

## **The Age of the Cowboys**

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Biological engineering has now entered a new phase. Gone are the wild ideas, the era with few, if any, rules and regulations, and where any imaginative fantasy relating engineering to biology was completely fresh. Here with us today are more mundane products and product improvements, Institutional Review Boards or Animal Care and Use Committees, and empiricism. In other words, the Technocrats have replaced the Cowboys.

The Age of the Cowboys was truly a golden era. Funding was loose, laws were looser, and excitement was in the air. Expectations were at once high and higher, and every success was a big success. Very few ideas had been tried before, so the Cowboys could try almost anything to see if it would work. Opportunities were seemingly limitless. There was some vague notion about what might be able to be done, but no one knew for sure. Technology was in its infancy, and it was like the California gold rush all over again.

The Cowboys were an interesting bunch. They had visions of biological engineering breakthroughs, and the means to try almost anything imaginable. They were explorers, magnates, and tinkerers all rolled together. They believed in themselves and the technology they thought they knew, but they had little idea about the chances of success. They were optimists, every one, and their collective motto was: "Let's try it!"

I was fortunate to have known some of the early Cowboys. People like Francis Long, Lester Goodman, Allen Kahn, Les Geddes, Pat Horner, Wilson Greatbatch, William Kolff, Michael Deakey, Adrian Kantrowicz, Otto Schmitt, and Dick Gowan. Many of these were biomedical device guys, for that's really where it all started. Soon after, the biological engineering visionaries appeared – people like John Ogilvie, Pat Hassler, Bill Splinter, Bill Fox, and Jan Jofriet.

They would probably admit their lack of biological engineering knowledge, but they were true pioneering giants.

On their shoulders stand the Technocrats of today. These men and women know as much about biology as they know about engineering. They compete successfully for funding and they are familiar with NIH rules and regulations. They are adept at getting the most from their creations involving living things, and their improvements are measured in tiny steps rather than in giant strides. They have and use vast amounts of empirical data so that they can overcome secondary limitations of their devices and systems. Just saving a life is not necessarily their goal; adding quality to a long lifetime is their goal.

You can tell that a field has reached maturity when the Cowboys are gone and the Technocrats abound. The field becomes much more specialized and fragmented because

the Technocrats generate specialized data and have limited ranges of interest. They are less interested in broad connections than they are in deep progress.

The original vision for biological engineering (and IBE) was that it would remain in the nascent state forever. It would bring biomedical engineers together with ecological engineers, and they would both be able to converse intelligently with metabolic engineers and food engineers. There would be no separation for synthetic biology, wetlands reconstruction, biomaterials, or bioreactor design. We would all appreciate the commonality that we share, and emphasize general laws at the expense of empiricism. We would all share enthusiasm for the system and appreciate its wholeness.

Something happened on the way to the corral. Our own generalist Cowboys have largely been replaced by our specialist Technocrats. Our meetings are dissected along specialty lines, and we hardly ever see a paper that cuts across these lines. We don't talk to each other in the hall as we once did, because we have little in common. We don't understand general connections because we are too interested in narrow research topics. The success of the IBE meeting is based on numbers of papers and attendees, and not on the discussions that we once had.

When did we lose the foundational vision of IBE? Perhaps it was when we had to face the prospect of writing funding proposals that required specialized expertise. No matter – IBE is now as balkanized as any other society.

I would suggest at least one non-concurrent session at each meeting to host papers of a generalized nature that cut across specialties. There needs to be no other theme for this session than its generality. Papers for this session would be selected, perhaps even invited, from the Cowboys among us. They should be selected to bring back the excitement that the discovery of new knowledge can generate. When the session is finished, we should have a party. With Cowboy hats.