Lecture #13, 14: Some partial answers to FUN

Extra, Optional Slides

By Leong Hon Wai

Side Learning from lectures…

Lectures on Graphs and Trees

- “Meet” some of the people involved
- Hear some stories
- Maybe, pick up some life lessons.

Lessons from Cattywampus

A Healthy Learning Attitude:

- "*Cattywampus*"
- Positive Learning Attitude,
- Questioning Attitude,
- Being independent learners,
- Taking initiative
- Good Sense of Humoru

People you will "meet"…

Leonard Euler
(1707 - 1781)

William R Hamilton
(1805 - 1865)

Kazimierz
Kuratowski
(1896 - 1980)

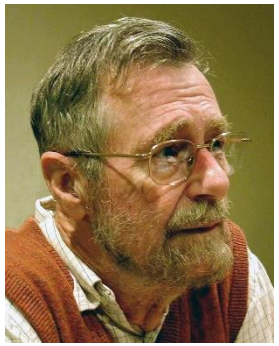
People you will "meet"…

Augustus De Morgan
(1806 – 1871)

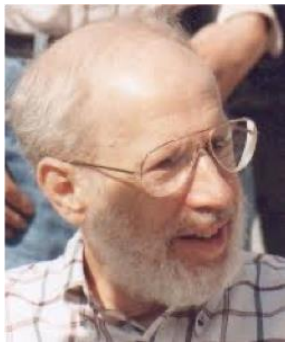
Appel (1932 - 2013)
and Haken (1928 -)

People you will “meet”…

Robert C. Prim
(1921 -)



Edsger W. Dijkstra
(1930 – 2002)



Joseph B. Kruskal
(1928 – 2010)

Guan Meigu
(管梅谷)
(1934 –)

People you will "meet"…

- "Meet" some CS celebrities

(1972)

(2000)

(1986)

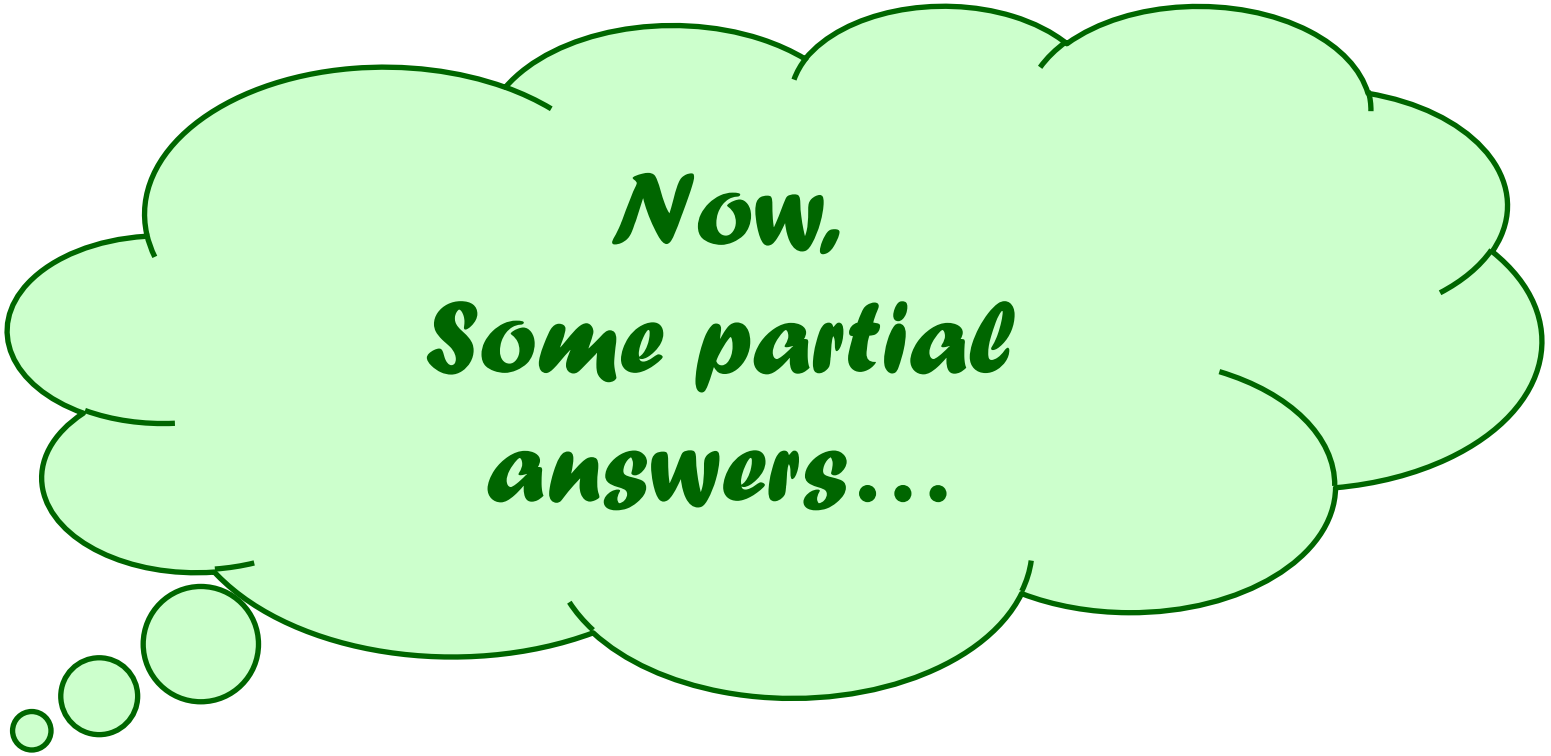
(1986)

Some fun…

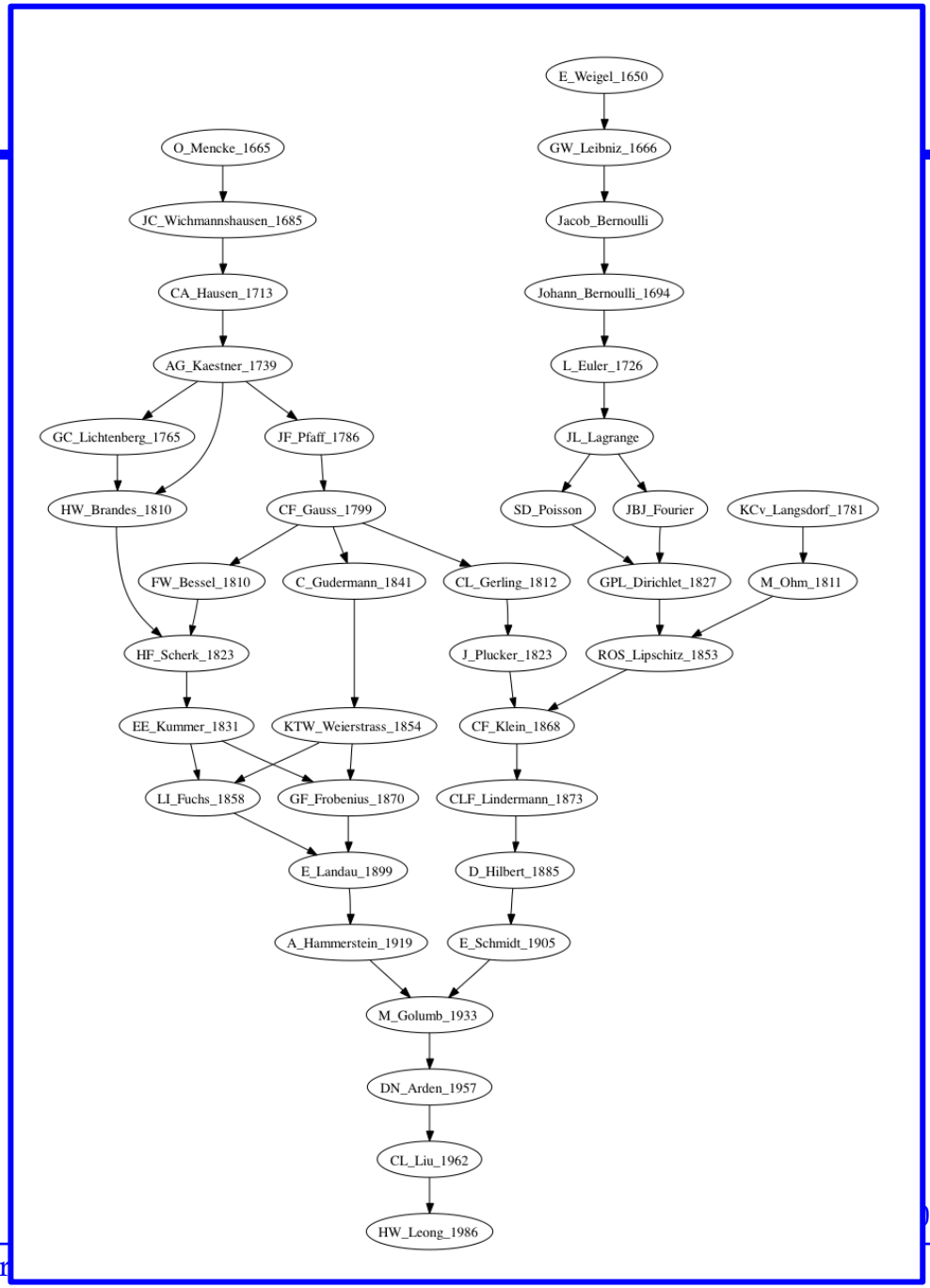
- **Who & what is the relationship?**

(1975)

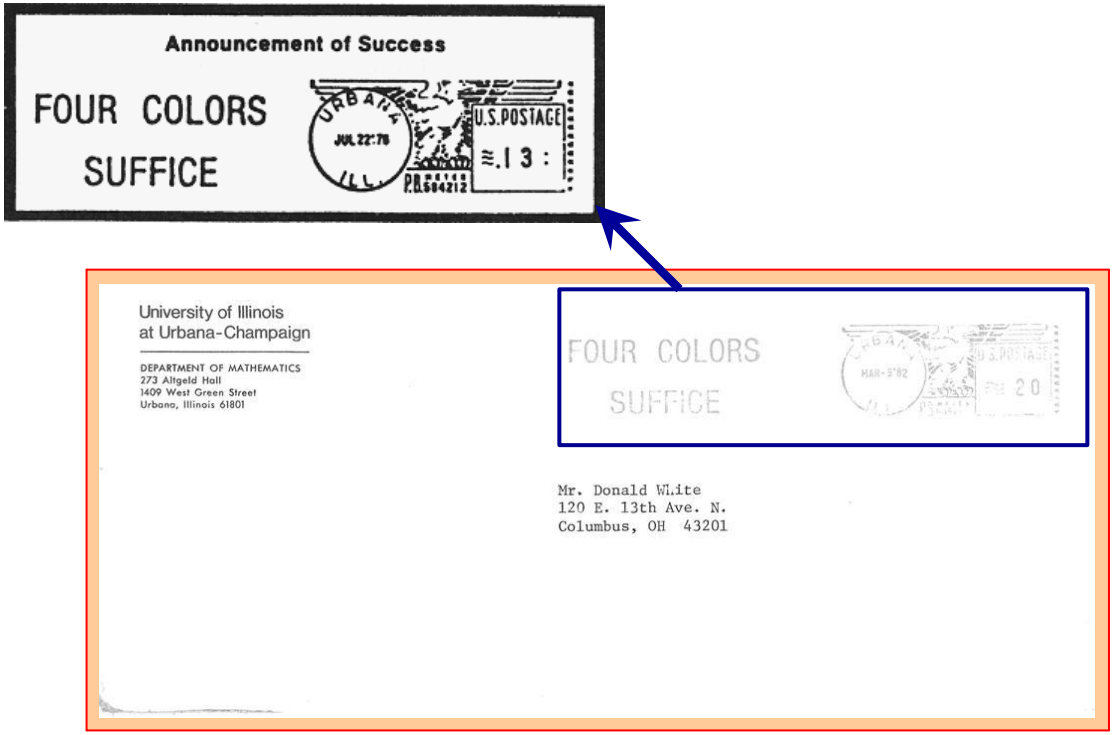
(1985)



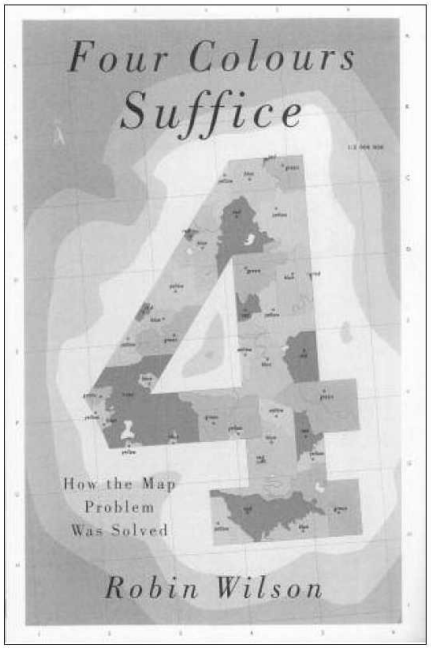
12 steps to Euler

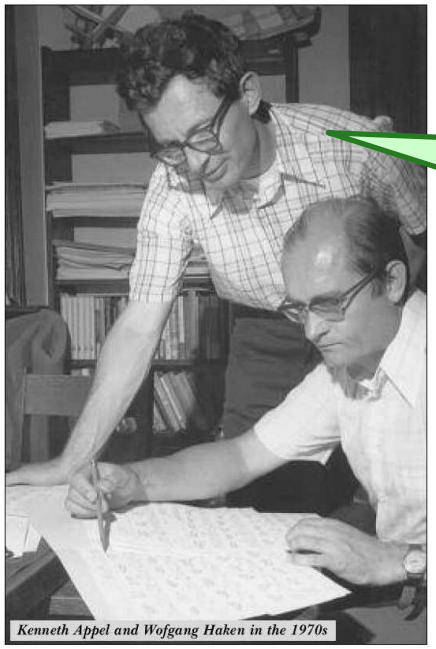


"Four Colors Suffices" postage stamp @UIUC



Learning "Four Colour Theorem" @UIUC



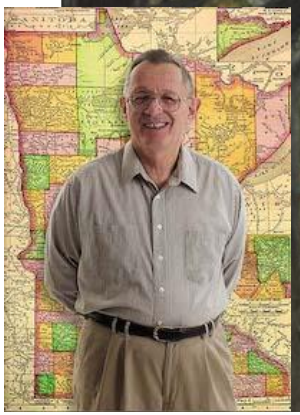

Kenneth Appel and Wofgang Haken in the 1970s

In Fall 1979,
I took a course
MA313 *Combinatorics*
taught by Ken Appel

…he spent 2 weeks on
Four Colour Theorem

Ken Appel & Wolfgang Haken @UIUC
(University of Illinois at Urbana-Champaign

Oct 2015, at UIUC Quad



Kenneth Appel
(1932 - 2013)

A chance meeting with Carole Appel (wife of Ken Appel) at UIUC in Oct 2015.

Story about Hopcroft & Tarjan

(1986)

(1986)

- **They met at Stanford;**
  - Hopcroft on sabbatical from Cornell-U
  - Tarjan was new graduate student
- **Worked on efficient algorithms with DFS**
  - Bi-Connectivity, strong connectivity,
  - Planarity testing in O(n) time

Graph Planarity Testing…

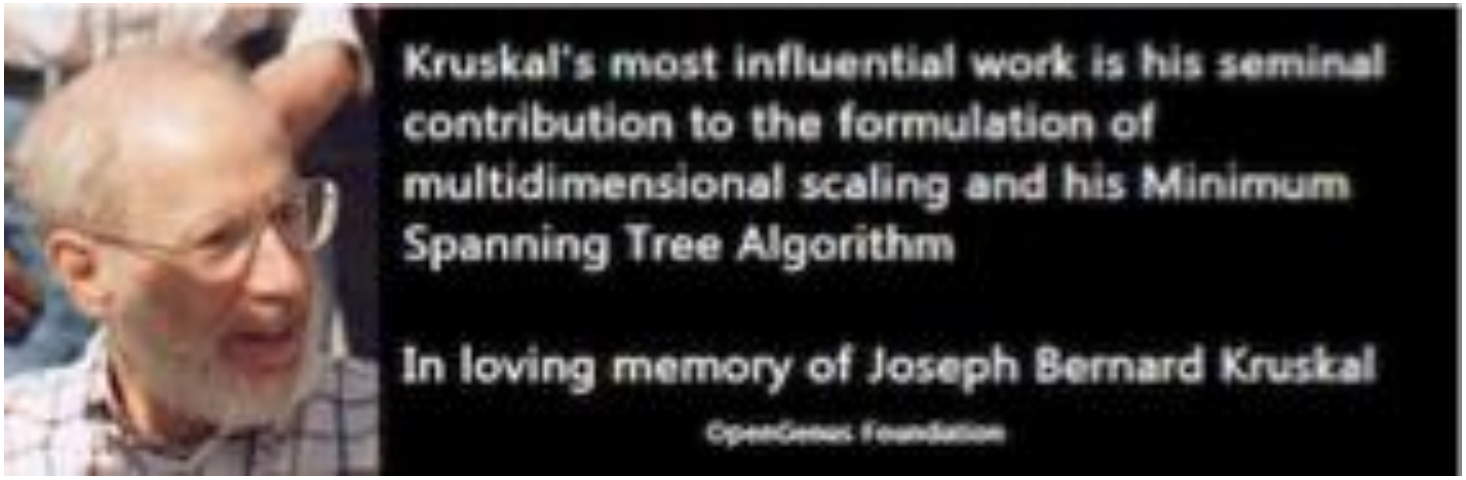
PLANARITY TESTING ALGORITHMS

PROBLEM : Given a graph, determine if it is planar

Date	Discoverer	Time
1930	Kuratowski	exponential
1961	Auslander & Porter	$O(n^3)$
1963	Goldstein	$O(n^3)$
1969	Shirey	$O(n^3)$
1967	Lempel, Even, & Cederbaum	$O(n^2)$
1972	Hopcroft & Tarjan	$O(nlgn)$
1974	Hopcroft & Tarjan	$O(n)$
1976	Booth & Leuker	$O(n)$

From my very old slides (transparency)

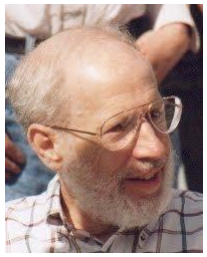
About that *Cool* Kruskal's Algorithm?



Joseph B. Kruskal (1928 – 2010)

https://iq.opengenus.org/kruskal-minimum-spanning-tree-algorithm/

Joe & Clyde, Encounter @UIUC



I (LeongHW) don't know Joseph Kruskal. Never met him.

But, I do know his nephew, Clyde.

Clyde Kruskal (now a professor in U. Maryland, College Park).
He was doing his post-doc at UIUC around 1980, when I was PhD student at UIUC.

Kruskal on Kruskal Algorithm

https://www.youtube.com/watch?v=qOv8K-AJ7o0

Pic with Guan Mei-ko (管梅谷), 1979 @SG

Picture with Guan Meigu (管梅谷) at the **Franco-Southeast Asia Mathematics Conference**, @Nanyang University, May 1979.
(I was tutor with MU)

1979 Franco-SEA Math Conference, @Nanyang University (NanTah), (May 1979)
with Kwan Mei-ko (Guan Meigu 管梅谷) [center], me leftmost.

The O(e log log v) paper…

AN O($|E|\log\log|V|$) ALGORITHM FOR FINDING MINIMUM SPANNING TREES *

Andrew Chi-chih YAO
Department of Computer Science, University of Illinois, Urbana, Illinois 61801, USA

Received 30 December 1975, revised version received 9 June 1975

Minimum spanning tree, linear median finding algorithm

(2000)

1. Introduction

Given a connected, undirected graph $G = (V, E)$ and a function c which assigns a cost $c(e)$ to every edge $e \in E$, it is desired to find a spanning tree T for G such that $\Sigma_{e\in T} c(e)$ is minimal. In this note we describe an algorithm which finds a minimum spanning tree (MST) in $O(|E|\log\log|V|)$ time. Previously the best MST algorithms known have running time $O(|E| \times \log|V|)$ for sparse graphs [1], and more recently Tarjan [2] has an algorithm that requires $O(|E| \times \sqrt{\log|V|})$ time.

Our algorithm is a modification of an algorithm by Sollin [3]. His method works by successively enlarging components of the MST. In the first stage the minimum-cost edge incident upon each node of G is found.

plying the linear median-finding algorithm [4]. Having accomplished this, we follow basically Sollin's algorithm as outlined above. Note that the number of operations needed in this phase is now reduced to

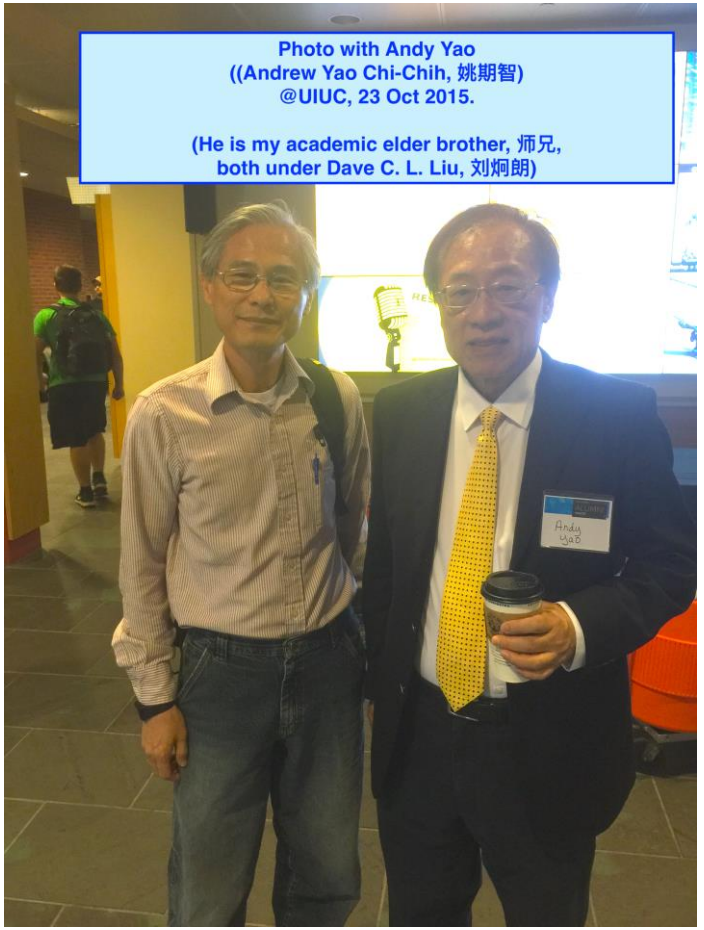
$$O\left(\frac{|E|}{k}\log|V|\right)$$

since only approximately $|E|/k$ edges have to be examined at each stage to find the minimum-cost edges incident with all the nodes. Therefore, the total number of operations required by our algorithm is

$$O\left(|E|\log k + \frac{|E|}{k}\log|V|\right),$$

which is $O(|E|\log\log|V|)$ if we choose k to be $\log|V|$.

Yao @UIUC (Oct-29, 2015)



https://cs.illinois.edu/news/alumnus-andrew-yao-sees-quantum-computing-next-great-science

Andy Yao @Tsinghua

Started "Yao Class" 姚班 @ 清华 Tsinghua

-- emulate US style undergraduate program in CS.

-- invited many visiting professors to Yao Class

C. L. Liu (刘炯朗) @清华

歷任校長

劉炯朗

1998~2002

劉炯朗 先生，廣東番禺人，民國23年出生，幼年時期在澳門就學，後因為父親在台灣擔任軍職，遂前來台灣就學，並考入當時的台南工學院電機系（成功大學）就讀，獲工學士。大學畢業後，劉校長從軍擔任陸軍少尉預官。退伍後報考清華大學原子科學研究所，獲得正取，但因同時取得美國麻省理工學院獎學金，所以便隻身負笈留美，順利取得麻省理工學院電腦碩士、博士。之後曾經執教麻省理工學院、伊利諾大學、清華大學等，並擔任伊利諾大學香檳校區助理副校長一職。1998年，經過本校及教育部甄選後，出任本校第二任遴選的校長一職。

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