The culture of an organization can be defined by its history.

The Evolution of the ASA Genetic Evaluation System:

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Emeritus Professor

Cornell University

2018 - In Celebration of ASA's 50th Year Anniversary

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A Continuing Story of Innovation

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Fifty Years of Research Dedicated to Livestock Production

The 1960's

Events of the 1960's forever changed the beef industry.

Era of expansion in the available beef germplasm through importation of "exotic breeds".

Increased focus on using performance information in cattle selection.

The Evolution of the ASA Genetic Evaluation System:
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"Visual analysis tells you what a Simmental appears to be.
His pedigree tells you what he should be.
His performance and progeny test tell you what he actually is."

Coming Together of Events and People

Charles Henderson
Paul Miller
Pollak and Quaas
Farm and Ranch Methodology Paper
Hans Graser visits ASA and Cornell

Charles Henderson

Dr. Henderson graduated from Iowa State University having worked on his Ph.D. under Dr. Jay Lush and joined the faculty in Animal Science at Cornell University in 1948.

Henderson developed of a powerful methodology for genetic evaluation referred to as Best Linear Unbiased Prediction (BLUP).

He also establish an animal breeding group at Cornell that focused on methodology and its application to field data.

Paul Miller

Dr. Miller was also at Cornell in the later 60's where he learned BLUP methods and later went to work for ABS.

He taught introductory animal genetics while at Cornell and I was a student in his class.

He developed the program that was used for ASA's first genetic evaluation published in 1971.

When he left for ABS Dr. Quaas was hired as his replacement.

Pollak and Quaas

In 1978, while on the faculty at the University of California at Davis, I went to Cornell University on a summer sabbatical leave to learn more about BLUP methodology from Dr. Henderson.

However, he had decided to paint his house that summer and could not work with me.

So, to my disappointment, I was assigned to the new guy at Cornell, Dick Quaas.

Animal Model Methodology

The result of our early collaboration was a paper that described an animal model strategy for genetic evaluation of beef weight traits.

This paper was published in 1980, the year I moved to Cornell.

Hans Graser

Hans Graser worked as a Visiting Post Doc in the Animal Genetics and Breeding Unit (AGBU) at the University of New England in 1980.

While there, he developed the genetic evaluation system used by the Australian Simmental Association following the methods published in our 1980 paper.

The first release of that evaluation was in 1982.

Connecting the Dots

In the early 1980's ASA was considering updating the genetic evaluation program developed by Paul Miller.

In 1982, Hans Graser visited the ASA office and discussed the Australian Simmental system he developed with them.

Afterwards visiting ASA, he came to Cornell and suggested we contact Dr. Peterson about working with ASA on developing their new genetic evaluations.

ASA/Cornell Partnership

We met with ASA board members and an ASA technical committee to discuss the proposed program of collaboration.

The ASA charge to us: We want you to put Simmental in a leadership role by building the best genetic evaluation system possible and keeping it the best.

Innovate and Evolve

Innovate?

What was going to be different?

Existing ASA model was the sire model:

- Only evaluated bulls with progeny

Simultaneous evaluation of all animals

Innovate?

What was going to be different?

Existing ASA model was the sire model:

- Only evaluated bulls with progeny
- Bulls were assumed unrelated

Including all relationships (Henderson, 1976)

Innovate?

What was going to be different?

Existing ASA model was the sire model:

- Only evaluated bulls with progeny
- Bulls were assumed unrelated
- Assumed random mating of bulls to cows

Simultaneously evaluating cows corrected for this

Innovate?

What was going to be different?

Existing ASA model was the sire model:
- Only evaluated bulls with progeny
- Bulls were assumed unrelated
- Assumed random mating of bulls to cows
- No maternal effects

We were including a maternal effect where needed.

Innovate?

What was going to be different?

Existing ASA model was the sire model:
- Only evaluated bulls with progeny
- Bulls were assumed unrelated
- Assumed random mating of bulls to cows
- No maternal effects
- Single trait analyses

Industry Discussion

During the two year development stage, there was a lot of discussion regarding our proposed program at venues like BIF.

There was not universal agreement that what we proposed was the right direction to go for the industry.

Drs. Frank Baker and Richard Willham organized a meeting to discuss genetic prediction at the Winrock Foundation.

Winrock Meeting

Beef geneticists, breed association and AI representatives met at to discuss the program we were developing and the future of genetic evaluation in beef.

The discussion rapidly focused on the concept that under the proposed evaluation system yearling bulls could be compared across herds.

Selection Bias

Our goal was to implement the Animal Model for weight traits including maternal effects for weaning weight.

But in examining the data we grew concerned over the selection bias resulting from selection on weaning weight biasing the evaluations for yearling weight.

Switched to doing a multiple trait evaluation (BW, WW, and YW).

For a multiple trait evaluation we had to use a Sire/MGS model.

Publication of Evaluations

Presented results of our final research run to the board.

The board wanted Roy Wallace to examine results of his bulls at Select Sires.

We passed the "Wallace Test" and the first Cornell/ASA evaluation was published in 1984.

The first Simbrah evaluation followed in 1987.

Reaction

Significant reaction to the change in ranks of bulls and questions about the results.

The daughters of my bull wean calves that weigh over 600 pounds. How can he have a negative maternal evaluation?

When I report birth weight on the first calves of a bull, if they are below average for BW he is negative for all weight traits.

Emphasized the need to provide a stronger educational program on the method of evaluation.

Other Breed Programs

In the early 1980's, Iowa State and the University of Georgia were working with breeds on genetic evaluation and soon after Colorado State University became involved.

Rapid adaptation of the animal model, for examples:

1985 Georgia: Limousin and Brangus; CSU: Gelbvieh
1986 CSU: Red Angus

Colorado and Georgia stepped up to take on multiple breeds.

Other Breed Programs

The alignments of breeds with the four Universities led to a healthy competition in developing and implementing methods for genetic evaluation.

It was healthy because, research was published and discussions on methods and results continued at venues like BIF and BIF sponsored Genetic Prediction Workshops.

Tremendous value in breed organization data sets being available to the universities for research.

Calving Ease

The second evaluation developed in the ASA/Cornell partnership was for calving ease first published in 1987.

System used a threshold model for direct and maternal calving ease predictions including BW as a correlated trait.

Started the debate on whether or not to publish birth weight EPDs since the information was now included in the calving ease EPD predictions.

I lost that debate!

Carcass Traits

Carcass trait EPDs were first published in 1993 for Marbling, REA and Carcass Weight using a multiple trait analysis.

In 2003, ultrasound data was added to the analysis as a set of correlated indicator traits.

As such, ASA did not publish results for the ultrasound traits themselves.

Tenderness

In the late 1990's there was concern over the tenderness of beef based on a consumer survey on eating quality.

Jerry Lipsey and Mike Dikeman conceived of a research project to capture tenderness data on Simmental cattle and this idea was brought up for funding at NCBA.

NCBA actually agreed to provide funding but the project had to be open to all breeds. Birth of the Carcass Merit Project.

Carcass Merit Project

Thousands of steaks were evaluated for tenderness at KSU representing 14 breeds of cattle.

DNA samples on all harvested animals were also collected.

In 2002 we published the first genetic evaluation for tenderness based on the Simmental data from that project.

In 2006 we added information on tenderness markers to produce Genomically Enhanced EPDs for tenderness.

Evolution of the Weight Trait Program

Two unresolved issues:

1. Fitting the animal model
2. Handling percentage animals

Released ASA's first animal model evaluation in 1993 which also accounted for differing variances for percentage cattle and by sex of calf (Dorian Garrick, Ph.D. thesis).

CHANGE: So you have been wrong all these years?

Evolution of the Weight Trait Program

The second major change in the weight trait evaluation was to develop a Multibreed Genetic Evaluation system.

The motivation was to better handle the non-Simmental genetics represented in the database.

But there was also thought that this program could be used to provide EPDs to other breed association.

Developed and implemented in the late 1990's and in fact three breeds soon joined the analysis.

Bulls of other breeds

Winding Down of the Partnership

In the late 1990's, Cornell University administration started having issues with service work and subsidies of the research.

In addition, Dick and I were aging (gracefully) and Cornell at that time were focusing on hiring molecular geneticists instead of faculty trained as we were.

It became obvious that there was a growing vulnerability to running the ASA genetic evaluations at Cornell.

Winding Down of the Partnership

Likewise, across the four universities the amount of duplication required to each develop the same programs to do the evaluations for our respective breeds was challenging.

We were also faced with the growing challenge presented by the increasing availability of DNA tests and how to integrate that new information into the genetic assessment of animals.

The NBCEC

To address these concerns we collaborated to develop the National Beef Cattle Evaluation Consortium (NBCEC).

With the help of industry we successfully lobbied congress for a special grant that lasted for 7 years to fund the consortium.

The hope was that industry would create "entities" that would do the service work of running evaluations and NBCEC would be the R&D arm for those entities.

Continuing Innovation

In 2006, ASA took the ASA/Cornell evaluation systems in house and became a genetic evaluation entity.

ASA has continued to develop its genetic program to support members. Evaluations for traits like stayability, indices for selection, Genomically Enhance EPDs and BOLT are all examples of continued progress.

If the culture of an organization can truly be defined by its history then ASA has clearly demonstrated a culture of innovation.