ONE HUNDRED YEARS OF VALUABLE SCIENTIFIC RECORDS: WHAT CRITICALLY IMPORTANT INFORMATION CAN WE "EXTRACT" FROM OUR SDAS *PROCEEDINGS* THAT INFORMS OUR COLLECTIVE FUTURE IN SOUTH DAKOTA AND THE WORLD?

Nels H. Granholm
Professor Emeritus of Biology and Global Studies
South Dakota State University
Brookings, SD 57007
Corresponding author email: nels.granholm@sdstate.edu

INTRODUCTION

Like you, I have had an exciting and rewarding life. Professionally speaking, I've been able to conduct molecular genetics research on the genes controlling melanogenesis in coat color mutants of mice – the agouti locus and the lethal yellow mouse as our primary research foci. And I've been able to work with and know many fine researchers and scholars in South Dakota. I've also had the opportunity to teach many exciting courses, from bioethics to evolution, global studies to international literature (*The 100 – Year - Old Man Who Climbed Out the Window and Disappeared* by Jonas Johansson), "Two Cultures" (considerations of sciences and humanities) to considerations of "Five Wishes" (making health care decisions at the end of life), and many more like embryology and comparative anatomy (do you remember the mudpuppy (*Necturus*) and the dogfish (*Squalus*)?)

The last six years of my career at SDSU were devoted to coordinating our new Global Studies Program at SDSU. My two major themes for Global Studies were: 1) the concept that other cultures and other traditions, no matter how different, have tremendous value and are worthy of our deepest respect; in short, we need to learn to love "the other"; and 2) how do we become authentic global citizens – how can we Americans gain the perspective to behave in ways that improve the world and make it a better place. The recent (March 2015) Obama Administration efforts and, in particular, the work of Michelle Obama to promote education for young women internationally are two cases in point. When young women are kept in school, effectively delaying their marriage for a few years, they get married later, have fewer children, are better wage earners, show improvements in family health and nutrition, have children able to attend school, and enjoy a fuller and more satisfactory life.

How does a person like me go from thirty-five years of rather intensive research and teaching in biology to Global Studies? What possible credentials would I have for this job? My credentials came in the form of an intense interest in global resources and all things ecological. I was also privileged to teach Bioethics for

close to thirty years. This course treated medical ethics and the critically important environmental ethics; we read and exhaustively analyzed Aldo Leopold's *A Sand County Almanac.* To be honest with you, I can't think of a better experience for our college and university students than bioethics – a unique mix of moral philosophy and science. In addition, for many years, I was privileged to teach an honors course entitled "The Two Cultures: Bridging the Gap between the Sciences and the Humanities". It is critically important for scientists to consider and embrace concepts of philosophy, art, music, literature, and others. Reciprocally, those practicing humanities are more effective and move convincing in their poetry, prose, art, and music if, in fact, they have an appreciation of science, e.g., the second law of thermodynamics. As I stated repeatedly in class, we have a staggering number of problems in our world. Given these profound problems, it takes the minds of our best scientists, poets, novelists, musicians, artists and others to address and hopefully resolve them. The late physician – scientist Dr. Lewis Thomas had a splendid "two-cultures" arts/sciences approach; his essays offer great possibilities for our future. For example consider analyzing Dr. Thomas' extraordinarily compelling essays in his 1997 collection of essays, *The Medusa and the Snail: More Notes of a Biology Watcher.*

Enough! How does all of this introduce today's topic of one hundred years of SDAS records? And to what extent are these *Proceedings* valuable? Of course, these one hundred years of *Proceedings* are valuable as a historic record. But, are they valuable in other ways as well? I believe they are precious! They are very informative, and a careful analysis of them will serve us well in the future. In the remainder of this paper, I hope to be able to convince you that our *Proceedings* are priceless in terms of what they can tell us about the past as well as how they can instruct our future.

Overall Value of the last one hundred years of the Proceedings:

The last one hundred years of Proceedings are invaluable for the following reasons:

1. Extensive record of biological, chemical, agricultural (including range science), microbiological or pathogen-related research, including veterinary science, geological, mathematical, perhaps meteorological, and others like sociological, anthropological, economics and other social sciences (even political science), and others;
2. History of agricultural practices in South Dakota – not only in terms of particular crops, crop genetics, and cropping practices, but also in terms of trends like drip irrigation, precision pesticide application, minimum soil disturbance practices (i.e., minimum tillage), an expression for the overall value, integrity, organic-richness, and autonomy of the soil, precision agriculture methods, and others;
3. In all the disciplines, one hundred years of baseline records. Just within the field of biology, the *Proceedings* represent an incredibly valuable reservoir of baseline data with respect to individual species, ecosystems and biomes, and others;
4. Evidence of biotic change. For example, what evidence can we extract from the *Proceedings* that support the notion of shifting ecosystems,

changing ecological community memberships, altered meteorological patterns, and other phenomena due to global climate change?. With respect to biotic change, how should we use these data to design future optimal agronomic systems for South Dakota?

5. With respect to biological research (and one could do this with other disciplines), what evidence do we have in the *Proceedings* for changing emphases in biological research (a kind of evolution or change in direction of biological research) over the last one hundred years? In general, have we gone from natural history (classical field studies) to cellular/ molecular biology and molecular genetics and now, in a sense, are returning in part to natural history/ecology once again? Are there authentic trends that we can recognize? And what can these trends tell us?
6. Do the subjects of the *Proceedings* over the last one hundred years reflect evolving political and/or social changes or patterns in South Dakota?
7. What do the *Proceedings* tell us, if anything, about the major interests of institutions of higher education in South Dakota like major programmatic foci, specialties, areas of unique concentration, as well as evidence for changing emphases over time? Examples include Missouri River studies at USD, agriculture at SDSU, geological, mineral and archeological emphases at SDSMT. What can we learn about the unique scientific goals of Augustana College, BHSU, Dakota Wesleyan University, Mount Marty College, NSU, Presentation College and others? To what extent have we encouraged the tribal colleges like Oglala Lakota College, Sinte Gleska University, and Sisseton Wahpeton College to participate in SDAS activities?
8. Who are the most interesting, singular, dynamic, and significant scientists and spokespersons for the SDAS over the last one hundred years and how are their unique activities reflected in the Proceedings? In my own personal experience, I would definitely suggest Dr. Swen Froiland of Augustana College as well as three gentlemen from SDSU - Charlie Taylor, Dr. David Holden and Dr. Gary Larson and others that would readily present themselves upon delving deeply and comprehensively into the last 100 years of the *Proceedings*.

Let me n*ow relate s*ome relevant information from Volume one of the SDAS (1916) and from Volume 45 fifty years later (1966) to give you an idea of the wealth of information, richness of ideas, and veritable treasure trove of valuable information embedded in our last 100 years of SDAS *Proceedings*.

SPECIFICS OF VOLUME I (1916) AND VOLUME 45 (1966) – FIFTY YEARS LATER:

Specifics of Volume I (1916): Presidential Address of Dr. Hilton Ira Jones, Dakota Wesleyan University, 1916.

First, a brief biography of Dr. Jones and his impressive credentials as our first SDAS President. He was born in 1882 near Mankato, MN. According to his own estimate, "His ancestry is American since the days of the Mayflower". Dr.

Jones spent his early life in Winnebago, MN, and graduated from Parker College in Winnebago (1903) with an AB degree, majoring in ancient languages with a minor in science. That very promising humanities and science background served Dr. Jones well as a scientist, a leader, as well as a model citizen. He graduated from Drake University in 1904 with an AM (presumably chemistry) and taught science at East High School in Des Moines. Then, Dr. Jones pressed on to Harvard University (1906-08), where he worked with Dr. H. A. Torrey on the synthesis of adrenalin. He married Ms. Blanche Pinkerton of Des Moines and moved to University of Chicago as a Fellow in chemistry (1908-09). Then, they moved to Muskogee, OK, to be head of the science department at Central High School (a Junior College). While in Muskogee, Dr. Jones was a chemist for Muskogee, an assistant geologist for the Geologic Survey, and an assayer for the Arbuckle Mining Exchange. He helped organize the Oklahoma Academy of Science. In the fall of 1912, Dr. Jones came to Dakota Wesleyan University as the Head of the Chemistry Department. In 1915-16 he enrolled at USD, working on mono-nitro-phenyl ethers with Dr. Alfred N. Cook – that work resulted in his Ph.D. By 1916, Dr. Jones had authored many scientific papers, had become a Fellow of the Oklahoma Academy of Science, a Fellow of the AAAS, and a Fellow of the Chemical Society of London. Wow!

During the first year of the SDAS, Dr. Jones, fortuitously for us, presented not one but two major, presidential addresses. Themes and facts from the first address include:

1. Our academy must be active participants in the process of science in South Dakota;
2. There is an absolute need for our scientists to meet, discuss, encourage/support each other and act on important issues of science in our State;
3. The first function of the South Dakota Academy of Science is to provide the comradery and support to conduct independent research. "No man can remain a live, virile teacher of science for long who does not do some original research work along the line of his interest";
4. Use our research to develop and utilize our vast resources of: i) Echinacea (coneflowers), ii) Lignite, iii) Sioux Falls quartzite as well as the vast and precious minerals of the Black Hills, and iv) Develop our material, physical, and agricultural resources;
5. Warning: "…..we must not be content to talk (and) attempt to graft the laissez-faire culture of the outgrown, overdone, effete East upon the forward-looking life of the young West"; and
6. Our charge: we in the SDAS "should be serving in the army of the common good—trying to make two ears of corn grow where one grew before".

Themes and quotes from Dr. Hilton Ira Jones' second SDAS Presidential Address of November 16, 1916 included (just a few of many important quotes):

1. "South Dakota's present wealth is practically confined to two fields, geological and agricultural;
2. "I feel that as an organization we should undertake a campaign of education, and marshal all of our political forces in the legislature, as well as personally enlist in the geologic work of the state. All that I have said on

behalf of the geological needs should be more than doubled in the matter of agriculture";

3. "….need to work on the buffalo grass problem for its feeding value as well as medicinal herbs of great importance, i.e., *Echinacea angustifolia";*
4. Dr. Jones' final exhortation in his November 16, 1916 address is the following: "….We should not only be the scientific advisors of the governor and the legislature, holding a function within the State precisely similar to that which the National Academy of Sciences holds to the national government, but we should also energetically cooperate with all the other organizations in aiding in every good work in the upbuilding and industrialization of South Dakota. This intense cooperation of every member in a program of this sort means life and growth and power to our Academy. Anything short of this will be less than our duty and our best".

Specifics of Volume 45 (1966) – fifty years later: A. Proc. SDAS. Vol. 45 (1966) – Report on Activities:

The purpose of this listing is to give you an idea of the range of activities and some of the flavor of the 1966 Proceedings –

Minutes of the 51st Annual Meeting of the SDAS (apparently 1965).

Officers for 1966-1967: 1) President: Robert Sandvig, SDSMT; 2) Ist VP: Charles Sidlo, Washington High School, Sioux Falls; 3) 2nd VP: C.L. Hills, DWU; 4) Editor: W.O. Read, USD;, and 5) Sec-Treas: Theodore Van Bruggen, USD.

Committee Reports: Many of these. I picked out two to highlight: 1) Conservation Committee. The Altamont Prairie was dedicated last September (1965). Conservation Committee serves as a liaison with the Nature Conservancy which along with the Wildlife Society has established South Dakota Chapters. This Committee reports on changing practices of the U.S. Fish and Wildlife Service. Quote – "any prairie dog control by Federal agents must be preceded by a survey for the presence of Black-footed Ferrets, which if present requires modification of control practices". Committee members include: Paul Springer, Willard Rosine, and Byron Harrel (Chair).

National Science Foundation Reports: 1) visiting Science Program; 2) Junior Academy; and 3) Collegiate Program.

Treasurer's Report.

Minutes of the Collegiate Section.

Minutes of the Junior Academy of Sciences.

Membership List. A very large number of members from all existing SD Institutions plus Dordt College, Huron College, Westmar College, Yankton College, High School Teachers, and General Junior Academy.

B. Presidential Address of Dr. Marvin H. Hanson, Department of Physics, Huron College, 1966:

Dr. Hanson's remarks provide us with a truly provocative and thoughtful discussion. Let me give you a flavor of Dr. Hanson's thoughts by listing some of the questions and considerations he raises. I think you will realize, as I do, that his questions go well beyond sciences and into the realm of the humanities, public

policy, government, and more. For example, Dr. Hanson begins with the following general questions and then proceeds with specific concerns:

1. "What will be the most urgent world-wide problems to be solved within the next 10, 20, or 50 years?
2. How are we to provide food, water, power, recreation, and space for the population growth due to increasing numbers being born and added average life span?
3. Who is to govern and control the outer spaces and the space below the level of the seas?
4. Is population growth to be controlled, and if so, where does the responsibility lie?
5. If alteration of the cells in human reproduction or life in the test tube becomes a reality, what group, government, organization, or individual is to be responsible for its control and use?
6. What are the limitations to the number and use of artificial or transplanted organs?
7. Are the research funds for space exploration being wisely spent or should they be used in areas that might be more valuable to life and to our long range economy?
8. If weather is to be modified and the moisture milked from the clouds, who determines whether one community or farm family is to receive the all-important rain and the equally deserving farmer in the next county or state is to be deprived of the same?
9. How are we to school the masses in the future? What should they be taught?"

To me, this is an incredibly creative and prescient list of questions. What truly critical considerations did Dr. Hanson omit from his list of questions? Not a whole lot! He presents themes of sustainability, governmental responsibility, and in some ways with his emphases on global population and global resources, one could make the case that he even anticipates sweeping global dilemmas like widespread poverty, global climate change, and maybe even a complex world of great hostility and conflict. I wanted to provide the essence of Dr. Hanson's considerations to you as an example of the value--, the incredibly rich scientific, social, and historical value--of the entire body of information within one hundred years of our SDAS *Proceedings*.

SUMMARY

Critical future considerations:

1. Where does the SDAS go from here in our next 100 years?
2. How can SDAS become more politically relevant in South Dakota?
3. How can we capitalize on the things we have done especially well in the last 100 years?
4. Looking critically at our overall structure over the last 100 years including our various activities and components like the Junior Academy, Collegiate

Program, Visiting Science Program, and many others, which of our structural configurations provides us with the most political influence in South Dakota? What new organizational structures could enable us to enhance our political clout in South Dakota?

5. As we review our history, what have we done really well? What are our strongest features? And reciprocally, what are our greatest liabilities?
6. How can we maintain and/or revise our existing structures and functions to continue making major accomplishments for the State of South Dakota? And finally,
7. Should we engage and encourage our leadership to grapple with the kinds of broad questions raised by Dr. Marvin H. Hanson in his Presidential address of 1966? One particularly significant question raised by Dr. Hanson strikes at the hearts of all educators, i.e., "How are we to school the masses in the future? What should they be taught? For specific answers to this last two questions, I suggest an analysis of some of the themes and ideas of Granholm (2013) in his report, "Global Imperatives of the 21st Century: The Academy's Response".

I hope I've been able to convey to you some of the more critical historical, social, as well as scientific value of our one hundred years of SDAS *Proceedings*. Let's do what we can to be aware, to study, and to analyze our last hundred years of progress so that we can maximize our next one hundred years of teaching, research, and service to the maximum extent possible for not only the State of South Dakota but for the greater good!

All best wishes to you and the South Dakota Academy of Science in the next 100 years!

ACKNOWLEDGEMENTS

I am very much appreciative of the many opportunities provided to all of us by the South Dakota Academy of Science. My interactions with the Academy proper as well as with my scientific colleagues have been incredibly important to my life, my professional colleagues, and to the lives of former SDSU students, many of whom are now practicing physicians in South Dakota. For my activities today, I am indebted to Dr. Gary Larson of SDSU, Dr. Donna Hazelwood of Dakota State University, and Dr. Bob Tatina of Dakota Wesleyan University.

LITERATURE CITED

Go to www.sdaos.org/proceedings/ for a complete set of the *Proceedings of the South Dakota Academy of Science* over the last 100 years. In addition to the annual proceedings, this site also provides extensive information on the many general aspects and features of the South Dakota Academy of Science such as Annual Conference, Officers, Mission and Activities, About Us, Contact Us, and Others.

Briggs Library at South Dakota State University. For purposes of this discussion, I made use of material from Vol. 1 (1916) and Vol. 45 (1966) of the Proceedings of the South Dakota Academy of Science.

Granholm, Nels H. 2013. Global Imperatives of the 21st Century: The Academy's Response. Perspectives on Global Development and Technology 12 (No. 1-2):162-178.