

55. MICRO MANIPULATION

George Seidel (b. 1943) – In January 1982, Jeanne and I were in Denver for the Stock Show. In pursuit of a technical stretch, we decided to attend a talk being presented in conjunction with the annual meeting of the *International Embryo Transfer Society*. We considered ourselves to be progressive ranchers, but, of course, embryo transfer (ET) involved futuristic technology that could ‘never’ be applicable on our ranch. The talk was being given by George E. Seidel, Jr., PhD, a young professor at CSU.

There may have been more to Dr. Seidel’s talk, but all that has stuck with me was the part about using ET to bring the *Woolly Mammoth* back from extinction using lady elephants as surrogate mothers for embryos modified with genetic material extracted from specimens uncovered from the Siberian permafrost. This science fiction speculation,¹ delivered in George’s puckish manner from beneath his thick eyebrows, conveyed distinct Transylvanian overtones.

I leaned over to Jeanne and whispered “*Now there’s a mad scientist.*” She responded “*I think he’s crazy enough to be a limited partner. I’m going to go up and meet him.*”² Horrified, I protested “*Oh no, Jeanne, don’t...*” and buried my head in my hands – it was too late; she was on her way.

Jeanne’s instinct was right. She bent George’s ear and a get-to-know-you dinner was arranged – at a nearby McDonalds (George’s suggestion). George and his wife, Sarah (b. 1942), were among our first limited partners.³

One of the best stockmen I have known (certainly the most knowledgeable), George grew up on a Berks County, Pennsylvania, dairy farm, earned a BS in dairy science at Penn State, MS and PhD from Cornell, followed by post-doctoral studies at Harvard Medical School before signing on at CSU in 1971.

A world-renowned scientist, George has authored hundreds of academic papers and presented many of

them around the globe. He has also written several books and has been the recipient of numerous awards, the most prestigious of which include the Humboldt Prize⁴ and election to the National Academy of Sciences.⁵

George and Sarah took an immediate shine to the ranch and brought numerous students and foreign dignitaries out to visit.⁶ I recall a couple of memorable day trips they dreamed up: A stream-side January picnic in the canyon for graduate students and faculty accessed by horseback in a ground blizzard over the Andrews Park Road; another, a raft trip that nearly ended in disaster.⁷

Identical Twins – George’s pioneering work at the CSU Embryo Transfer Lab, including splitting and freezing of embryos, foreshadowed many of the concepts and techniques now commonly used in human fertility clinics.

George approved of the way we ran the ranch and our artificial insemination program could mesh with his experimental work. In due course, he proposed large scale experiments using our cows to test techniques for splitting and freezing embryos.

These sorts of experiments would exact a toll on the pregnancy rates in our cow herd. To help compensate for this, the Lab supplied the semen, performed the artificial insemination and provided labor. In addition, George designed the experiments in a manner that would favor the production of identical twins.

Naturally occurring identical twins in cattle are rare. For certain types of controlled experiments, identical twin calves can be quite valuable. George could help us find a market for such twins at a substantial premium. Hopefully, all of this would help the ranch maybe break even on our experimental association with the CSU Embryo Transfer Lab.

Our ranch hands enjoyed their association with this new-fangled cattle technology and I made several trips to Texas Tech University in Lubbock to peddle identical twin calves at near highway robbery prices.

Photo Notes – Our expanded corrals at the Ferree Place worked well for handling the livestock side of the CSU experiments.

The middle house, or second Barlow house, (Chapter 24) at the Ferree Place served as a lab and office. George, sporting a spiffy plaid shirt, is shown in Photo #6. Jeanne and one of the ranch hands, Ken Neil,⁸ can be seen in the background of Photo 7.

The twins in Photo 18 don’t look quite identical, do they? It turns out that placement of color markings is attributable to a degree of randomness in pigment distribution independent of absolute genetic uniformity.

Thanks to George Seidel for his good-natured help with this chapter.

¹ Years in advance of Michael Crichton’s book, *Jurassic Park* and Steven Spielberg’s movie of the same name, which posited a similar science fiction.

² Jeanne and I were far enough into our initial quest for limited partnership investors to know that we needed to be on the outlook for ‘special people’.

³ The fortuitous involvement of George and Sarah Seidel in the Phantom Canyon Ranch Co, partnership accounts considerably for the preservation success of the project (more about George and Sarah later).

⁴ Awarded by the Alexander von Humboldt Foundation in Germany.

⁵ Our partnership, Phantom Canyon Ranch Co., had two partners who were members of the National Academy of Sciences. In addition to George, there was Gilbert F. White, PhD, a geographer at CU, renowned for his work on natural hazards. Gilbert called Jeanne one day and said “*Don’t tell anyone, but in the near future, George Seidel will be elected to the National Academy of Sciences.*” Unfortunately, I couldn’t find an inside trade by which to profit from this advance information. ;</ (more about Gilbert later)

⁶ Including a group of dairy farmers from Parma, Italy, who presented Jeanne with a large wheel of aged ‘real’ Parmesan cheese.

⁷ (more about that later)

⁸ (more about Ken later)



1) Cows being injected with hormones and/or fertility drugs.



2) Heat activity being observed in both donor and recipient cows.



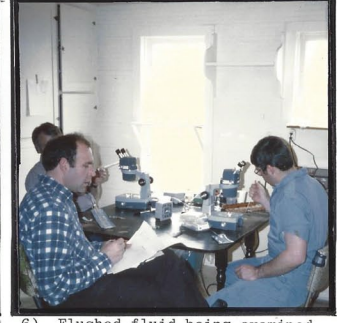
3) Artificially inseminating a super-ovulated donor cow.



4) The weather is not always co-operative!



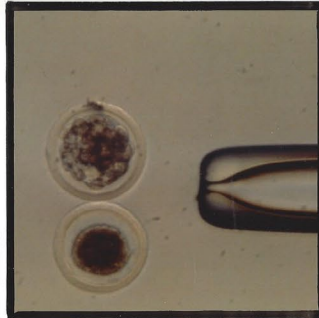
5) Retrieving embryos non-surgically by flushing the uterus at 7 days after breeding.



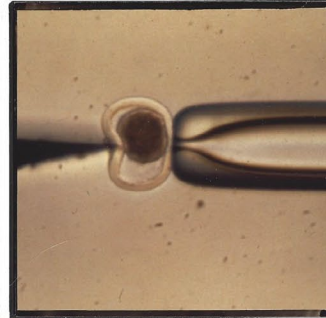
6) Flushed fluid being examined to find embryos. Dr. George Seidel-head of CSU Embryo Transfer Lab



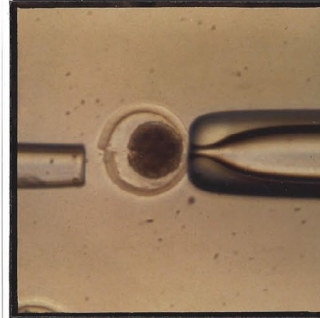
7) Dr. Williams splitting embryos using a micro-manipulator (note camera)



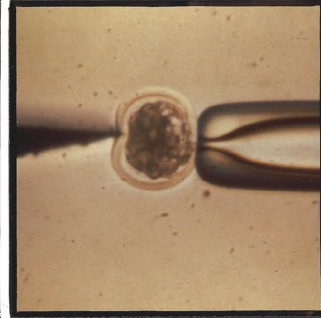
8) 60 cell embryo (top). Unfertilized egg (bottom). Vacuum pipette (right). Magnified 100X.



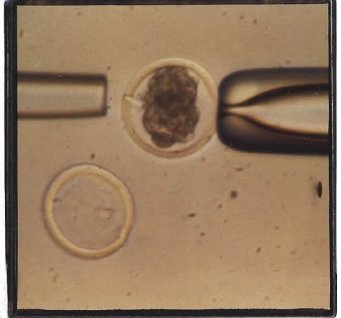
9) Cracking the shell of an unfertilized egg.



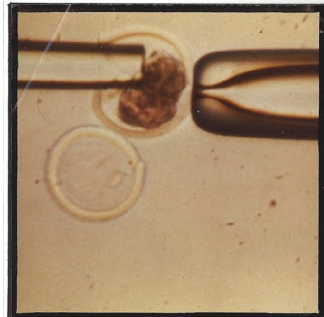
10) Preparing to remove the unfertilized egg from its shell by suction.



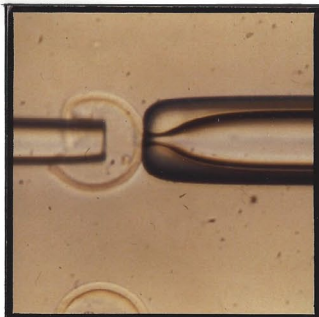
11) Cracking the shell of an embryo and cutting embryo into two halves.



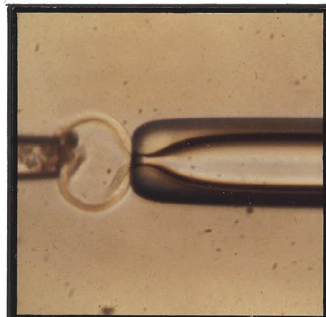
12) Preparing to remove the half embryo. Note the empty shell of the unfertilized egg (lower left).



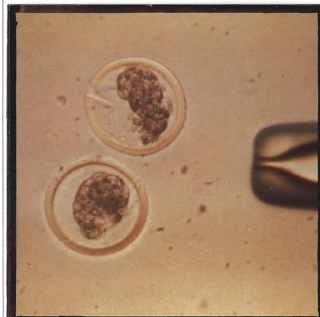
13) Removing the half embryo by suction.



14) Preparing to place the half embryo into the empty shell.



15) Placing the half embryo into the empty shell.



16) End result: 2 identical twin half embryos.



17) Non-surgically transferring two identical twin half embryos into a recipient cow.



18) Results: A set of identical twins produced at Judson Cattle Company

Making Identical Twins