CS-103 Announcements

- Quiz 1 will be Friday October 6
  - In lecture, about half the period
  - Will include material from lectures and HWs from Sept 6 to Sept 29
  - You will be tested separately on lab material
- Reading
  - Six Degrees Ch 3, 4
  - Web 101 Ch 4.6

HW3

- Due 9pm Wed Sept 27, 2006
- Entirely online—no paper, no email
- In Lab 2 we added question #6:

  Add a post to your blog that contains an image directly hyperlinked to another website

Six Degrees Ch 3

1. Social networks consist of many small overlapping groups
   – Each group is densely interconnected
   – Groups overlap because of individuals with multiple affiliations
2. Social networks are dynamic (not static)
3. Not all new relationships are equally likely
4. Sometimes we do things based entirely on individual preference and free will

Social network modeling in a nutshell

We do what we do because of

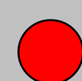
- Structure
- Agency

Math Modeling Rule #1

- “Make everything as simple as possible, but no simpler”

  -Einstein

- What is the simplest possible network?



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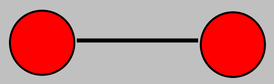

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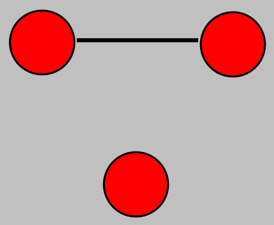

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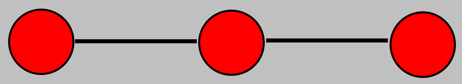

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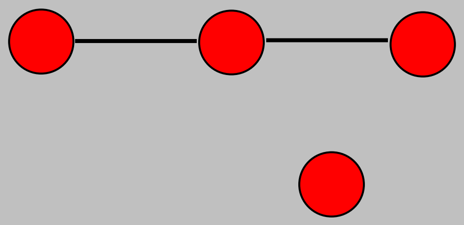

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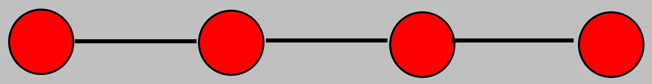

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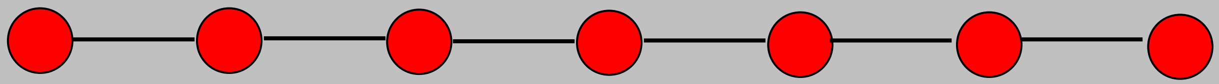

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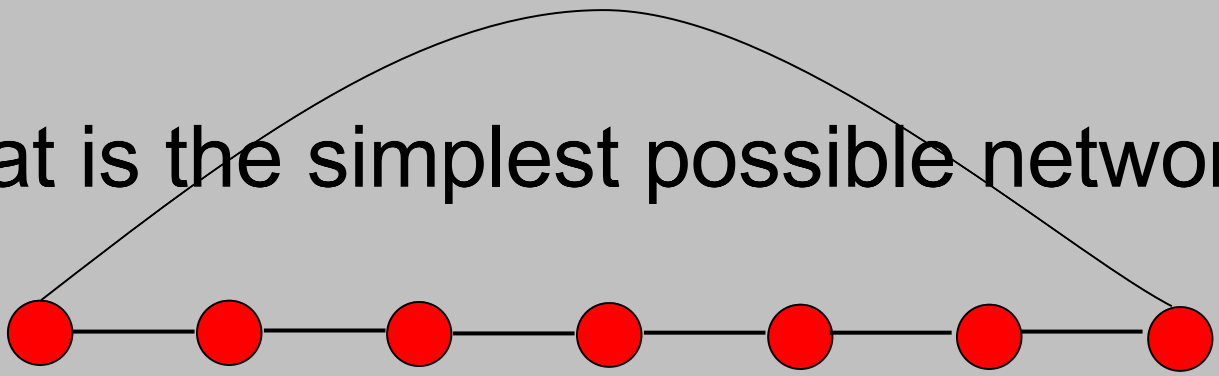
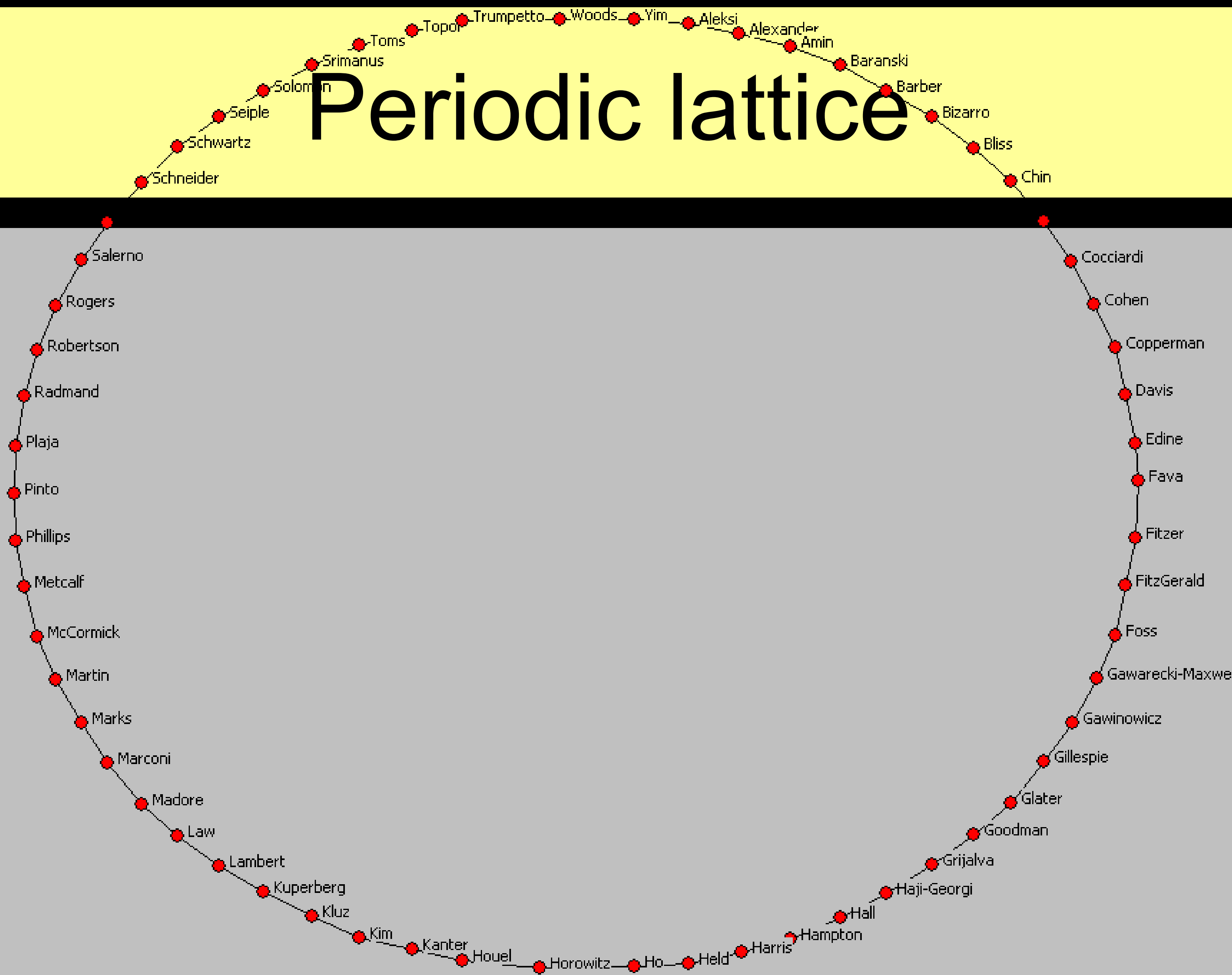
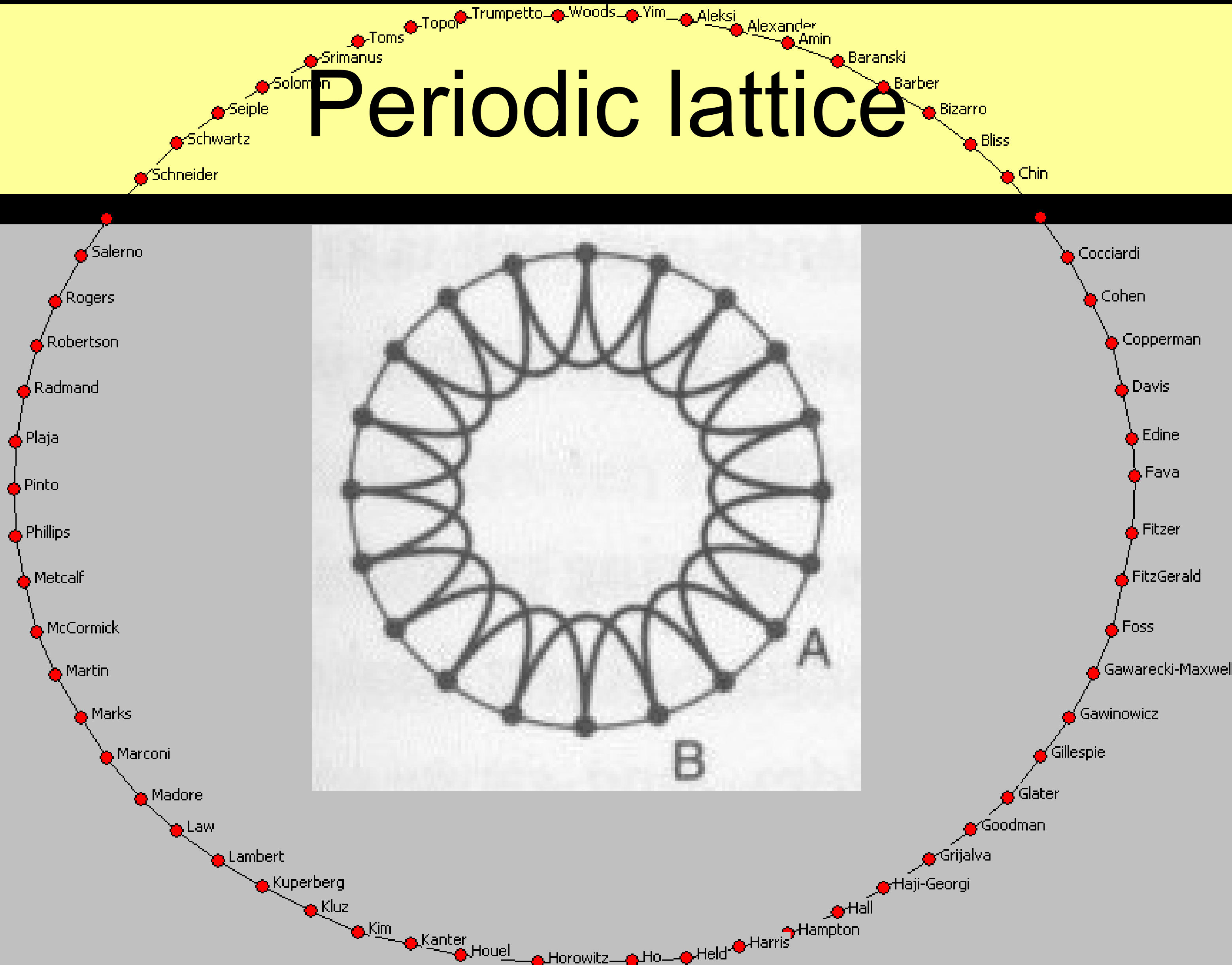


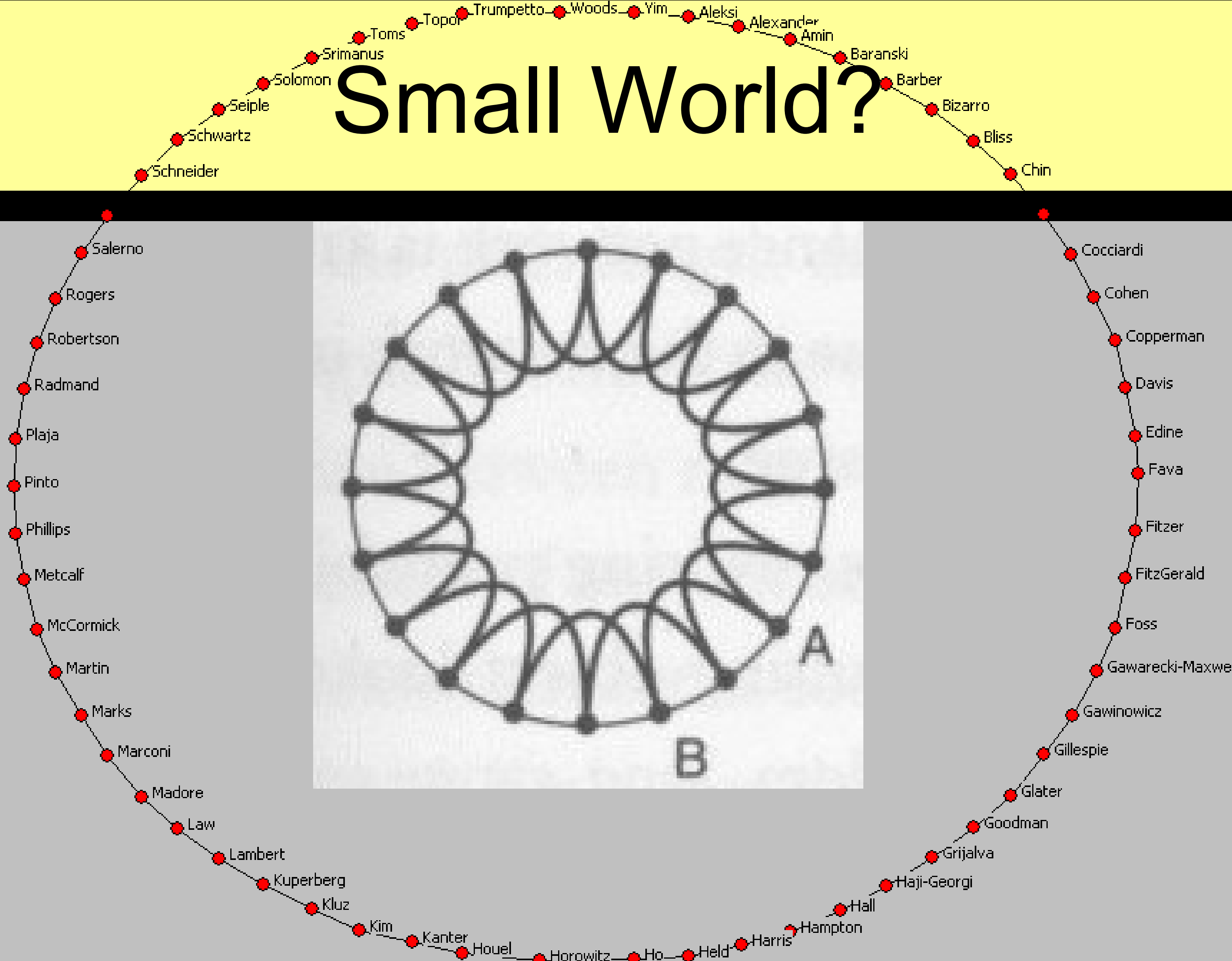
Periodic lattice



Periodic lattice

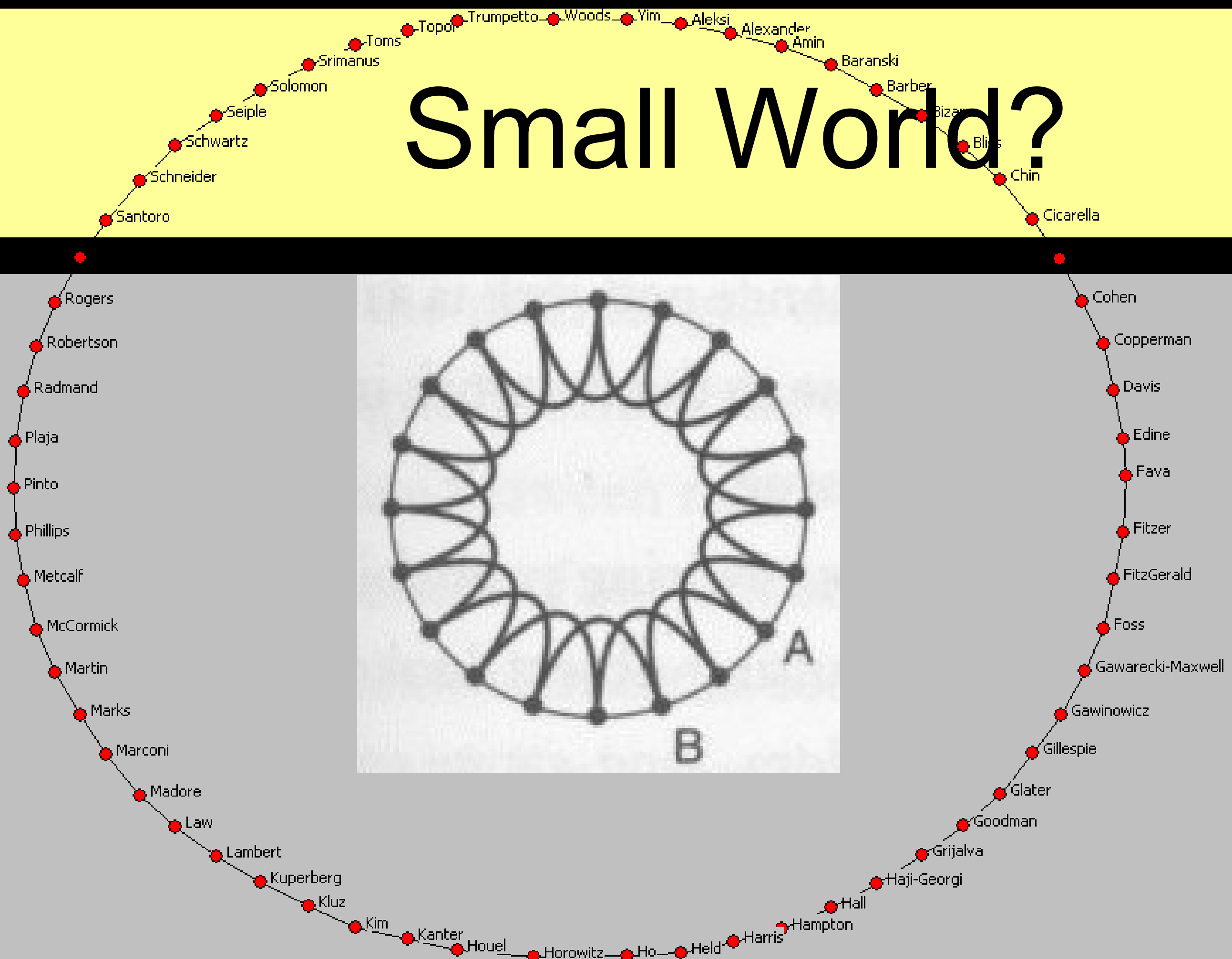


Small World?



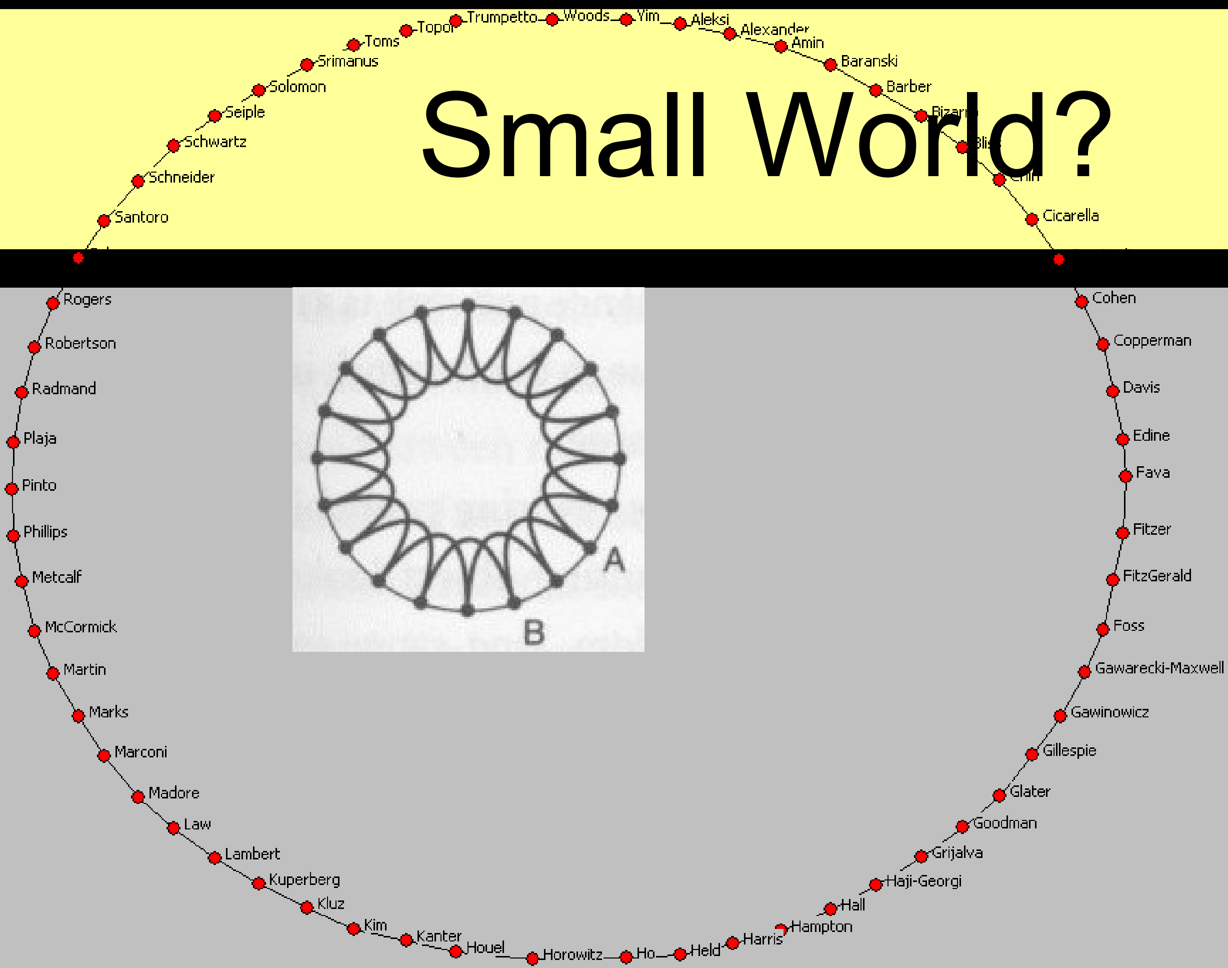
Trumpetto
Woods
Yim
Aleksi
Alexander
Amin
Baranski
Barber
Bizarro
Bliss
Chin
Cocciardi
Cohen
Copperman
Davis
Edine
Fava
Fitzer
FitzGerald
Foss
Gawarecki-Maxwell
Gawinowicz
Gillespie
Glater
Goodman
Grijalva
Haji-Georgi
Hall
Hampton
Harris
Held
Ho
Horowitz
Houel
Kanter
Kim
Kluz
Kuperberg
Lambert
Law
Madore
Marconi
Marks
Martin
McCormick
Metcalf
Phillips
Pinto
Plaja
Radmand
Robertson
Rogers
Salerno
Schneider
Schwartz
Seiple
Solomon
Srimanus
Toms
Topol
A
B

Small World?



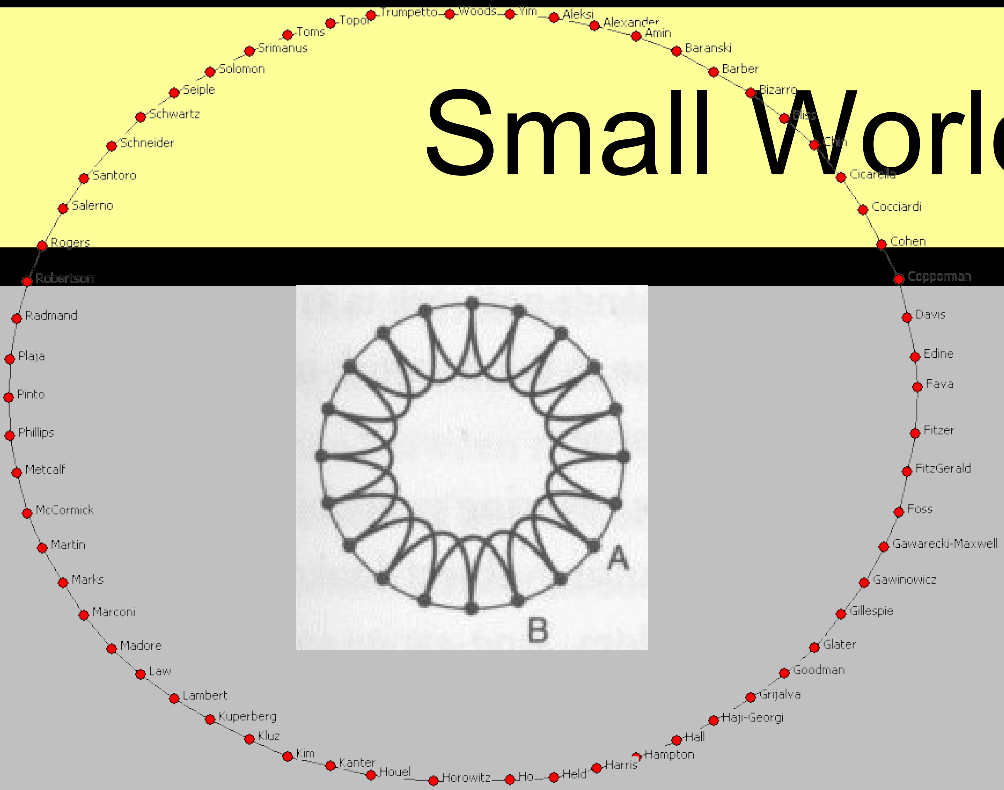
degree(x) << |V|

Small World?



Any friends x and y know the same people

Small World?



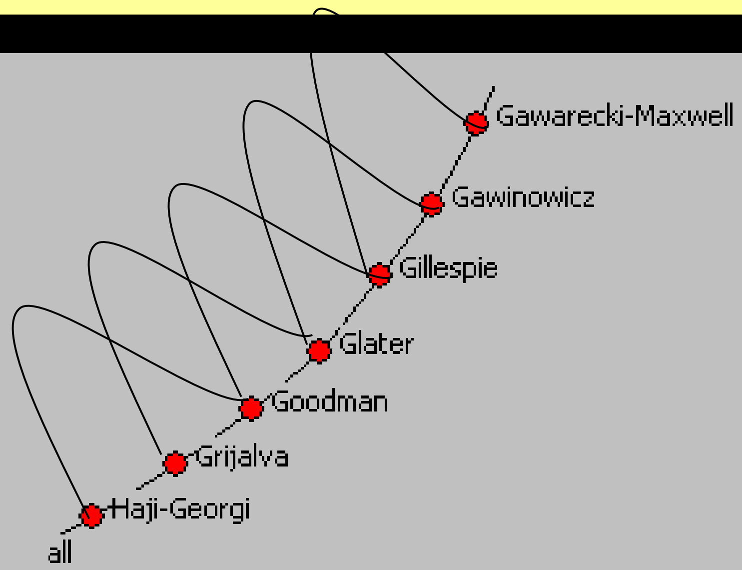
For any pair of adjacent nodes {x,y}

|neighborhood(x) ∩ neighborhood(y)|

is not too much smaller than

|neighborhood(x) U neighborhood(y)|

Small World?

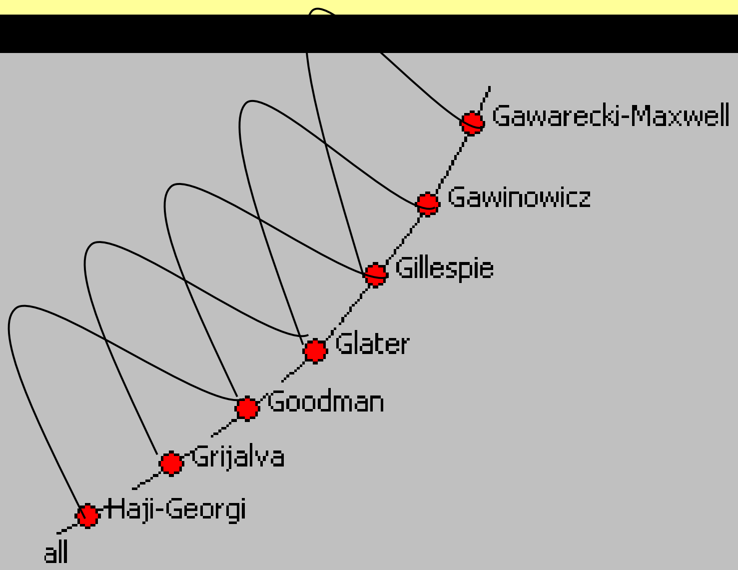


Example: Glater and Gillespie are adjacent (“friends”)

neighborhood(Glater) =

{Glater, Goodman, Gillespie, Grijalva, Gawinowicz}

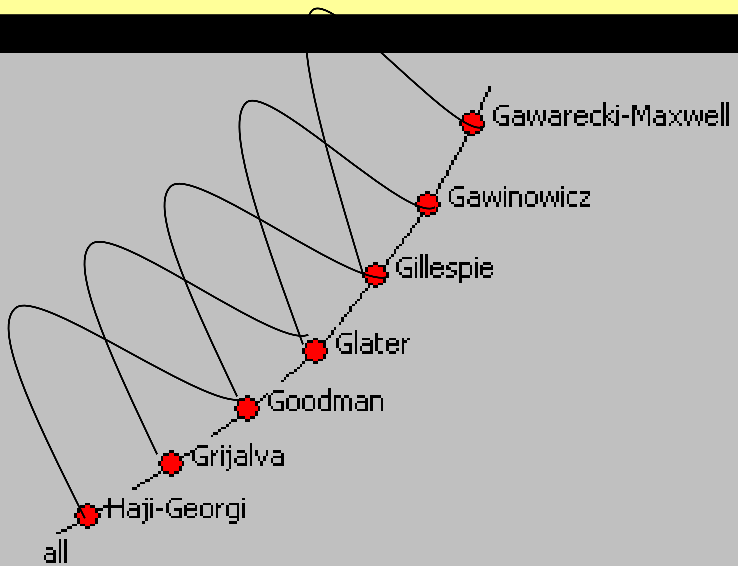
Small World?



neighborhood(Gillespie) =

{Gillespie, Glater, Gawiniwicz, Goodman, Gawarecki-Maxwell}

Small World?



neighborhood(Glater) =
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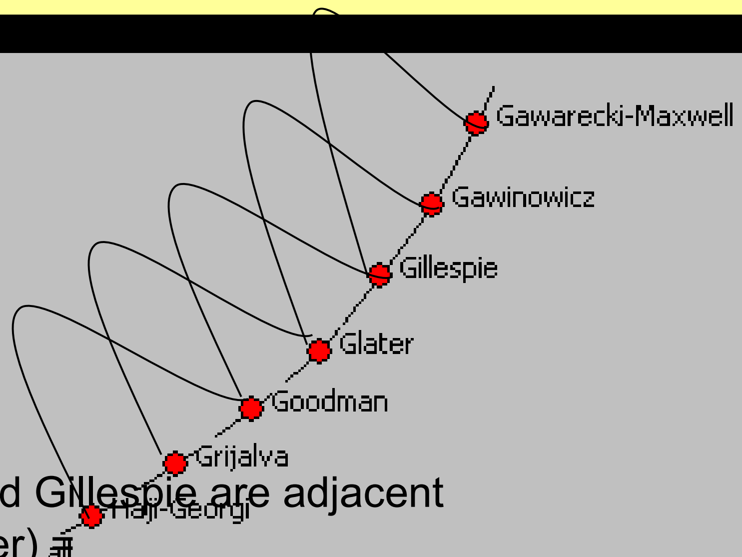
neighborhood(Gillespie) =
{Gillespie, Glater, Gawiniwicz, Goodman, Gawarecki-Maxwell}
neighborhood(Glater) ∩ neighborhood(Gillespie) =
{Gillespie, Glater, Gawiniwicz, Goodman}

Small World?



Example: Glater and Gillespie are adjacent

neighborhood(Glater) =

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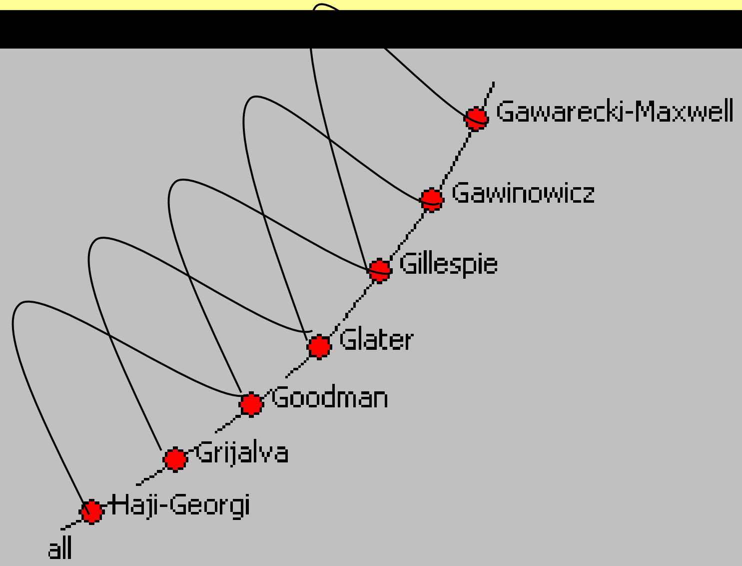
neighborhood(Glater) ∩ neighborhood(Gillespie) =

{Gillespie, Glater, Gawiniwicz, Goodman}

neighborhood(Glater) U neighborhood(Gillespie) =

{Gillespie, Glater, Gawiniwicz, Goodman, Grijalva, Gawarecki-Maxwell}

Small World?



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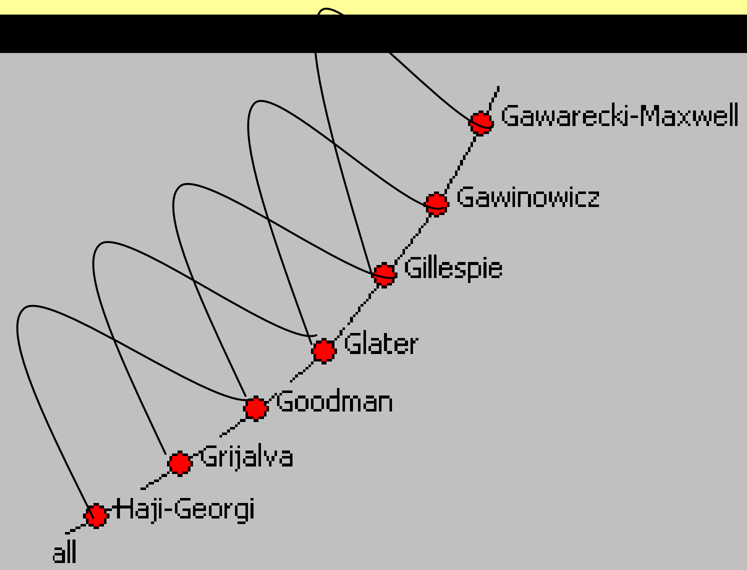
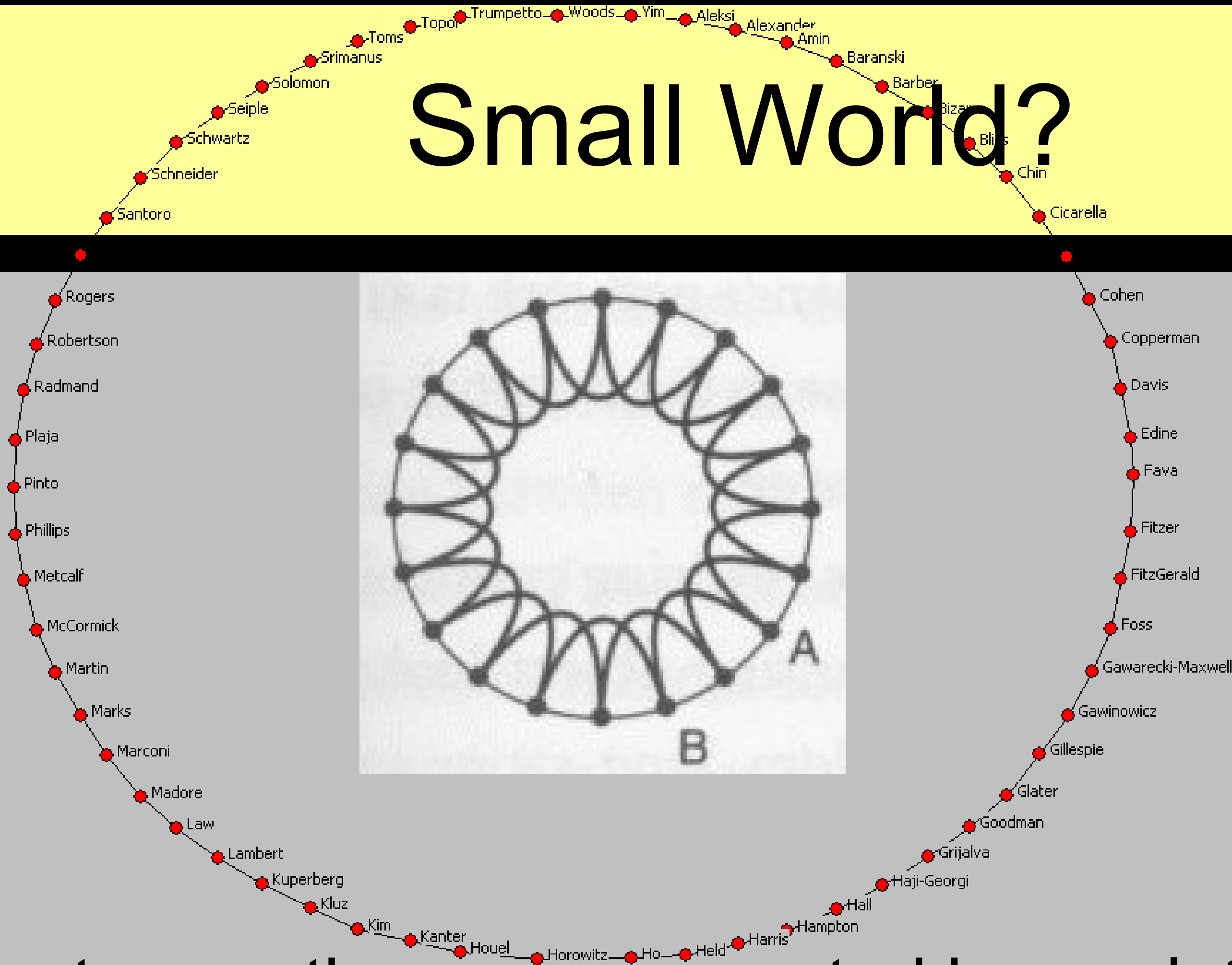


|neighborhood(Glater) ∩ neighborhood(Gillespie)| =
|{Gillespie, Glater, Gawiniwicz, Goodman}| = 4

|neighborhood(Glater) U neighborhood(Gillespie)| =
|{Gillespie, Glater, Gawiniwicz, Goodman, Grijalva, Gawarecki-Maxwell}| = 6

Clustering coefficient = 4/6 = 0.66666…

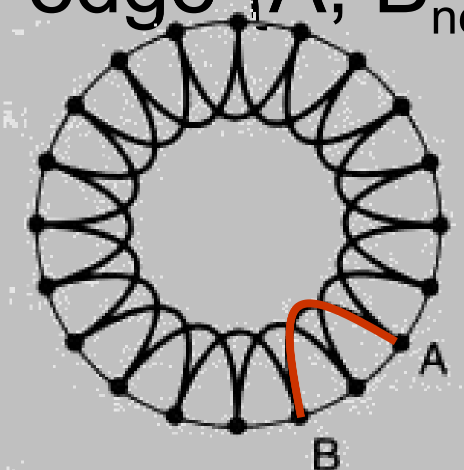
Small World?

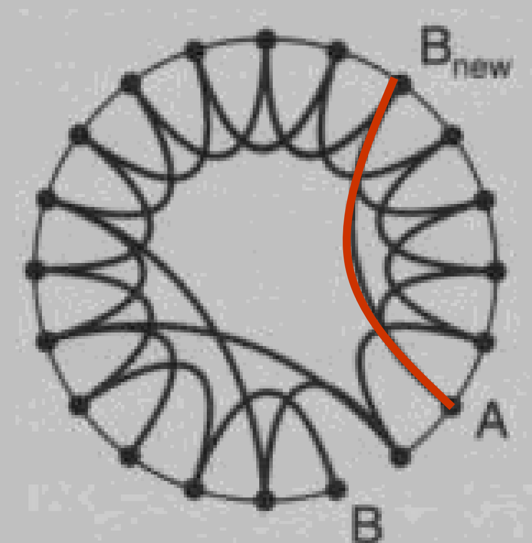


Any two vertices are connected by a relatively short path

Random rewiring

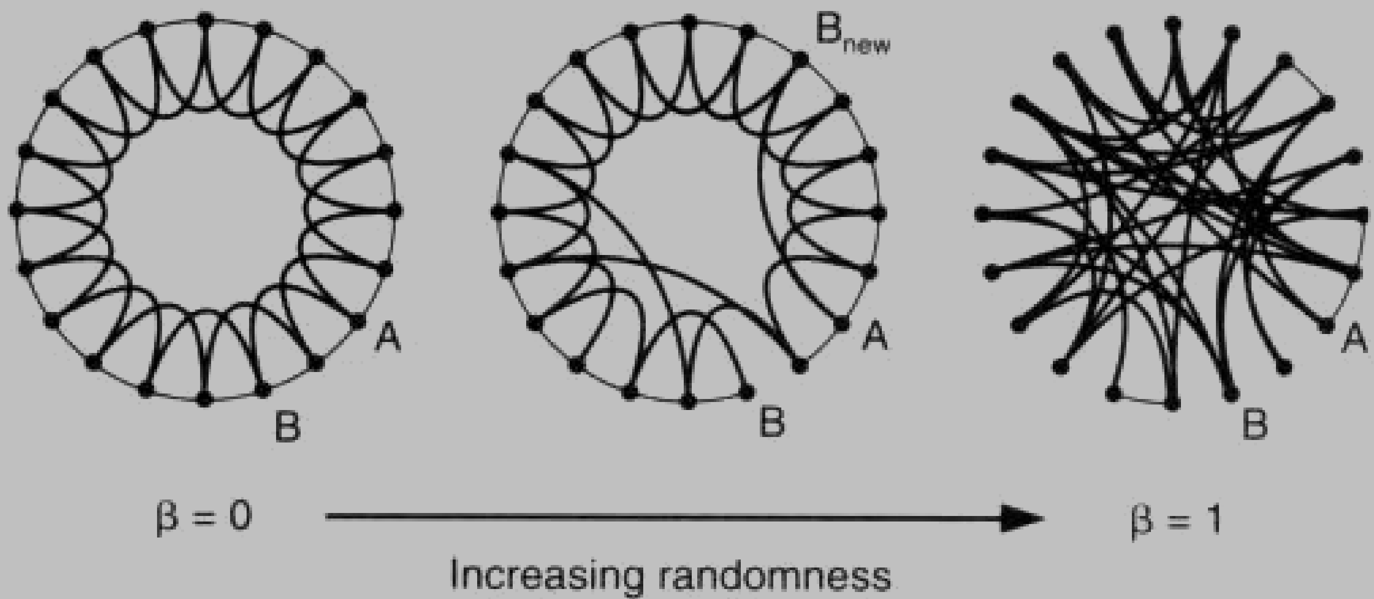
- Pick an edge {A,B}
- Delete edge {A,B}
- Randomly pick a vertex, call it B_{new}
- Add edge {A, B_{new}}



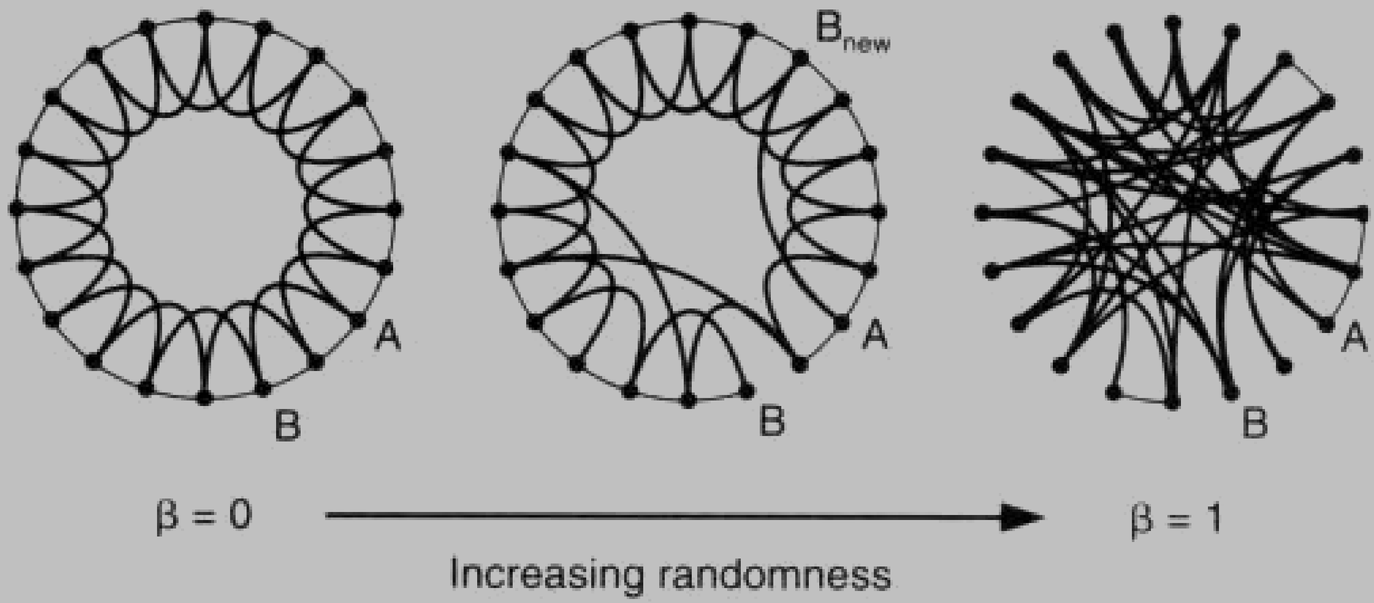


Beta model

Beta = probability of rewiring each edge



Beta model



What happens to expected path length and clustering coefficient as Beta changes?

Beta model and small worlds