

**Rafael David Epstein Numhauser**

**I. Qualifications**

- Industrial Engineer, Universidad de Chile, 1988.
- Master's in Engineering Sciences, Honorable Mention in Industrial Engineering, Universidad de Chile, 1988.
- Ph.D. in Operations Research, M.I.T., 1998.

**II. Main Awards and Honors**

- i) **Franz Edelman Award, 1998:** Awarded annually by INFORMS (Institute for Operations Research and Management Science, U.S.A.) considered the highest international honor in applied research in the field of Management Science. Awarded to a company and the authors in recognition of a fundamental change in the operational management of the Arauco timber company and other Chilean timber companies. Winners from other years include companies such as IBM, AT&T, and American Airlines. We are one of only two Latin American winners of the prize; the other being the Central Bank of Mexico in 2010.
- ii) **OR For Development, 2002:** Award given by IFORS (International Federation of Operational Research Societies) every three years in recognition of the best application of Operations Research and Management Science work in developing countries. Awarded for a novel combinatorial bidding model for awarding school meals service contracts in public and State-subsidized schools in Chile run by the state agency JUNAEB. This system – awarding by far biggest contract in Chile – was used by JUNAEB from 1997 to 2013, with results that were widely praised by academics and the business community alike, with savings of 20% and a tender of US\$ 1 billion per year.
- iii) **Avonni Innovator of the Year, 2008:** Corresponding to the individual honor given by Avonni for the innovator of the year. This prize is awarded by a mixed committee under the auspices of CORFO, SOFOFA, and the Ministry for the Economy in a public event broadcast on the TVN television channel. Other notable winners include Fernando Fischmann (founder of Crystal Lagoons, the only “unicorn”, a startup company valued at over one billion dollar, in Chilean history) in 2007 and the renowned architect Alejandro Aravena (founder of the Elemental studio) in 2009.
- iv) **Premio Ramón Salas 2011:** Awarded annually by the Chilean Institute of Engineers for the best published engineering work over the course of the current three-year period. This prize was awarded for the optimization of the container fleet of shipping company Compañía Sudamericana de Vapores (CSAV), with over half a million containers located on five continents.

- v) **Finalist, Franz Edelman Award (INFORMS), 2011:** With the work carried out for the CSAV shipping company in the optimization of the management of their container fleet. Other finalists that year included The International and Commercial Bank of China (the largest commercial bank in the world), the InterContinental Hotels Group (the largest hotel chain in the world), and the American high-voltage transmission giant Midwest Independent Transmission System Operator.
  
- vi) **First Prize worldwide with the Universidad de Chile in the “10<sup>th</sup> Rothkopf Rankings of Universities Contributions to the INFORMS Practice Literature”:** This achievement was for publications of an applied nature written by academic authors Rafael Epstein, Andrés Weintraub, and Guillermo Durán, all of equal merit according to the methodology of the ranking system. This result has had a strong impact in Chile, given the country’s prominence globally.

### III. Other Awards

- vii) **Best Publication Award in Natural Resources 2015:** With the paper “Optimizing long-term production plans in underground and open-pit copper mines”. Award given by the Natural Resources chapter of INFORMS (Institute for Operations Research Societies, U.S.A.) for the best publication in the field over the past three years.
  
- viii) **Best Publication Award in Natural Resources 2007:** With the paper “Harvest Scheduling Subject to Maximum Area Restrictions: Exploring Exact Approaches”. Award given by the Natural Resources chapter of INFORMS (Institute for Operations Research Societies, U.S.A.) for the best publication in the field over the past three years.
  
- ix) **“Combinatorial Auctions for Procurement: An Empirical Study of the Chilean School Meals Auction”:** Article published in the journal Management Science in 2012, appeared in the INFORMS Editor’s Cut Collection 2016: “Confronting Public Problems with Operations Research”.
  
- x) **Finalist in the EURO Excellence in Practice Awards, Lisbon, 2010:** Prize in recognition of the best publication in Operational Research. The work presented was “Quantitative methods for a new configuration of territorial units in a Chilean government agency tender process”.
  
- xi) **Best Full-Time Professor of the Department of Industrial Engineering of the Universidad de Chile, 2006:** This award is given by Industrial Engineering students.

- xii) **Best Full-Time Professor of the Department of Industrial Engineering of the Universidad de Chile, 2007:** This award is given by Industrial Engineering students.
- xiii) I have led numerous scientific and technological research projects including Fondecyt, Fondef, and Innova Corfo.
- xiv) I have headed numerous high-impact projects with important national and international companies, ministries, and public offices.
- xv) Keynote speaker at several conferences and seminars such as ICORD 2016 (IFORS conference for Latin America) in Mexico City, where I was the main invited speaker.
- xvi) M.I.T. graduate with a 4.0/4.0 grade (or 5.0/5.0 using the current scale).
- xvii) Highest entry score in Chile for Engineering courses with 825 points, in 1980 (including two exams with the highest national score).

#### **IV. Main Positions at the Universidad de Chile**

- a) **Director of the Department of Industrial Engineering, 2005 to 2008.** Among my principal achievements were the management of important donations from the country's biggest companies (in excess of US\$ 20 million), the purchasing of properties for the expansion of our facilities and installations, the accreditation of courses for up to seven years, the renewal and expansion of the academic staff, the recovery of our properties with a high patrimonial value, and the launch of new programs such as a Master's in Global Management, which has allowed us to create agreements with universities in the US, Europe, and Asia.
- b) Member of the **University Senate** from the end of 2015 to mid-2016.
- c) **Provost** of the Universidad de Chile from mid-2016 to present.
- d) **Director of the Center for Operational Research for the Mining Industry** from 2009 to present. This center carries out important research in the area of Operational Research in conjunction with the mining industry. The center comprises the Department of Industrial Engineering, the Department of Mining Engineering, and the Institute of Complex Engineering Systems (ISCI, to use its Spanish acronym).

- e) **Department Advisor, Faculty Advisor** and member of numerous university commissions.
- f) **Associate Professor of the Department of Industrial Engineering at the Faculty of Physical Sciences and Mathematics** from 1990 to present.

#### **V. Main Positions outside of the Universidad de Chile**

- 1) **President of the Center of MIT Alumni in Chile**, 2006-2007 (12 months). This position is awarded by vote among all MIT alumni in the country. My term was followed by José de Gregorio, President of Chile's Central Bank, then Vitorio Corbo, also President of the Central Bank.
- 2) **Salmon Industry Expert Panel**, 2011-2014. Panel created by the Ministry for the Economy to tackle the crisis surrounding the ISA virus. The panel comprised of five experts, with Santiago Urcelay (Dean of the Veterinary School) and myself representing the Universidad de Chile.
- 3) **Chief Researcher at the Institute of Complex Engineering Systems** from 2007 to present.
- 4) **Associate Editor of the journal "Naval Research Logistics"** from 1999 to 2002.

#### **VI. Main Publications**

##### **Main Scientific Articles in ISI-indexed Journals**

- R. Epstein, J. Yarmuch, R. Cancino, and J.C. Peña; "Evaluating Crusher System Location in an open pit mine using Markov chains". International Journal of Mining. Pag. 1-14. 2015.
- F. Bonono, J. Catalan, G. Duran, R. Epstein, A. Jawtuschenko, and J. Marengo: "An Asymmetric Multi-Item Auction with Quantity Discounts Applied to Internet Service Procurement in Buenos Aires Public Schools". Annals of Operations Research, PUBLICATION PENDING.
- M. Olivares, G. Weintraub, R. Epstein, and D. Yung: "Combinatorial Auctions for Procurement: An Empirical Study of the Chilean School Meals Auction". Management Science, Volume 58, Issue 8, 2012.
- R. Epstein, A. Weintraub, A. Neely, F. Valenzuela, S. Hurtado, G. Gonzalez, M. Naveas, F. Infante, A. Beiza, F. Alarcon, J. Catalan, C. Berner, D. Yung, G. Angulo, and C.

Gonzalez: "A strategic empty container logistics optimization in a major shipping company", *Interfaces* Vol. 42. Issue 1. 2012.

- G. Duran, R. Epstein, C. Martinez, and G. Zamorano; "Quantitative Methods for a New Configuration of Territorial Units in a Chilean Government Agency Tender Process". *Interfaces*, Volume 41, Issue 3, 2011.
- R. Epstein, M. Goic, A. Weintraub, J. Catalan, P. Santibañez, R. Urrutia, R. Cancino, S. Gaete, A. Aguayo, and F. Caro (2012, *Journal Operations Research*): "Optimizing Long-Term Production Plans in Underground and Open Pit Copper Mines". *Operations Research*, Volume 60, Issue 1, 2012.
- J. Catalan, R. Epstein, M. Guajardo, D. Yung, and C. Martinez: "Solving multiple scenarios in a combinatorial auction". *Computers & Operations Research*, Volume 36, Issue 10, 2009.
- R. Epstein. A. Weintraub. P. Sapunar, E Nieto, and F. Bustamante: "A combinatorial heuristic approach for solving real-size machinery location and road design problems in forestry planning". *Operations Research* 54 (6): 1017-1027, 2006.
- M. Goycoolea, R. Epstein, A. Weintraub, A. Murray, and F. Barahona: "Harvest Scheduling Subject to Maximum Area Restrictions: Exploring Exact Approaches". *Operations Research*. Vol. 53. Nº3. pp. 490-500, 2005.
- R. Epstein. L. Henríquez. J. Catalán. G. Weintraub. C. Martínez and F. Espejo: "A Combinatorial Auction Improves School Meals in Chile: A Case of OR in Developing Countries". *International Transactions in Operational Research* 11. 593-612, 2004.
- R. Epstein, L. Henriquez, J. Catalan, G. Weintraub, and C. Martinez: "A Combinatorial Auction Improves School Meals in Chile". *Interfaces*, Vol. 32, Issue 6, 2002.
- A. Weintraub, R. Epstein, G. Murphy, and B. Manley: "The Impact of Environmental Constraints on Short Term Harvesting: Use Planning Tools and Mathematical Models". *Annals of Operations Research* 95, 41-66, 2000.
- R. Epstein, R. Morales, J. Serón, and A. Weintraub: "Use of OR Systems in the Chilean Forest Industries". *Interfaces* 29, (1), 7-29, 1999.
- R. Epstein, E. Nieto, A. Weintraub, P. Chevalier, and J. Gabarró: "A System for Short Term Harvesting". *European Journal of Operations Research* 119, 427-439, 1999.
- A. Weintraub, R. Epstein, R. Morales, J. Serón, and P. Traverso: "A Truck Scheduling System Improves Efficiency in the Forest Industries". *Interfaces*, 26, (4), 1-12, 1996.
- A. Weintraub, F. Barahona, and R. Epstein: *Forest Science*, "A Column Generation Algorithm for Solving General Forest Planning Problems with Adjacency Constraints" 40, 142-161, 1994.

- F. Barahona, A. Weintraub, and R. Epstein: "Habitat Dispersion in Forest Planning and the Stable Set Problem". *Operations Research*, Volume 40, Issue 1, 1992.

### **Books and Book Chapters**

- A. Weintraub, and R. Epstein: "The Supply Chain in the Forest Industry: Models and Linkages", *Applied Optimization, Supply Chain Management Models, Applications, and Research Directions*, Kluwer Academic Publishers, Joseph Geunes, Panos M., Pardalos and H. Edwing Romeijn Editors, 343-362 (2002).
- M. Goycoolea, R. Epstein, A. Murray, A. Weintraub, G.J. Arthaud and T.M. Barret: "An Adjacency-Modeling Problems Based on Construction Harvesting Areas", (Eds), *Systems Analysis in Forest Resources*, 279-283, 2003.
- Caro, Epstein, Santibañez and Weintraub (2007): "An Integrated Approach to the Long-Term Planning Process in the Cooper Mining Industry". *Handbook of Operations Research in Natural Resources*. (eds). Andres Weintraub. Carlos Romero. Trond Bjorndal. Rafael Epstein. pp.595-609. Book Chapter.
- R. Epstein, M. Ronnqvist, and A. Weintraub (2007): "Forest Transportation". *Handbook of Operations Research in Natural Resources*. (eds). Andres Weintraub. Carlos Romero. Trond Bjorndal. Rafael Epstein. pp.391-403. Book Chapter.
- R. Epstein, J. Karlsson, M. Ronnqvist, and A. Weintraub (2007): "Harvest Operational Models in Forestry". *Handbook of Operations Research in Natural Resources*. (eds). Andres Weintraub. Carlos Romero. Trond Bjorndal. Rafael Epstein. pp. 365- 377. Book Chapter.
- R. Caldentey, R. Epstein, D. Saure: Book Chapter: "Optimal Exploitation of a Mineral Resource under Stochastic Market Prices". To appear in "Real Options in Energy and Commodity Markets", Now Publishers Inc.