

# 國立臺北大學自然資源與環境管理研究所

九十九學年度第二學期

『環境系統分析』課程講義 (三)

進度：整數規劃

## Integer Programming

### ● INTEGER PROGRAMMING

#### □ Introduction: Why Integers?

- ⇒ Decision Variable => Integer => Binary and General Integers
- ⇒ Discrete vs. Continuous Decision Spaces
- ⇒ “Integer-friendly” and LP Relaxation
- ⇒ Linearization of Nonlinear Programming=> *e.g.*, Fixed Cost Problems
- ⇒ Examples => Discrete Values, Yes/No Decision => Mixed Integer Programming

#### □ Integer Programming with Network Formulations

- ⇒ Transportation Problem
- ⇒ Assignment Problem

#### □ Facility Siting Systems (Location Theory or Location Analysis)

(for the memory of C. ReVelle 1938-2005, *Creator of Location Analysis*)

- ⇒ Location Set Covering Problem
- ⇒ Plant Location Problem

#### □ Solution Technique and Software Packages for IP

- ⇒ Cutting Plane; Branch and Bound
- ⇒ Packages: LINGO => @GIN, @BIN; GAMS => RMIP, MIP; What'sBest!

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nytimes.com

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August 25, 2005

Charles S. ReVelle, 67, Expert on Choosing the Perfect Site, Is Dead  
By [JEREMY PEARCE](#)

Charles S. ReVelle, an environmental engineer and systems analyst whose creative application of mathematical models helped determine the ideal sites for reservoirs, nature preserves, power stations and other projects, died on Aug. 10 at his home in Baltimore. He was 67.

The cause was lymphoma, his family said.

Dr. ReVelle, whose work influenced a variety of environmental policies, was a professor of geography and environmental engineering at Johns Hopkins University for more than three decades.

In the 1960's, he began his career as a chemical engineer, but soon became interested in the newly emerging field of location analysis. The field considers an array of variables in finding a site for a given project - a reservoir or hospital, for example - and then tries to plug those variables into a mathematical model called an algorithm. The model yields a solution that suggests the most effective and environmentally sound sites for the facility.

Dr. ReVelle (pronounced ruh-VEL) applied his algorithms to a sweeping set of subjects that grew to include the location and optimal scale of sewage-treatment plants, warehouses, preserves and emergency services. He was also interested in devising efficient routes of transportation and power grids.

In 1967, his doctoral dissertation at Cornell addressed a question of disease prevention, and how best to allocate drugs and resources for fighting tuberculosis within a group of developing countries.

In later work, Dr. ReVelle and others applied his models boldly to problems in history, to the location of military legions within the Roman empire and to modern-day problems of nuclear arms control. He was also interested in devising a mathematical model to strike a balance between cost-effective timber harvesting while still protecting delicate forest species. In the 1970's, his models were used to help the City of Baltimore decide which of its surplus fire stations to close.

Charles Seymour ReVelle was born in Rochester. He earned his undergraduate degree at Cornell, where he also taught before joining Johns Hopkins in 1971.

Dr. ReVelle was an associate editor of the journal *Management Science*. In 1996, he received a lifetime achievement award for his studies in location analysis from the Institute for Operations Research and Management Sciences.

With his wife, Penelope L. ReVelle, a biochemist, he wrote a series of college-level environmental textbooks, including the widely used "Global Environment: Securing a Sustainable Future" (Jones & Bartlett, 1992). Dr. ReVelle is also survived by two daughters, Cynthia ReVelle of Boston, and Elizabeth ReVelle of New Castle, [Australia](#); two brothers, Douglas ReVelle of Los Alamos, [N.M.](#), and Jack ReVelle of Orange, Calif.; and one grandchild.