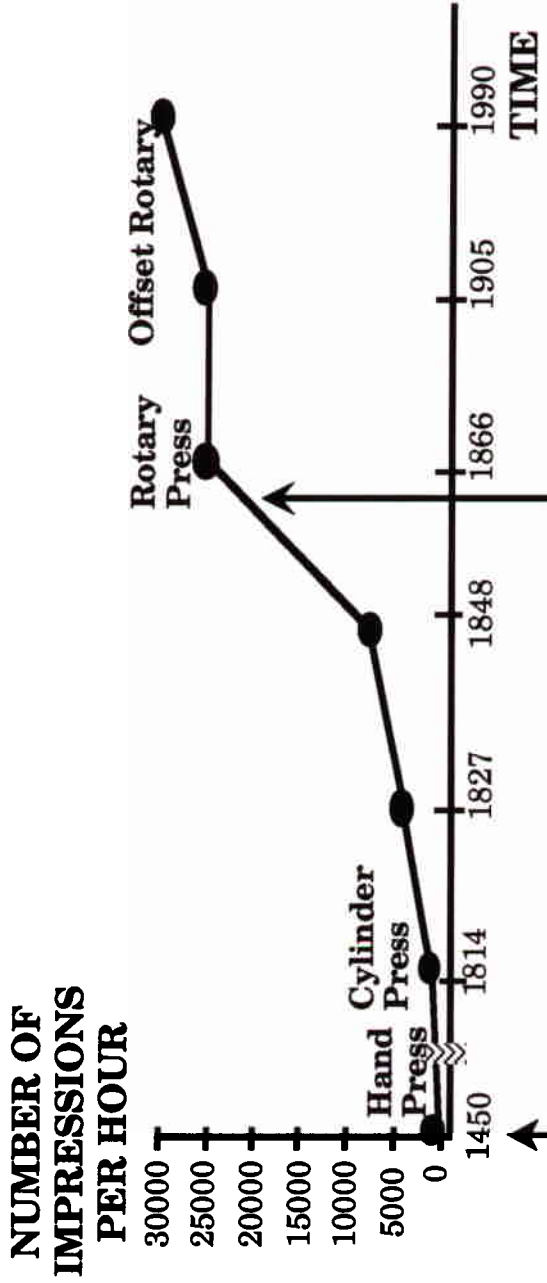


# **Changing the Face of Science: The Impact of Print**

**Kathleen Carley  
Dept. of Social and Decision Sciences  
David Kaufer  
English Dept.**



# Historical Change



Rise Of Modern Journalism

The Era Of Print Begins About Here

professions + ??  
 scientific societies +200  
 telephones +1.27mil  
 newspapers x7  
 postoffice x3  
 telegraphs x9  
 copyrights x8  
 patents x2

# **The Mythology of Print**

**Rapid diffusion and social change**

**The great equalizer**

**The instant consensus builder**

**Fundamentally altered cognition (language)**

**Necessary for professions**

**Necessary for science**

# **The Royal Society**

**Founded 1660 , Granted charter by Charles 2nd**

**Small group of scientists**

**End of patronage system**

**Goal - expand culture (universities preserved culture)**

**Initial plan - small (100), proximal, weekly meetings**

**Quickly began to encourage "lay" members**

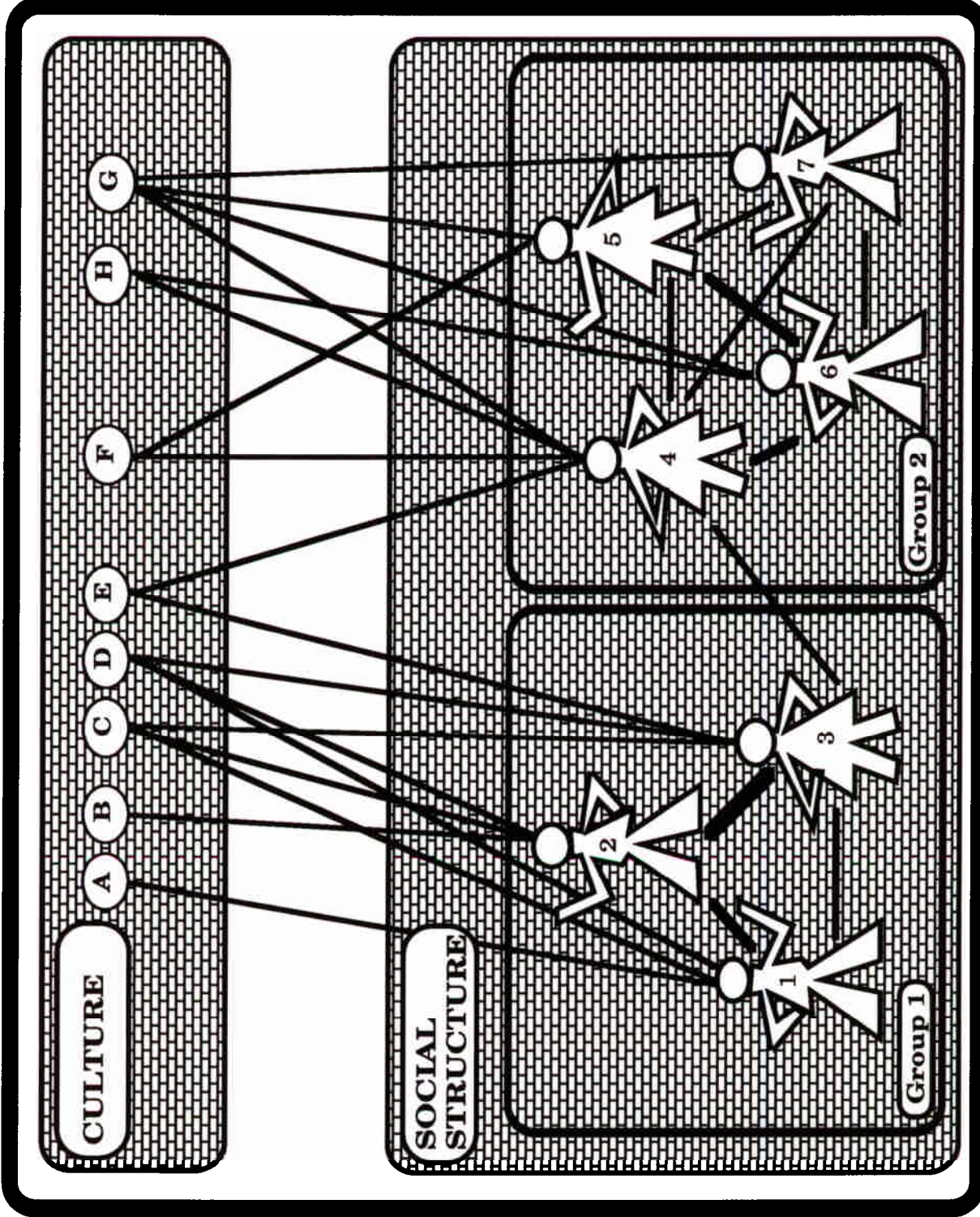
**First scientific journal**

**Most articles in journal were generalist and recaps**

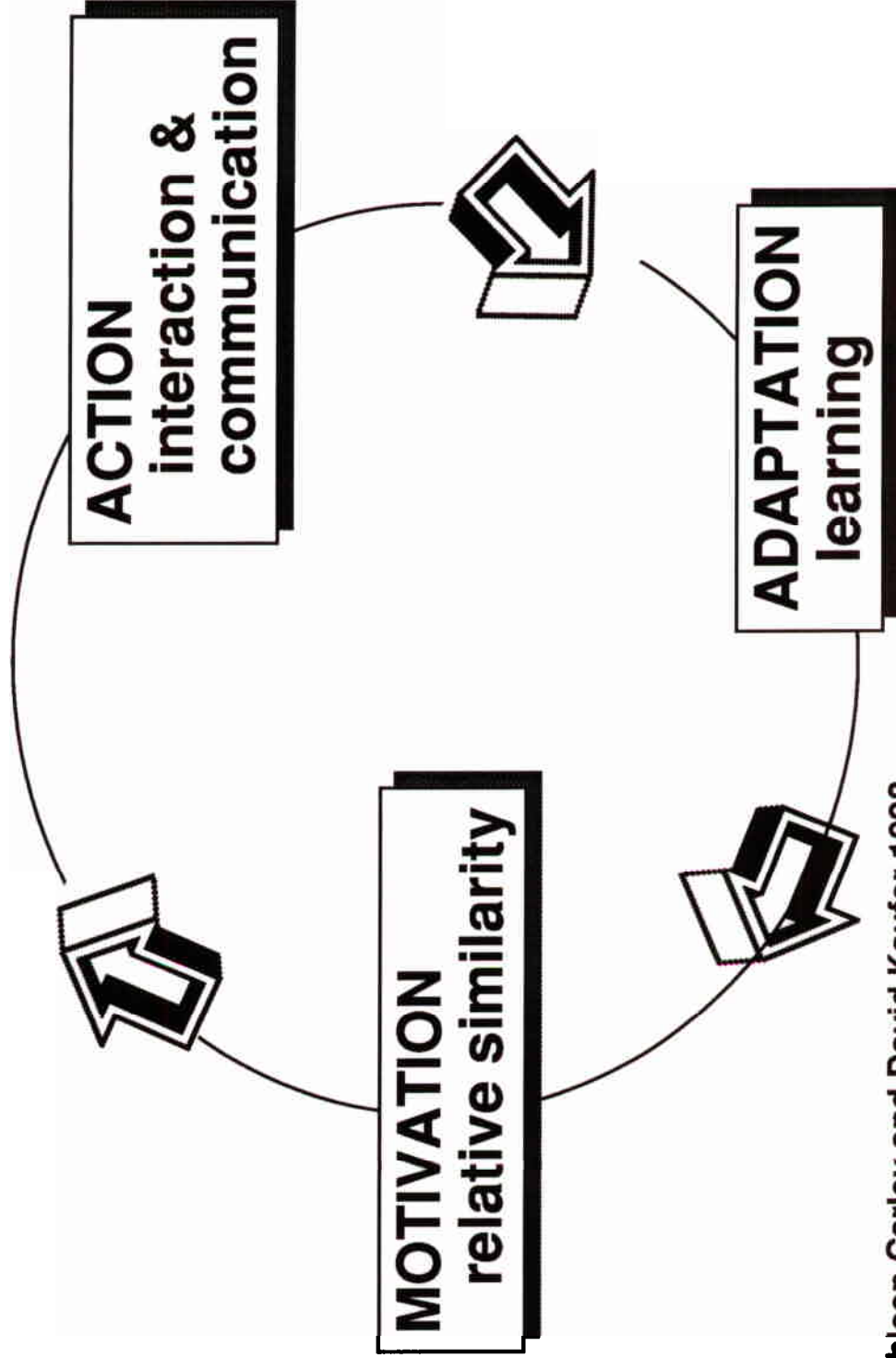
**-- in Society at large --**

**increased literacy, population, technology, culture**

**Kathleen Carley and David Kaufer 1993**



# Communicative Cycle



# Measures

**Diffusion** - Fraction of people who know the new information (content of message)

**Homogeneity** - Fraction of information shared by any two individuals

**Consensus** - Fraction of dyads having the same belief (fixed evaluation scheme belief = weight \* fact)

**Time until these reach 90% of final value**

# Communication Technologies

## Altering the agent's properties & consequently interaction

**Oral Agent**

**Print Agent**

**- interaction at a distance**

**One-to-One**

**One-to-Many**

**Two-way exchange of information**

**One-way exchange of information**

**Both agent's learn**

**Can not learn**

**Innovator - one new info**

**Innovator - Complex Book - 4 facts**

**Oral World**

**Print World**

**All oral agents**

**One agent has print - the innovator  
All other agents are oral**



# Experimental Design - 1

**One Group Society**

**Population Size (P) ----- 6, 12, 18**

**Cultural Complexity (C) ----- 10, 20, 40**

**Facts Known (K) ----- 25%, 50%, 75%**

**Communication Scenario -----  
oral ----- 1:1**

**print-complex ----- 1 book, 4 facts, 1:N**

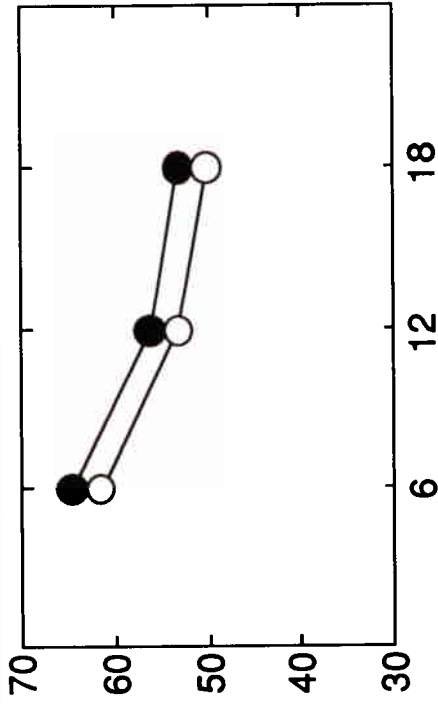
**27**

**Monte-Carlo - 100 repetitions, 500 time periods**

**Kathleen Carley and David Kaufer 1993**

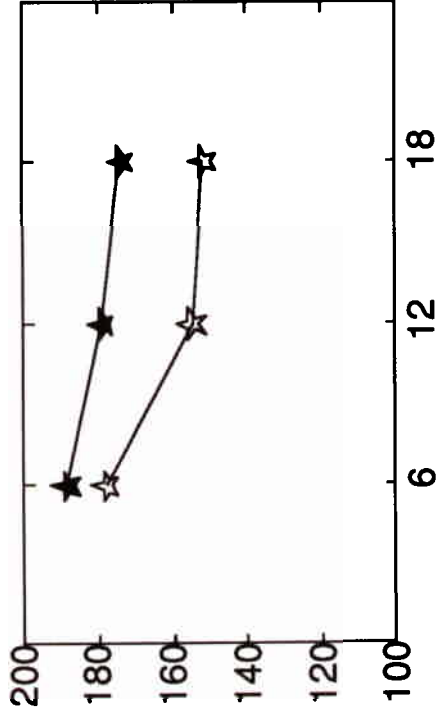
# Population

Time-to-Homogeneity



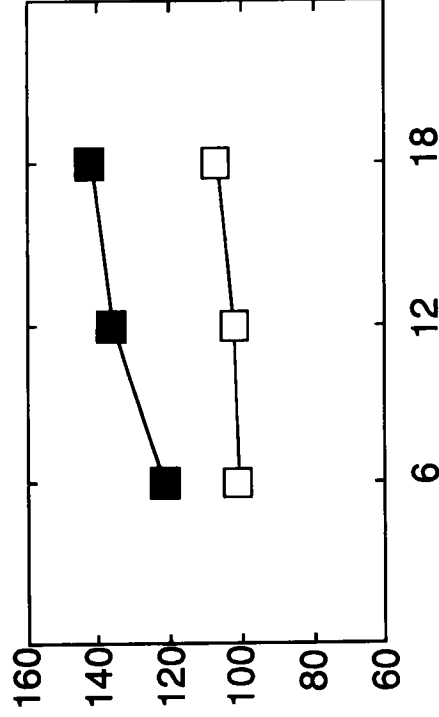
People

Time-to-Consensus



People

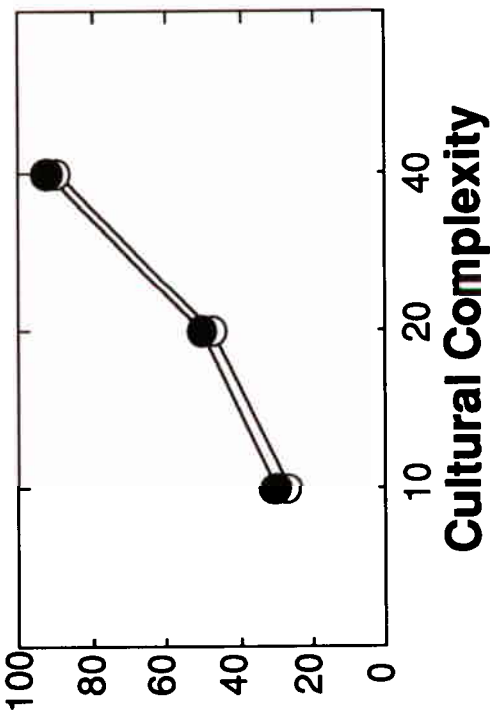
Time-to-Diffusion



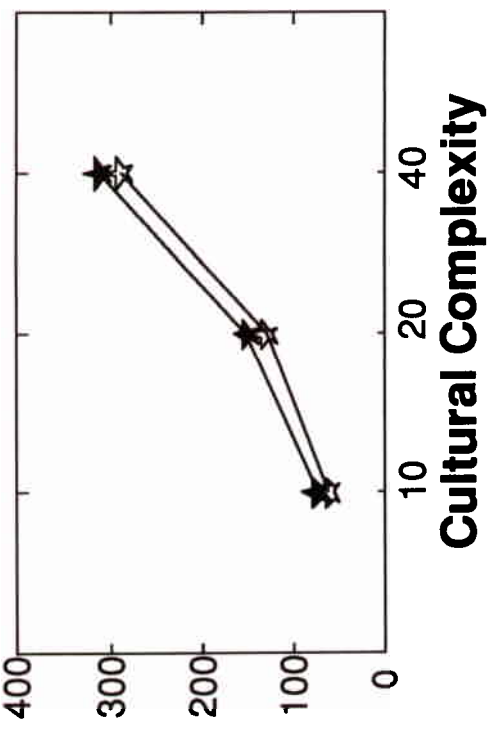
People

# Cultural Complexity

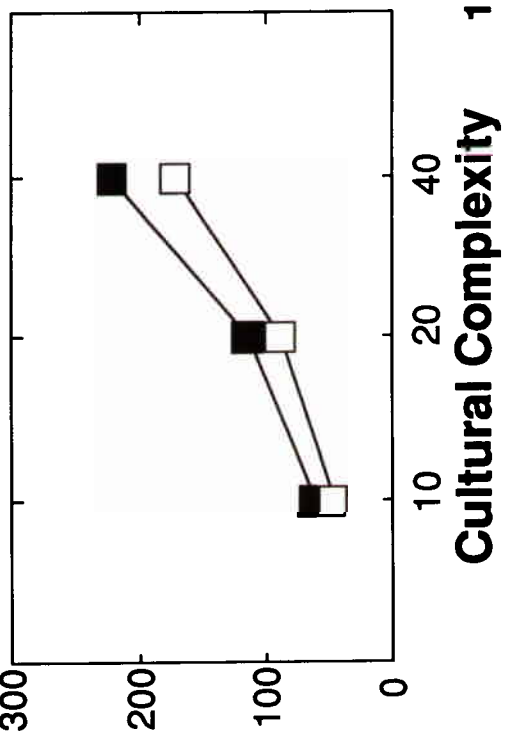
Time-to-Homogeneity



Time-to-Consensus

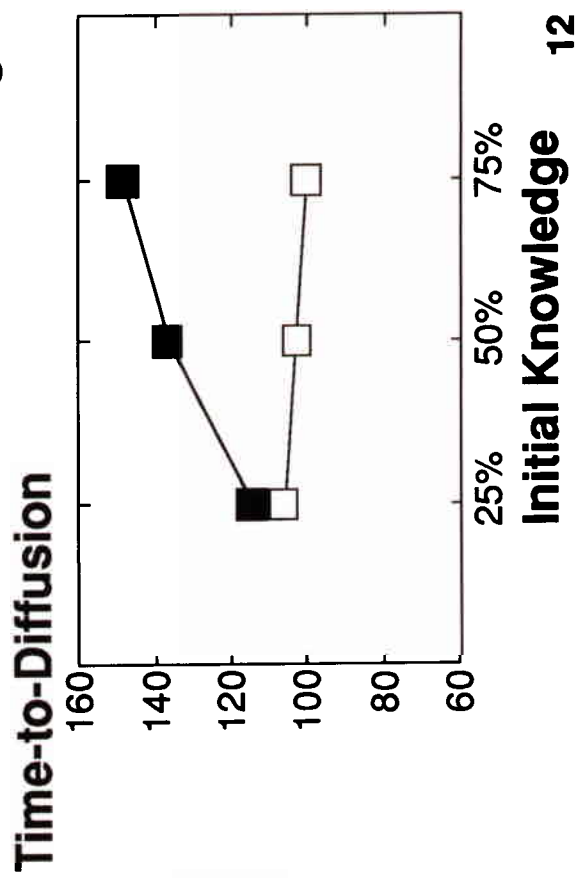
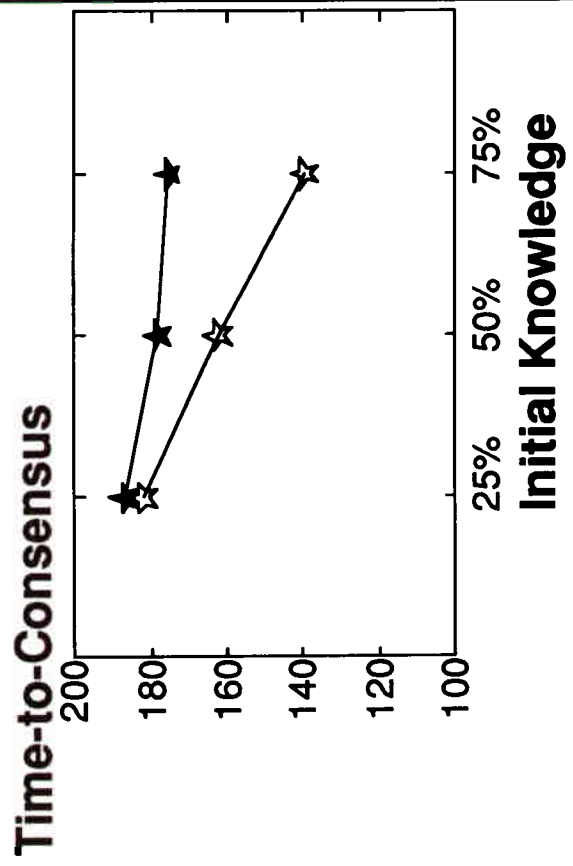
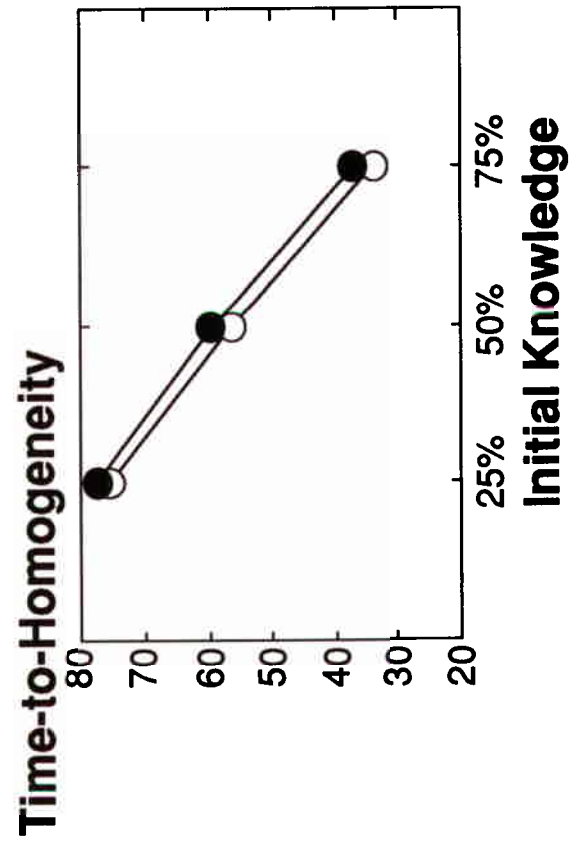


Time-to-Diffusion




  
 ORAL 1:1
   
 1 COMPLEX BOOK

# Initial Knowledge



# Experimental Design - 2

## Two Group Society

Population Size --- 12  
Cultural Complexity --- 20  
Ratio of Group Sizes -----  
Exclusively Internal Ties -----  
External Ties -- %Known -----

1:1, 1:2, 1:3  
20%, 40%, 80%  
10%, 20%, 40%

27

## Communication Scenario

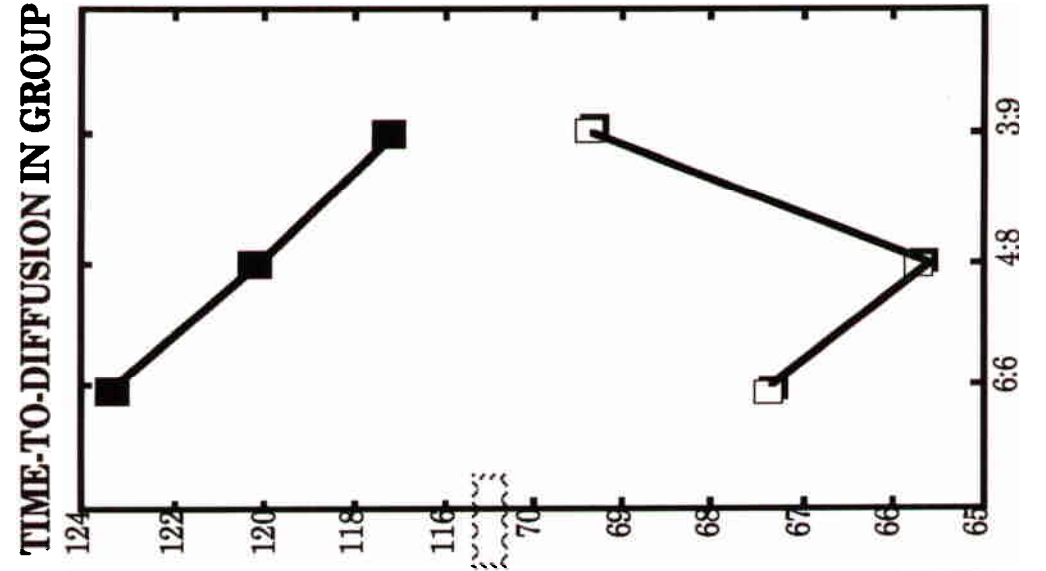
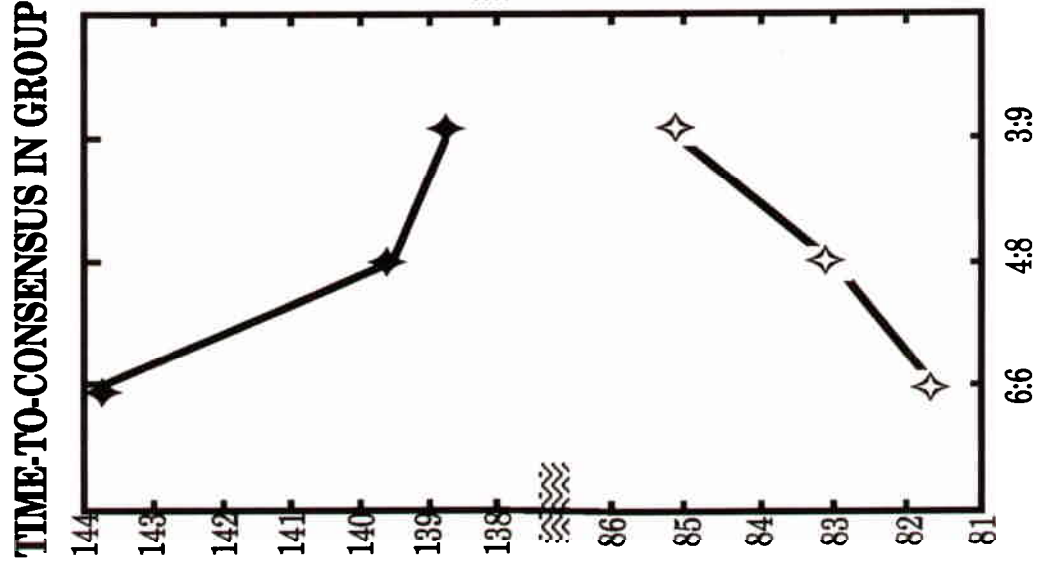
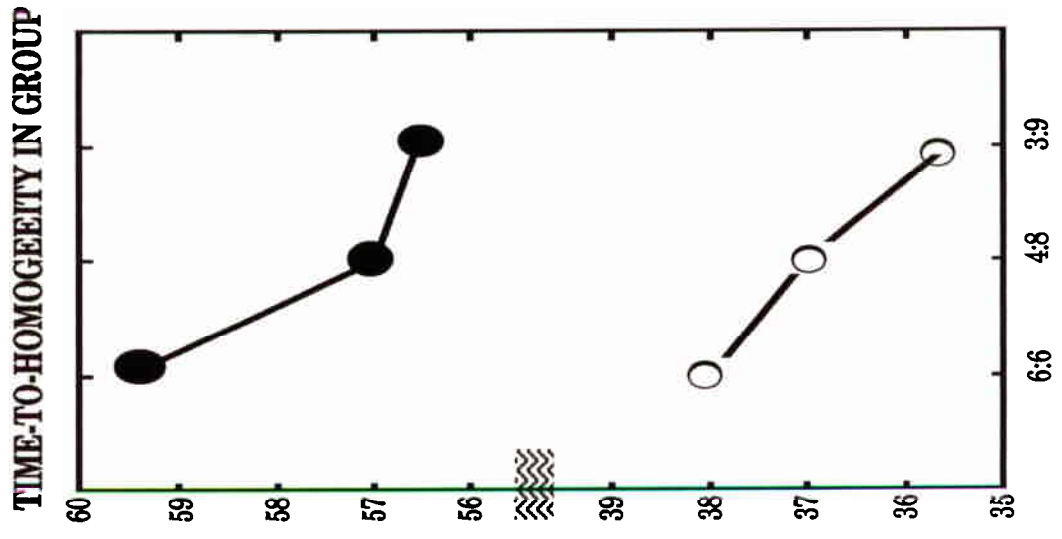
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Kathleen Carley and David Kaufer 1993

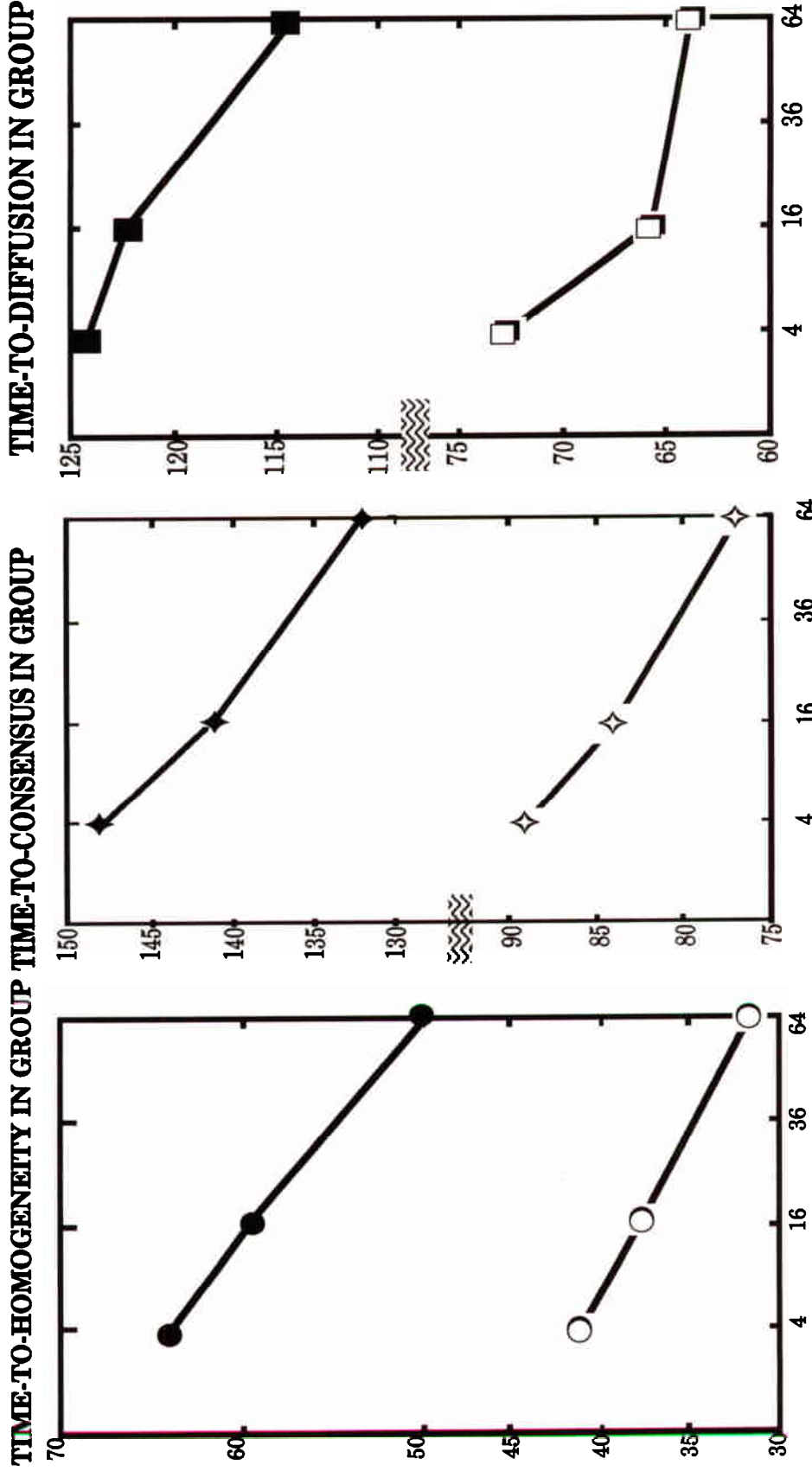
# Relative Group Size



**Afford to grow**

**Kathleen Carley and David Kaifer 1993**

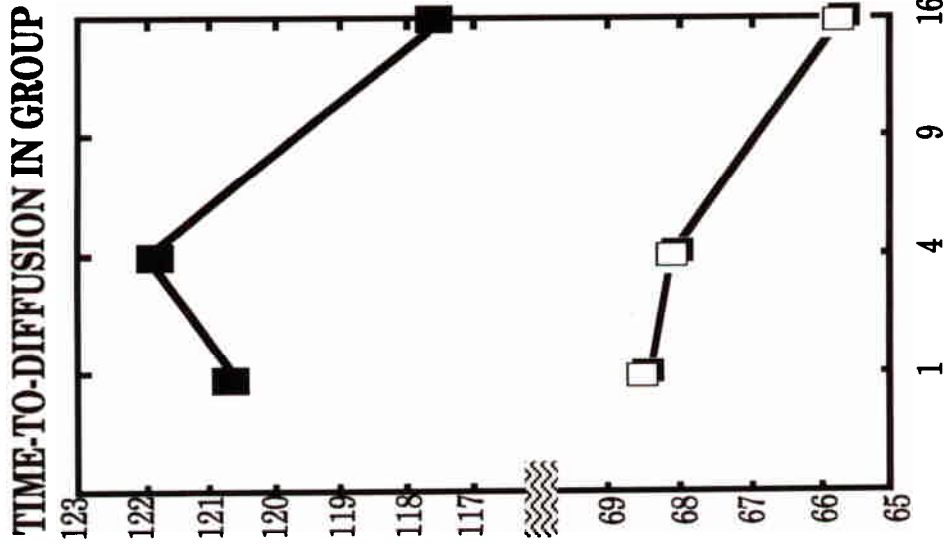
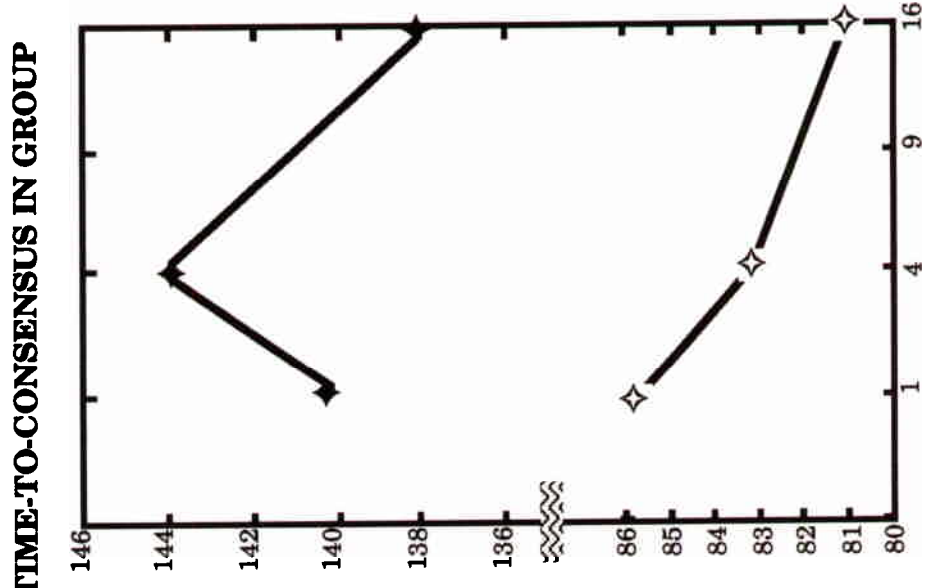
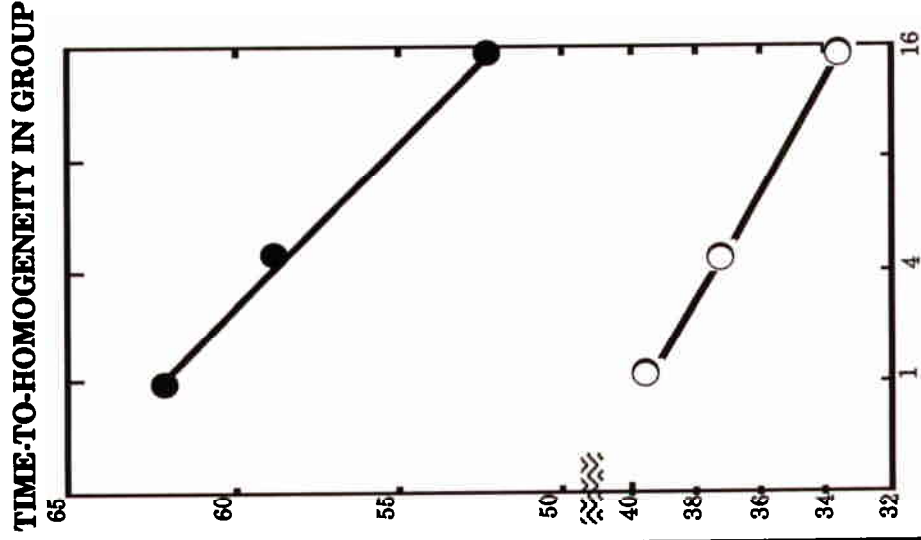
# Within Group Ties or Cultural Integration



Kathleen Carley and David Kauffer 1993

Afford less integration 15

# External Ties Or Specialization



Kathleen Carley and David Kaufer 1993

Afford specialization 16



# General Implications

## Rate of Diffusion

	No Print	Print
Cultural Complexity	slower	slower
Size of Society	slower	slower (less)
Initial knowledge	slower	faster
Group Size	slower	mixed
Integration	faster	faster
Specialization	mixed	faster

Human interaction becomes ritualistic

Print's does not

## **Possible Explanation**

**Need print to speed things up, enhance diffusion**

**But print most helps large, culturally complex groups**

**Not enough core scientists to take advantage of print**

**Print world -- larger, less integrated, more specialized**

**Lay personnel increased size and decreased integration**

**Generalist journal maintained relative-similarity and  
specialization**

**Generalist journal was eminently practical solution for  
enhancing communication among the few**

## **General Ideas**

**Constructural model enables analysis of social, cultural and historical change**

**Individuals produce change by engaging in concurrent and recurrent communicative transactions**

**Communication technologies affect agent's properties**

**Communication mediums can be artificial agents**

**Using simulation what-if analyses can be performed**

**Rule out explanations**

**Gain insight into critical historical periods**

**Expand Theory**

# **Print Implications**

**Just putting something in print may have little effect**

**Complexity helps**

**Competition helps**

**In short run, print has a mixed effect**

**In long run, print speeds things up**

**The impact of print is greater:**

**the larger the population**

**the greater the societal homogeneity**

**the more complex the culture**

**Inability of text to learn enables rapid diffusion**

**Multiplicity of print permeates group boundaries**

**Multiplicity of print alters value of tie**