

R. L. Anderson Lecture

Anova at 100: A Resolution to an Enduring Quandary

Friday • April 10, 2026

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R. A. Fisher formalized Analysis of Variance – ANOVA – in *Statistical Methods for Research Workers*, first published in 1925. Soon ANOVA became widely accepted and applied in agriculture, economics, engineering, social sciences, and other scientific disciplines. The subsequent need for instruction in ANOVA and applied statistics prompted the early establishment of statistics departments in several Land Grant colleges. ANOVA is arguably the most widely used of all statistical methods.

ANOVA spawned terms like additive, interaction, fixed, and random factor effects. It was the primary motivation to broaden the scope of multiple regression models to more general non-full-rank models, which required dealing with the notion of estimability. Its influence on the broad subject of linear models, on the teaching of statistical methods, and on the practice of statistics has been immense.

Despite this long history, the simple question, “In unbalanced designs, how should I test main effects in a model that includes interaction effects?” still prompts conflicting answers and even heated controversy. One frequently-cited paper’s title commands “Use Type II instead of Type III sums of squares.” In the 2017 R. L. Anderson Invited Lecture, Michael Kutner dealt with some of those unsettled questions.

My goal in this lecture is to describe a resolution for ANOVA in unbalanced designs, including those with empty cells. That entails a general formulation of models for ANOVA effects and then some new results in the basic theory of linear models. Together those open two major, equally valid, paths for inference about ANOVA effects.

There have been many different accounts of this subject over the last century. If you would like to familiarize yourself with the way I have treated ANOVA more recently, see the attached references.*

A data set is included as a supplement to this abstract to illustrate the different responses to the same question that are available from widely-available statistical computing packages, depending on the package and the options chosen.* I hope you’ll give it a shot in your preferred package.

*Available upon request



EVENT DETAILS



Friday
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3:00 - 5:00pm



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All are welcome!

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