

MORE RESEARCH WE'D LIKE TO SEE

Bridger Bowl Ski Patrol and ISSW 2000 Participants
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ABSTRACT: The ISSW brings together leading snow science researchers, educators, and field practitioners. Our project was an attempt to facilitate dialog, brainstorming, collaboration, and moments of brilliance to generate especially valuable research ideas.

We posted several research categories and provided blank spaces for workshop participants to provide input. This input may help researchers focus on questions from practitioners, and it may encourage more field workers to conduct valuable experiments and present their results at future workshops.

1. INTRODUCTION

This paper summarizes the responses of ISSW 2000 participants to the question: "What further research would you like to see?" Spaces were provided at the poster location for input in 10 different categories. Responses ranged from specific questions to general pondering to science fiction. Some of the questions have been studied in the past. The sections below list those responses and then briefly discuss research methods and existing literature/resources.

2. ISSW RESEARCH IDEAS

Here are the (mostly) unedited ideas as presented by the participants of ISSW 2000:

Snowpack Stability

- Field test to corroborate/confirm or refute the connection between S. Colbeck's 1.57:1 grain size ratio (as a threshold beyond which bonding does not occur) with B. Jamieson's work showing greater likelihood of a skier-triggered release when denser (hard slab) snow (1 finger/knife) overlies a soft (fist) weak layer.
- Bridging – fact or fiction?

Snow Properties

- How does sudden settlement affect stability?
- What is the "subjective" variability of collecting snow pit data?
- How about an easy, unambiguous way to measure "grain size"?
- New term for "near surface facets".
- Why, in most conditions, do we see rapid grain coarsening with free water, and why do some springtime slush layers stay fine grained for weeks?
- How do snow conditions in the avalanche track contribute to entrainment or detrainment of the snow there and contribute to avalanche volume and running distance?

Weather

- How far can numerical weather models be extended: regional scale, long-range scale?
- Have ski areas, avalanche centers and WestWide using the same format for weather and avalanche data. Make submitting data to the different centers a lot easier.

Explosives

- What is the weak part (link) of the cap and fuse system?
- How many mis-lights do programs have?
- Can we collect and disseminate product information, such as prices, dud rates, etc?
- Product development?

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Forecasting

- Can we isolate causes/reasons for those times we are wrong?
- What about nearest neighbors that were freaks – contra indications?

More Data We'd Like to See

- More information on education levels of avalanche victims
- Snow and avalanche data standards to ensure compatibility

More Tools We'd Like to See

- "Wonderprobe" for stability evaluation
- A really good inclinometer
- Objective hardness tool (i.e. five pound pressure spring that measures finger to fist...). [This one had lots of support from other participants.] Pencil sized tool with spring/coil that measures thin fist-hardness layers.
- More objective studies on transceivers
- Lectures, videos and tapes distributed to participants
- Reusable/portable air delivery device for shots (not bamboo)
- Field-based data entry devices
- Remote sensing goggles that reveal unstable regions in starting zones (sweet spot goggles")

Education

- Best way to educate others
- Modern/advanced techniques for travel through 35-60 degree terrain
- Workshop to share teaching tips

Human Factor

- Women's impact on avalanche research
- Good educational tools for teaching human factors

3. DISCUSSION

The ideas above show a wide range of scales and interests. Many of the questions address the needs of people attempting difficult practical tasks such as deciding when to close roads. The available tools and decision-making processes are based on experience and on past research.

During this ISSW conference, several of the presentations dealt with ideas expressed above. Others dealt with the principles that control snow behavior. If you want a brick house, you have to place one brick at a time. Research over the years

has laid the foundation, and continuing research builds onto the body of knowledge. Practitioners can increase their effectiveness by studying the existing body of knowledge and by contributing to further research.

3.1 Existing knowledge

There is a large and diverse body of snow science knowledge. Those who are not aware of previous work may make unnecessary mistakes or may waste time reproducing existing studies. Some of the resources for finding this knowledge are:

- Libraries – public and universities – many of these have reference librarians who can help with literature searches. Most libraries also have the means to obtain copies of obscure publications through interlibrary loans.
- Internet – this resource is gaining strength at a rapid rate. Avalanche.org has a library section, book reviews, online ordering help, etc. This web site will continue to be a valuable information source. Some of the scientific journals are available online. There are also services that will provide electronic copies of various works for a fee.
- Friends – the ISSW community has many distinguished, well-read scientists and engineers, many of whom are happy to put others on the right track. The theory and practice relationship has been and will continue to be a rewarding experience for those who put effort into this unique community.

3.2 Research methods

At each ISSW meeting there are a range of projects presented, such as:

- Statistical evaluations of new or historical data
- New product development and testing
- Descriptions of specific events or operations – often including "lessons learned"
- Modeling efforts
- Classical scientific method research

The scientific method goes something like:

- Develop a focused, testable question
- Predict the answer (hypothesis)
- Test the hypothesis
- Present the findings

Many field practitioners have excellent natural laboratories for conducting this type of research. Many of us use the scientific method on a daily basis. Example:

- Question: Is the snowpack stable today (should we open bowls or lead clients)?
- Hypothesis: Unstable due to significant new snow accumulation
- Test: snow pits, ski-cutting, explosives
- Present the findings: daily documentation, public forecast, etc.

The possibilities for field practitioner research are limited only by imagination (and sometimes funding).

4. CONCLUSIONS

We have a rich history of meaningful and rewarding work by theorists and practitioners. As the wheels of technology continue to accelerate, let's continue to build cooperative associations that will take us into the exciting research frontiers.