



Peck教授,1999 (取自 NGI Publication 207)

Ralph B. Peck

— Engineer, Educator,
A Man of Judgment

范嘉程*

一、大地工程近代大師

Peck教授為近代土壤力學與基礎工程領域的大師，其於土壤隧道地頭沉陷槽及開挖擋土壁背側視土壓力之研究為現今世界各國大地工程師所需熟知的知識，並廣為工程實務界使用。Peck教授無論於大地工程理論與實務均有極高之貢獻，且其言行與風範亦為吾輩大地工程師所景仰。

Peck教授於1912年出生於加拿大Manitoba省Winnipeg市，於6歲移民至美國。父親為橋樑結構工程師，於其濡目染之環境，Peck教授於1930年高中畢業後，申請進入美國Rensselaer Polytechnic Institute，修習土木工程，1937年畢業於Rensselaer Polytechnic Institute，取得土木工程博士學位，並修結構工程，論文研究題目為：“Stiffness of Suspension Bridges”，當時對土壤力學並未有高度之興趣。Peck教授於畢業同日與Marjorie Truby女士結婚。

二、生涯轉捩點-大地工程師

Peck教授於取得博士學位後的第一份工作為橋樑結構工程師，然其服務之American Bridge Company因美國經濟大蕭條，營運不佳，Peck教授亦遭失業。然

「失之東隅，收之西隅」，由於當時無適合之結構工程工作，惟有與土壤力學(哈佛大學)及水利工程(愛荷華州)相關之工作機會，因此，Peck教授乃決定至當時Casagrande教授任教的哈佛大學擔任土壤力學試驗室助理，同年Terzaghi教授亦至哈佛大學任教，由於Terzaghi教授計為其土壤力學著作需一位懂統計學的人，Peck教授乃被推薦給Terzaghi教授，一次45分鐘之面談，奠定Peck教授日後數十年與Terzaghi教授及大地工程的深厚關係。於1938年，Terzaghi教授接任芝加哥市地下鐵興建計畫顧問工作，而Peck教授亦接受Casagrande教授之建議，任職工程師，並負責該計畫之土壤試驗室，直到1942年Peck教授前往伊利諾大學Urbana-Champaign校區任教，開始其教學研究與工程實務結合之大地工程工作生涯。於芝加哥市地下鐵計畫工作期間，Peck教授根據擋土開挖監測資料，於1943年發表“Earth-Pressure Measurement in Open Cuts, Chicago Subway”論文，開啓至今深開挖擋土結構分析常用之視土壓力估算法，芝加哥地下鐵工作期間實為Peck教授工程生涯之轉捩點。另於1969年於第七屆國際土壤力學與基礎工程研討會(7th ICSMFE)發表State-of-the-art論文“Deep Excavation and Tunneling in Soft Ground”，其中之隧道開挖地頭沉陷槽理論

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與深開挖地頭沉陷分佈圖至今仍為該課題之重要貢獻。Peck教授之著作中有許多為大地工程界所讚賞，其中數篇重要 Keynote papers列如后：

1. Advantages and Limitations of the Observational Method in Applied Soil Mechanics. Ninth Rankine Lecture, *Geotechnique*, June 1969, 19, pp. 171-187.

2. Presidential Address, The Direction of Our Profession. *Proc. 8th Int. Conf Soil Mech.*, Moscow (1973), 4.1, pp. 156-159.

3. Soil Mechanics in Engineering Practice: The Story of a Manuscript, 1942-1948. *Terzaghi Memorial Lectures*, Bogazici Univ., Istanbul (1973), pp. 50-77.

4. The Selection of Soil Parameters for the Design of Foundations. 2nd Nabor Carrillo Lecture. Mexican Soc. for Soil Mech. (1975), 64 pp.

5. On Being Your Own Engineer. *Civil Eng. Alumni Assoc. Newsletter*, Univ. of Ill., Urbana, Illinois, Fall 1976, pp. 4-5.

6. The Last Sixty Years. *Proc. 11th Int. Conf. Soil Mech.*, San Francisco (1985). Golden Jubilee Volume, pp. 123-133.

7. Pains of A New Profession in Soil Mechanics 1925-1940, *ASFE Annual Meeting, Boston, Mass., (1988)*.

8. Six Decades of Subway Geo-Engineering: The Interplay of Theory and Practice, Geo. Engineering for Underground Facilities. *ASCE-Geo-Institute Geot. Spec. Publ. 90, (1999)*, pp. 1-15.

Peck教授於近60年之教學研究與工程實務顧問工作中，對大地工程知識的研究發展與教學貢獻卓越，並成為此領域中最具影響力的領航者之一。Peck教授相當重視大地工程理論與工程實務之結合，共發表234篇論文，另有數本大地工程著作，其中與W. Hanson、T. Thornburn合著之“Foundation Engineering”(1974)及與K.

Terzaghi教授合著之“*Soil Mechanics in Engineering Practice*”(本著作於1996年由伊利諾大學Mesri教授及Peck教授重新修訂成為第三版)至今仍為學生與土木工程師喜愛之經典力作。此外，並於世界各國參與超過1045件土壤力學與基礎工程計畫，主要包括基礎工程、隧道、水壩、堤防等計畫，其中1968年參與之“Dead Sea Dikes”計畫最為Peck教授所津津樂道。

Peck教授於1974年自伊利諾大學Urbana-Champaign校區土木工程系退休，目前定居於新墨西哥州Albuquerque市，並從事工程顧問工作。其後每月均返回學校演講，將其於大地工程數十年之經驗與見聞見傳授予學生。筆者於1989年至1995年於伊利諾大學土木工程系就讀時，Peck教授已近80歲高齡，仍每月返校演講，筆者亦均前往聆聽，演講廳中座無虛席，參加者包括學校教授、研究生、大學部學生、及欲一睹大師風範者，期望由Peck教授演講中抓住些隻字片語，便不虛此行。Peck教授之演講幾乎沒有數學式，亦沒有電腦程式，多的是工程歷史的見證，許多早期重大工程計畫在演講中如同歷史倒帶，彷彿進入時光隧道，前人艱路藍縷之景象如歷眼前。記得印象最深刻的一次演講題目為有關於「監測方法於大地工程問題解決之使用」，於90分鐘之演講中，強調詳細規劃之監測系統於大地工程計畫成功之重要性，必須針對工程計畫之特性規劃監測系統，而“監測”為獲得設計印證與回饋最為重要之“定量”資料。演講過程對其參與過之大型計畫如同說故事般娓娓道來，並不時點出工程計畫之key problems，對於吾輩工程師大地工程觀念之啟發與引導有莫大之助益。

Peck教授於其60年之教學研究與工程顧問工作，受到工程界高度之肯定與讚賞，曾獲得多項獎項，重要者包括：1) The Norman Medal by ASCE, 1944；2) The Wellington Prize by ASCE, 1965；3) The Karl Terzaghi Award, 1969；4) President

of the International Society of Soil Mechanics and Foundation Engineering (1969-1973) ; 5) The National Medal of Science, 1975 (由當時福特總統頒發)。

由於 Peck 教授於土壤力學與基礎工程之貢獻卓越，於 1965 年獲選為美國國家工程研究院 (National Academy of Engineering) 之院士。美國 ASCE Geo-Institute 亦於 1999 年設立 The Ralph B. Peck Award。Peck 教授亦為 American Academy of Arts and Sciences 之 Fellow，並為 ASCE、日本、墨西哥、及東南亞土壤力學學會之榮譽會員。

三、NGI 設立 Ralph B. Peck 圖書館

2000 年 5 月 Norwegian Geotechnical Institute 於挪威奧斯陸 (Oslo) 設立 Ralph B. Peck 圖書館，與設立於 1967 年之 Terzaghi 圖書館毗鄰，Peck 教授與 NGI 之結緣始於與 NGI 第一任院長 Dr. Laurits Bjerrum 之深厚友誼關係，且與 NGI 一直維持著緊密之聯繫，為表彰 Peck 教授於大地工程知識之貢獻，NGI 乃收集 Peck 教授個人所有的著作、各工程計畫顧問工作檔案、日記、及筆記簿等，成立 Ralph B. Peck 圖書館，並出版 "NGI Publication Number 207, Ralph B. Peck, Engineer, Educator, A Man of Judgment"，主要內容包括有：

- "The Norwegian Connection" - the welcome
- "A Profile of his career" - presented in the format of a borehole log
- "In His Own Words" - the result of the interview
- A list of awards and citations
- Reprints of three publications with powerful behavioral messages
- "Words of Wisdom"
- A list of publications.

四、Peck 教授之 Words of Wisdom (智慧語錄)

Peck 教授 "Words of Wisdom (智慧語錄)" 為收錄其過去 60 年著作中具有深遠意涵，且深切領悟 "大地工程" 知識後之想法，其內容跳脫工程技術層面，涉及教學、研究、及對大地工程實務工作應有之觀念，值得吾輩大地工程師細讀與體會。以下為 Peck 教授 "智慧語錄" 中關於工程重要性 (Importance of Engineering)、溝通 (Communication)、教學 (Education)、研究 (Research)、設計 (Design)、施工 (Construction)、監測 (Observation and Instrumentation)、及工程判斷 (Engineering Judgment) 等之部份摘錄 (Ralph B. Peck, 2000；為尊重原著作，謹以原句刊出)。

• On the Importance of Engineering

Our personal, individual attitudes toward engineering and toward society have potential impact on our country's future. However small that impact, each of us should try to make it for good.

Engineering is indeed a noble sport [this statement was first made by Karl Terzaghi], and the legacy of good engineers is a better physical world for those who follow them.

• On Communication

If it's important, say why!

If you can't reduce a difficult engineering problems to just one 8½ × 11-inch sheet of paper, you will probably never understand it. (Advice to his students).

We should write with more discrimination.

the same as those operate in the field.

• On Education

Our practice falls short of our knowledge.

It would be a serious mistake to permit the subject of soil mechanics to be taught by individuals who do not possess an adequate background of field experience.

Unfortunately, with the present trend many students are led to believe that theory and laboratory testing constitute the whole of soil mechanics.

Why should there be such a discrepancy between our knowledge and our general practice? To some extent, I fear, because of too much specialization and too little appreciation of the interrelation of the various branches of civil engineering.

• On Research

The most fruitful research grows out of practical problems.

No theory can be considered satisfactory until it has been adequately checked by actual observations.

The academic climate encourages finding a subject for investigation that can be pursued at the desk or in the laboratory until all aspects have been exhausted. The subject is likely to be chosen more for convenience than for significance.

In soil mechanics, no evidence can be considered reasonably adequate until there is sufficient field experience to determine whether the phenomena observed in the laboratory are indeed

• On Design

Simple calculations based on a range of variables are better than elaborate ones based on limited input.

The most successful practitioners of the art (-of engineering-) will maintain a healthy respect for the ability of Nature to produce surprises.

We should be on guard not to ascribe to elaborate analytical routines a reliability they do not possess.

Those who try to force Nature into the pattern by simplifying assumptions of theory will be courting disaster.

Sophisticated calculation is too often substituted for painstaking subsurface investigation. The ease or the fascination of carrying out calculations taking into account complex loadings, geometrics, and soil condition leads many of us to believe that realistic results will somehow emerge even if vital subsurface characteristics are undetected, ignored, or oversimplified.

• On Observation and Instrumentation

Instrumentation is no substitute for adequate design.

Indeed, in my judgment, the simplest measurements are always the best because they have the least possibility for error and the greatest likelihood of survival.

An instrument too often overlooked in our technical world is a human eye connected to the brain of an intelligent human being.

• On Engineering Judgment

Theory and calculation are not substitutes for judgment, but are the basis for sounder judgment.

There is actually such a thing as engineering judgment and it is indispensable to be successful practice of engineering.

Your real security will lie in your ability as engineers, which in turn will depend on the quality of your judgment.

Where has all the judgment gone? It has gone where the rewards of professional recognition and advancement are greatest - to the design office where the sheer beauty of analysis is often separated from reality. It has gone to the research institutions, into the fascinating effort to idealize the properties of real materials for purpose of analysis

and into the solution of intricate problems of stress distribution and deformation of idealized materials. The incentive to make a professional reputation leads the best people in these directions.

五、後記

本文 Peck 智慧語錄為 Peck 教授於 1960 年代指導的二位博士研究生 Dr. Elmo DiBiagio 及 Dr. Kaare Flaate 所整理收集，並發表於 *Geotechnical News* 期刊 (2000)。筆者取得 Dr. Elmo DiBiagio 之同意後轉載其中部份內容，同時，Dr. DiBiagio 提供關於 Peck 教授之 "NGI Publication 207" 部份文件，筆者亦深表感謝。

參考文獻

PECK, RALPH B., (2000), "Words of Wisdom", *Geotechnical News*, Selected by Elmo DiBiagio and Kaare Flaate, September, pp.35-37.