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“...how wonderful the field of statistics is...”

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4.1 Introduction

There are two purposes for this chapter. The first is to remind/introduce readers to some of the important statistical contributions and attitudes of the great American scientist John W. Tukey. The second is to take note of the fact that statistics commencement speeches are important elements in the communication of statistical lore and advice and not many seem to end up in the statistical literature. One that did was Leo Breiman’s 1994.¹ It was titled “What is the Statistics Department 25 years from now?” Another is Tukey’s² presentation to his New Bedford high school. There has been at least one article on how to prepare such talks.³

Given the flexibility of this COPSS volume, in particular its encouragement of personal material, I provide a speech from last year. It is not claimed to be wonderful, rather to be one of a genre. The speech below was delivered June 16, 2012 for the Statistics Department Commencement at the University of California in Los Angeles (UCLA) upon the invitation of the Department Chair, Rick Schoenberg. The audience consisted of young people, their relatives and friends. They numbered perhaps 500. The event was outdoors on a beautiful sunny day.

The title and topic⁴ were chosen with the goal of setting before young statisticians and others interested the fact that America had produced a great scientist who was a statistician, John W. Tukey. Amongst other things he created the field Exploratory Data Analysis (EDA). He gave the American statistical community prestige, and defined much of their work for years.

Further details on specific remarks are provided in a Notes section. The notes are indexed by superscripts at their locations. A brief bibliography is also provided.

4.2 The speech (edited some)

I thank Rick for inviting me, and I also thank the young lady who cheered when my name was announced. She has helped me get started. It is so very nice to see Rick and the other UCLA faculty that I have known through my academic years.

Part of my time I am a sports statistician, and today I take special note of the Kings⁵ winning the Stanley Cup⁶ five days ago. I congratulate you all for surely your enthusiasm energized your team. I remark that for many years I have had a life-size poster of Wayne Gretzky,⁷ wearing a Kings uniform, in my Berkeley office,⁸ Rick would have seen it numerous times. All of you can enjoy this victory. I can tell you that I am still enjoying my Leafs⁹ victory although there has been a drought since.

Rick asked me to talk about “how wonderful the field of statistics is.” No problem. I welcome the opportunity. I have forever loved my career as a statistical scientist, and in truth don’t understand why every person doesn’t wish to be a statistician,¹⁰ but there is that look. I mean the look one receives when someone asks what you do, and you say “statistics.” As an example I mention that a previous University of California President once told me at a reception, seemingly proudly, that statistics had been the one course he had failed in his years at the University of California. Hmmh.

My talk this afternoon will provide a number of quotations associated with a great American scientist, Rick’s statistical grandfather,

John Wilder Tukey (1915–2000)

To begin, Rick, perhaps you know this already, but in case not, I mention that you owe John Tukey for your having an Erdős number of 4.¹¹

Mr. Tukey had a number of aliases including: John Tukey, Mr. Tukey, Dr. Tukey, Professor Tukey, JWT, and my favorite — The Tuke. The Tuke was born June 16, 1915 in New Bedford, Massachusetts, and in some ways he never left. He was a proud New Englander, he ate apple pie for breakfast, and he bought his Princeton house putting cash on the barrelhead.

Dr. Tukey was a unique individual during his childhood, as a professor, as an advisor, as an executive, and as a consultant. He learned to read at a very young age and was home schooled through high school. His higher education included Bachelor’s and Master’s degrees in Chemistry from Brown University in 1936 and 1937, followed by a Master’s and a Doctorate in Mathematics from Princeton in 1938 and 1939.

He went on to be Higgins Professor at Princeton and Associate Executive Director of Research Information Sciences at Bell Telephone Laboratories. As a graduate student at Princeton he drew attention by serving milk instead of the usual beer at his doctoral graduation party.¹²

John Tukey was quick, like Richard Feynman.¹³ He could keep track of time while reciting poetry and seemingly do three different things simultaneously. I watched him continually, I guess, because I had never seen anyone quite like him before. He was called upon continually to provide advice to presidents and other decision makers. He created words and phrases like: bit, software, saphe cracking, the jackknife and his marvelous creation, EDA.¹⁴ He delighted in vague concepts, things that could be made specific in several ways, but were often better left vague. He worked in many fields including: astronomy, cryptography, psephology, information retrieval, engineering, computing, education, psychology, chemistry, pollution control, and economics.

John Tukey was firmly associated with Princeton and Bell Labs.¹⁵ Moreover, he had associations with UCLA. For example, I can mention his friendship and respect for Will Dixon. Will started your Biostat/Biomath group here in 1950 and had been John's colleague at the Fire Control Research Office (FCRO)¹⁶ in World War II.

John had the respect of scientists and executives. The Princeton physicist John Wheeler¹⁷ wrote:

“I believe that the whole country — scientifically, industrially, financially — is better off because of him and bears evidence of his influence. [...] John Tukey, like John von Neumann, was a bouncy and beefy extrovert, with interests and skills in physics as well as mathematics.”

A former President of Bell Labs, W.O. Baker¹⁸ said in response to a personal question:

“John was indeed active in the analysis of the Enigma¹⁹ system and then of course was part of our force in the fifties which did the really historic work on the Soviet codes as well. So he was very effective in that whole operation. [...] John has had an incisive role in each major frontier of telecommunications science and technology: uses of transistors and solid state; digital and computers.”

Dr. Tukey was involved in the construction of the von Neumann computer. In particular, A. Burks wrote:

“John Tukey designed the electronic adding circuit we actually used in the Institute for Advanced Studies Computer. In

this circuit, each binary adder fed its carry output directly into the next stage without delay.”

John Tukey was renowned for pungent sayings.

“The best thing about being a statistician,” he once told a colleague, “is that you get to play in everyone’s backyard.”

“The collective noun for a group of statisticians is a quarrel.”

“Perhaps because I began in a hard but usually non-deductive science — chemistry — and was prepared to learn ‘facts’ rather than ‘proofs’, I have found it easier than most to escape the mathematician’s implicit claim that the only real sciences are the deductive ones.”

“Doing statistics is like doing crosswords except that one cannot know for sure whether one has found the solution.”

“A consultant is a man who thinks with other people’s brains.”

“The stronger the qualitative understanding the *data analyst* can get of the subject matter field from which his data come, the better — just so long as he does not take it too seriously.”

“Most statisticians are used to winning arguments with subject-matter colleagues because they know *both* statistics and the subject matter.”

“The first task of the analyst of data is quantitative detective work.”

“Well, what I think you need is folk dancing.”²⁰

Tukey had a quick wit. For example the seismologist Bruce Bolt and I developed a method to estimate certain Earth parameters following a great earthquake. I half-boasted to John, that with the next one Bruce and I would be in the morning papers with estimates of the parameters and their uncertainties. John’s response was,

“What if it is in Berkeley?”

Indeed.

Tukey wrote many important books, and many papers. A selection of the latter may be found in his *Collected Works*.²¹

Some advice for the students

Learn the theory for the theory becomes the practice.

Learn the math because that is the hard part of the other sciences.

In consulting contexts ask, ‘What is the question?’ Ask it again, and again, and...

Answer a question with, ‘It depends,’ followed by saying what it depends upon.

Be lucky, remembering that you make your luck.

Don’t forget that statisticians are the free-est of all scientists — they can work on anything. Take advantage.

Closing words

Congratulations graduates.

May your careers be wonderful and may they emulate John Tukey’s in important ways.

Thank you for your attention.

4.3 Conclusion

In my academic lifetime, statistical time series work went from the real-valued discrete time stationary case, to the vector-valued case, to the nonstationary case, to the point process case, to the spatial case, to the spatial-temporal case, to the generalized function case, to the function-valued time parameter case. It proved important that robust/resistant variants²² followed such cases.

In summary there has been a steady progression of generalization and abstraction in modeling and data analysis of random processes. Learning the mathematics and continuing this progression is the challenge for the future.

For more details on John Tukey’s life, see Brillinger (2002a) and Brillinger (2002b). This work was partially supported by the NSF Grant DMS-100707157.

Notes

1. www.stat.berkeley.edu/~dpurdy/Breiman-1994-commencement.html
2. See p. 306 in Anscombe (2003).
3. See Rodriguez (2012).
4. These words come from an email of Rick's describing his wishes for the talk.
5. The Kings are the National Hockey League (NHL) team in Los Angeles. They won the Stanley Cup in 2012.
6. The Stanley Cup is the trophy awarded to the NHL championship team each year.
7. Wayne Gretzky is a renowned Canadian hockey player holding many NHL records.
8. Room 417 in Evans Hall on the UCB campus.
9. The NHL team based in Toronto, Canada, where I grew up.
10. In Sacks and Ylvisaker (2012) one reads, "But seriously why would one choose to be something other than a statistician?"
11. A mathematician's Erdős number provides the "collaborative distance" from that person to Paul Erdős.
12. The famous mathematician John von Neumann is reputed to have said, "There is this very bright graduate student, and the remarkable thing is that he does it all on milk."
13. Richard Feynman was an American physicist known for his work in the theoretical areas. With Julian Schwinger and Sin-Itiro Tomonaga, he received the Nobel Prize in Physics in 1965.
14. Exploratory data analysis (EDA): 1. It is an attitude; *and* 2. A flexibility; *and* 3. Some graph paper (or transparencies, or both). See Tukey (1965).
15. Bell Labs was an institution sponsored by AT&T. It was the birthplace for many scientific and development advances.
16. The Fire Control Research Office (FRCO) located in Princeton during the Second World War.
17. John Archibald Wheeler (1911–2008) was an American theoretical physicist, and colleague of Tukey at Princeton. He worked in general relativity.

18. Personal communication from W.O. Baker.
19. Enigma was an important code employed by the Germans in World War II.
20. Personal communication from Leo Goodman.
21. See Cleveland (1984–1994). There are eight volumes spread over the years 1984–1994.
22. Robust refers to quantities not strongly affected by non-normality, and resistant refers to those not strongly affected by outliers.

References

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