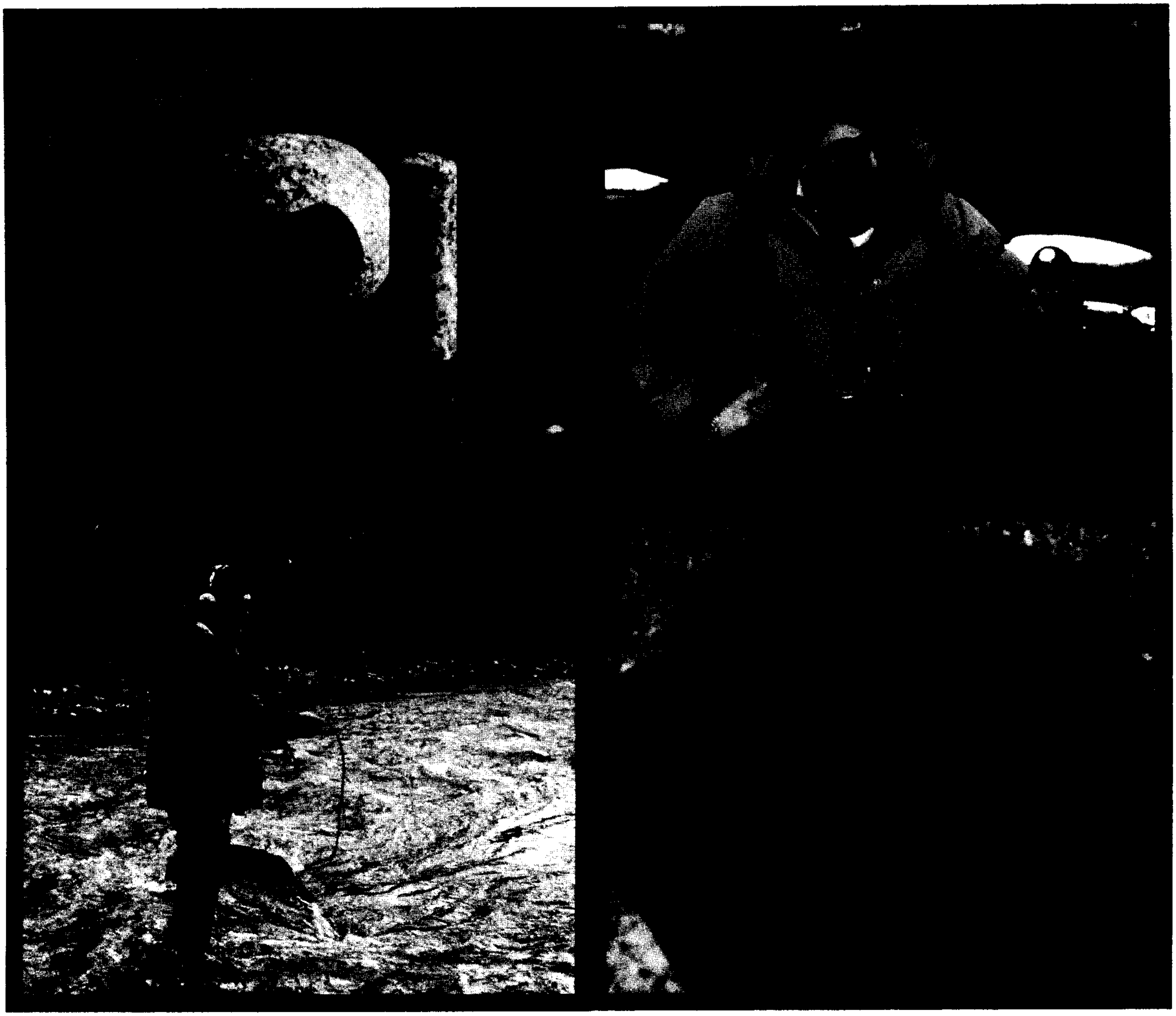
THE

NORTHERN ENGINEER

a publication of the school of engineering



Volume 22, Number 3
Fall 1990

Editorial

by

Vincent S. Haneman, Jr., P.E.
Dean, School of Engineering

As noted in the last issue, the TNE Advisory Board met and made recommendations concerning this publication. We will make all possible revisions to implement their suggestions. The School would like to thank the Board for their time and interest in this magazine.

Publications which originate on campus, have as either an acknowledged or subliminal goal—the name recognition of the institute and the university. It is always hoped that this recognition is favorable. To the Dean involved, it is critical and his success in this area depends on the individual or individuals to whom he assigns reponsibility for the publications.

Some issues ago, the importance of staff was the topic for this column. In part, the topic for this issue is somewhat the same; that is to say as loudly as possible "Thank you" to the staff with particular attention, in this case, to one individual who has become the overall, primary reason for the continuous improvement in this publication, Ms. Stephanie Faussett.

Stephanie works continuously at this magazine and other publications for the School of Engineering. Her days are full of obtaining material, securing professional opinion, setting pages, getting graphics, mailings, accounting for the costs, acknowledging contributions, meeting with the faculty committee, applying the comments of the Advisory Board, conceiving ideas for yet another set of publications, soon to appear, and producing the *Northland, Northwater*, and *Research Possibilities* newsletters. This Dean is very happy with the image being created for the School of Engineering and solicits your comments on any and all of our publications.

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IN THIS ISSUE . . .

THE **NORTHERN ENGINEER** would like to thank Dr. Robert Carlson, Civil Engineering, Dr. Don Schell, Water Research Center, and Dr. Larry Bennett, Engineering and Science Management, for reviewing the articles included in this issue.

COVER

The cover photos were taken by Edward F. Chacho, Jr. during a research project whose purpose was to detect sediment movement in a highly-mobile streambed. The movement was measured using radio transmitters, placed inside hollowed-out rocks. The first photo (upper left) shows one of the hollowed-out rocks; the next photo shows co-researcher Robert Burrows placing one of the rocks in the stream. The third shows Burrows locating one of the transmitter-rocks and the last photo shows the depth to which the recovered rocks were buried by the stream.

THE NORTHERN ENGINEER (ISSN 0029-3083) is a quarterly publication of the School of Engineering, University of Alaska Fairbanks. The magazine focuses on engineering practice and technological developments in cold regions, but in the broadest sense, including articles stemming from the physical, biological, and behavioral sciences. It also includes views and comments having a social or political thrust, so long as the viewpoint relates to technical problems of northern habitation, commerce, development or the environment. Opinions in the letters, reviews, and articles are those of the authors and not necessarily those of the University of Alaska, the School of Engineering, or THE NORTHERN ENGINEER staff and board. Address all correspondence to THE NORTHERN ENGINEER, SCHOOL OF ENGINEERING, UNIVERSITY OF ALASKA FAIRBANKS, FAIRBANKS, ALASKA 99775-0660, USA. Subscription price: one year, $15; two years, $28; back issues, $4 (US$ only please). The University of Alaska is an EO/AA employer and educational institution.

CALL FOR ARTICLES

Recently, with the Gulf Crisis and its accompanying energy crunch, we are all looking for alternate ways to conserve resources. One idea which has been discussed for many years is to use heat pump technology. TNE is currently looking for articles describing heat pump and refrigerated foundation system technologies. Both theoretical and practical papers will be considered.

Articles should be no more than ten pages long, double-spaced typed, with appropriate headings, subheadings, and references. Line drawings or black & white photographs make articles more readable and their use is encouraged. All articles published in THE NORTHERN ENGINEER are required to pass through a technical review process. While TNE reserves the right to all final editorial decisions, no manuscript is printed without author approval of the content of the final edited version.

If you would like to submit an article to THE NORTHERN ENGINEER, please contact us at the following address:

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Deadline for receipt of articles: March 1, 1991.

Detection of Coarse Sediment Movement Using Radio Transmitters

by

Edward F. Chacho, Jr., Robert L. Burrows, and William W. Emmett

The following was originally published in the Proceedings of the 23rd Congress of the International Association for Hydraulic Research, held in Ottawa, Canada, August 21–25, 1989.

ABSTRACT

The use of radio transmitters to track and locate coarse sediment (39 millimeters (mm) or larger) was successfully demonstrated by tracking five individual rocks through a highly mobile, braided river system. Radio-implanted rocks traveling distances greater than 1,500 meters (m) in 8 days' time were tracked during periods of high flow and turbid water conditions. After flow receded and access to the bars and channels was possible, the rocks were again located and recovered even though burial of up to 0.3 m had occurred. A motion sensing device that detects whether a particle is in motion or at rest was also tested successfully.

INTRODUCTION

Currently, most investigations of sediment transport include measurements of the transport rates of sediment and analyses of particle sizes in motion at a given point or cross section of a river. Improvements in the ability to predict sediment-transport rates requires an understanding of the travel path, travel time, and travel distance of each size class of sediment particles in a natural river system. Until now a system to measure these three sediment motion parameters, particularly gravel-size material, has not been used. Flume studies have enabled observations of these parameters, but extrapolation of the results to natural rivers is difficult. A technique to track individual gravel-size particles in a natural river system is required. We recognize that problems exist in interpreting the results of tracing individual particles, particularly with regard to the statistical significance of extrapolating the results from a few particles to the respective size-class populations existing in nature. A discussion of those problems, which apply to any tracer study regardless of technique, is beyond the scope of this paper. Our purpose here is to describe a method using radio transmitters to locate large sediment particles; we feel this will expand and improve the capability of tracer studies (Burrows et al., 1988).

The importance of tracking sediment particles has resulted in the development of many different techniques with varying degrees of success and applicability. Reid et al. (1984) reviewed the various techniques that have recently been used to trace coarse bedload movement, and found that under the best conditions only about 50% of the tagged or labeled particles had been recovered. In addition, they also emphasized that the current methods only provided flood-by-flood or gross seasonal changes in the movement of individual particles and did not provide any indication of the nature of the bedload movement. This is true not only of methods relying on visible sightings of the labeled particles, such as painted rocks (see for example, Leopold et al., 1964), but other methods, such as the use of a metal detector (Butler, 1977) or a magnetometer (Schick et al., 1987) which require access to close proximity of the appropriately tagged particles for detection.

Reid et al. (1984) described an electromagnetic device capable of continuously monitoring the passage of artificial pebbles labeled with a ferruginous material. Ergenzinger and Custer (1983) described a similar device which detected the passage of naturally magnetic sediment particles. In both cases insight into the timing and nature of coarse bedload movement was gained but determinations of travel path and travel distance were beyond system capabilities. In addition, these techniques have serious drawbacks. First, there is an installation problem—both methods require the burial of a detector rod in the stream bed which limits the application to sites with relatively stable channels and to very small streams. In the test cases, the largest stream was less than three meters wide. Second, only the activity at a single cross section is measured; spatial or temporal variations due to local channel variability are missed.

SITE DESCRIPTION

The Toklat River is a glacier-fed river located in Denali National Park, central Alaska. It is a very steep, braided, gravel river with a highly mobile bed and unstable channels. Composite samples of the stream bed were taken to obtain the bed-material size distribution (Fig. 1) which was relatively uniform and contained particles up to 150 mm. A gaging station had not been established on the river, but during the study period in 1988, streamflow was measured six times and ranged from 3 to 20 meters cubed per second (m^3/s). At the time of the discharge measurements, bedload samples were collected using Helley-Smith type samplers with 76.2 x 76.2 mm nozzles (Emmett, 1980). The bedload transport may be slightly underestimated since particles larger than 76 mm were not measured. During the study period, measured bedload transport rates ranged from 8 to 2,630 megagrams per day (Mg/day), correlating very well with discharge (Fig. 2).

INSTRUMENTATION

Existing radio transmitting equipment, commonly used by biologists in tracking fish and game animals, was used to trace the movement of sediment particles. The transmitters are hermetically sealed, including batteries and internal antennas, and transmit a signal pulse at a specified frequency and time interval. Two types of transmitters were used in our preliminary studies: the standard transmitter emitting a continuous signal at a single frequency and time interval, and the motion-sensor-equipped transmitter that also emits a signal at a single frequency, but with a time interval that changes depending on whether the particle is in motion or at rest. Frequencies and signal time intervals are user specified for both types of transmitters. Transmitter life is dependent on the transmitting interval and the size of the battery in the self-contained transmitter unit. The smallest package (15 x 39 mm) has a transmitting life of about 60 days, while a larger unit (18 x 72 mm) will last for 10 months. The cost of a transmitter in 1988 was about $300 installed. Recovered transmitters can be refurbished by the manufacturer.

A Fairbanks lapidary shop drilled holes in selected cobbles with a special water-lubricated coring bit. The transmitters were placed inside the rocks and epoxy-puttied in place. The rocks were painted with fluorescent paint to aid in recovery at the end of the field season. The rocks were weighed and their specific gravities were determined before and after implanting the transmitters. The drilling and transmitter implant resulted in a reduction of specific gravities from 5.3% to 12%. For this preliminary study no attempt was made to correct the specific gravity back to the original value, but in future studies the correction may be made by implanting additional weight with the transmitter.

A portable receiver and digital signal processor were used in conjunction with an "H" pattern directional antenna to locate the radio-equipped rocks. By rotating the antenna and observing signal strength, signal direction was determined. Location of radio-equipped rocks can be made either by triangulation from two points or, as done in this study, by moving along an established baseline and determining the point where signal direction is perpendicular to the baseline. If the transmitting source was accessible, the antenna was removed when within close proximity, and signal strength alone was used to locate the rock.

PROCEDURE

Initially four rocks, equipped with standard transmitters, were placed in the Toklat River on August 9, 1988. Each transmitter operated at a different frequency to allow separate tracking of the individual particles. Particle sizes ranged from 39 mm to 64 mm or between the 70th and 80th percentile of the bed material size, as shown in Figure 1. At the time of deployment, discharge was 10.8 m^3/s and the bedload transport rate was measured at 1,720 Mg/day. The bed was highly mobile and the introduced particles were within the size range of the material in motion (based on observations of the bedload samples collected that day; size distribution analyses of the bedload samples are in progress but the results were not available at the time this paper was prepared). A fifth rock, 72 mm in diameter and equipped with a motion sensor, was deployed on September 1, 1988. The particles were tracked on about a weekly basis for the remainder of the summer runoff season. When flow was too high to cross the braided channels, tracking consisted of locating the rock along an established baseline. During lower flows the actual position of the rock was marked to within a 2-m radius.

RESULTS

Based on the capabilities of the previous methods used to track sediment movement, the radio transmitting technique would be an improvement if the following criteria were met: (1) the source of the radio signal could be located at some distance from the radio-equipped rock, (2) the signal could be located in turbid, flowing water, and (3) the locating could be accomplished regardless of whether the rock was lying on the

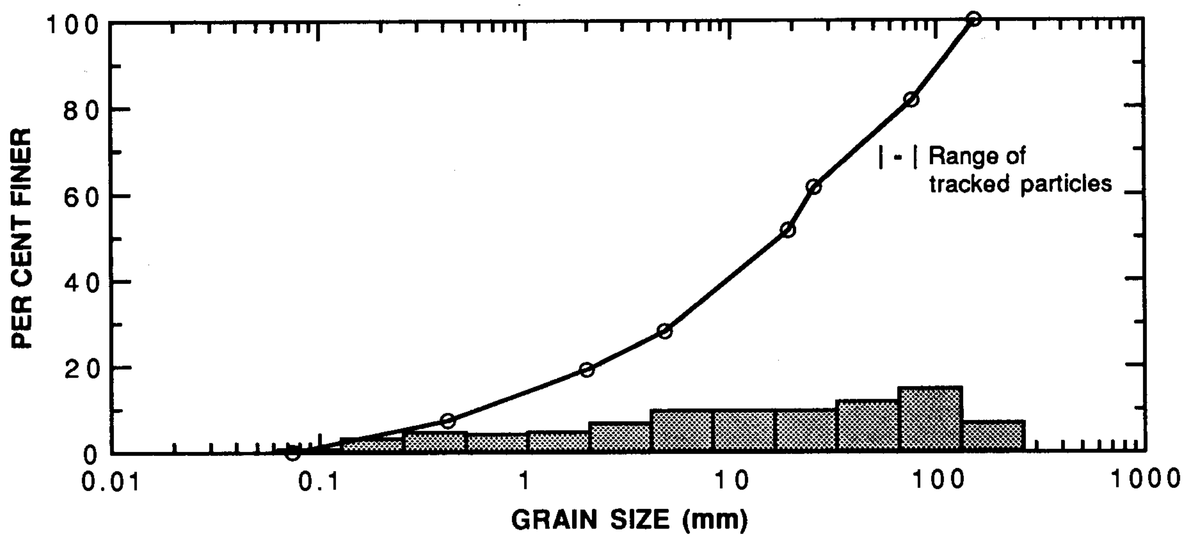

Figure 1. Bed-material size distribution for composited bed samples from the Toklat River, Alaska, in the summer of 1988.

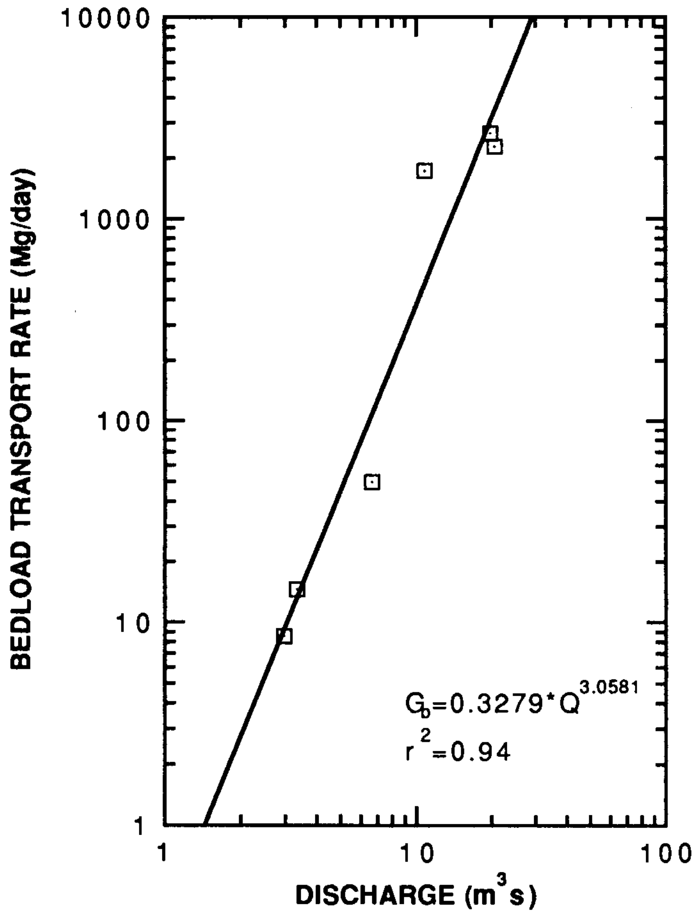

Figure 2. Bedload transport rates (G_b) as a function of discharge (Q) for the Toklat River, Alaska, in the summer of 1988 including the log-transformed simple linear regression line and equation.

surface of the stream bed or buried within the stream bed sediments. The results of tracking the test rocks, (Fig. 3 and Table 1) show that these criteria were met. The four rocks with standard transmitters were first relocated on August 17, at which time the flow was 20.6 m^3/s and the computed bedload transport rate was 2,270 Mg/day. The travel distance ranged from 887 m to 1,533 m. On August 24 the four rocks were in the same position as on the previous visit, indicating that they were buried or immobilized at the time of the previous visit. On both dates the flow was too high to wade the channels and more accurately determine the position of the rocks or to attempt recovery.

At some time over the next week, two of the rocks (58 mm and 42 mm) had been re-entrained and transported 245 m and 121 m downstream respectively, as measured on September 1. By this time the flow had receded sufficiently to allow us to precisely locate the four rocks. The two smallest rocks were recovered; one was buried 0.30 m in a dry bank and the other was buried 0.25 m in a recently abandoned channel. The other two rocks remained in fast flowing channels and were left for further tracking. Although flow continued to drop after September 1, the 58-mm rock moved an additional 358 m, but by September 9 it had been abandoned in a dry bank and was recovered at a depth of 0.2 m. The largest rock did not move after the first week, but though its position was known, local flow conditions prevented its recovery.

In addition to the ability to trace the movement of individual sediment particles, the radio tracking system has the unique ability to monitor the timing and duration of sediment movement. To demonstrate this capability, we placed a fifth rock, 72 mm in diameter and containing a motion sensing transmitter, in the river on September 1. Monitoring was manually con-

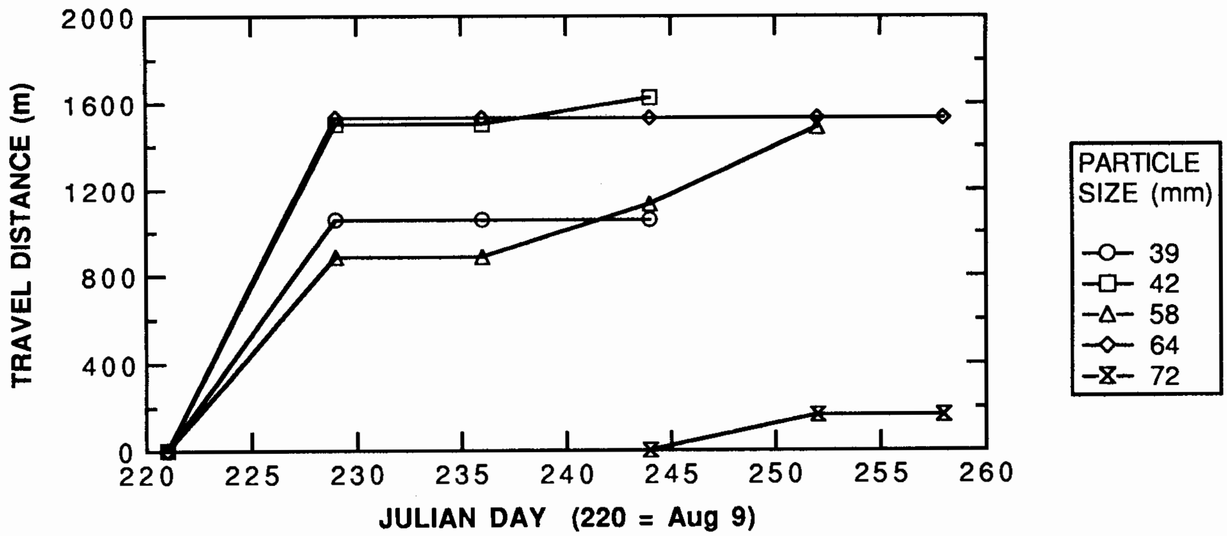

Figure 3. Cumulative distances traveled by radio tagged sediment particles on the Toklat River, Alaska, in the summer of 1988.

ducted for a two-hour period during which time short bursts of intermittent motion lasting from 5 to 43 seconds were observed. Travel distance was not measured until 6 hours after deployment when the rock was at rest and had traveled 73 m. On subsequent site visits, the rock was at rest, although by September 9, an additional 91 m of transport had occurred, but no further periods of motion were observed. The motion-sensor-equipped rock was recovered from the surface of the stream bed on September 15.

We could detect the signal from a transmitter implanted in a sediment particle lying on a dry surface at distances up to 500 m. When the transmitter-implanted rock was buried up to 0.2 m or located in flowing water we could detect the signal from a distance of 150 m. Higher gain antennas are available which should extend the range. With practice, locating the position of the buried rocks could be done in a few minutes and with relatively high precision. For example, by the time we recovered the last buried rock, our proficiency was such that only a 1-m diameter hole was required to retrieve the rock at a depth of 0.2 m. Further improvements are expected with antenna modification. Painting the rocks aided in identifying the radio tagged rocks during recovery, especially in the flowing channels, although much of the paint had worn off after only three or four weeks in the river. In the future a fluorescent pigment may be added to the epoxy holding the transmitter in place to assure a visible identifying mark to aid recovery.

Table 1. Travel Distance and Status of Individual Particles

Date (1988)	Discharge (m^3/s)	Bedload (Mg/day)	Interim Travel Distance (m) and Status 39 mm	42 mm	58 mm	64 mm	72 mm
Aug. 9	10.8	1720	I	I	I	I	- -
Aug. 17	20.6	2270	1059	1504	887	533	- -
Aug. 24	- -	- -	0	0	0	0	- -
Sep. 1	6.63	49.5	0 b,R	121 a,R	245 a/b	0 a	I
Sep. 9	3.34	14.6	- -	- -	358 b,R	0 a	164 c
Sep. 15	2.97	8.51	- -	- -	- -	0 a	0 c,R

I = installed
R = recovered
a = buried in channel
b = buried in bank or dry bar
c = on bed surface in channel

CONCLUSIONS

Our purpose in conducting this study was to determine if radio tagging of coarse sediment particles improved our capability of tracking sediment movement in a natural river system. By tracking the movement of five rocks in one of the more complex types of river systems, we demonstrated that through the use of this technique we can determine the travel path, travel distance, and travel time of individual sediment particles. Flood stages and particle burial did not affect the measurements. This technique should be applicable during most flow conditions and to all streams types moving large sediment particles. Systematic application of this technique should allow us to gain insight into the timing and nature of coarse sediment movement.

Note: Since the original presentation of this paper in 1989, we have become aware of the development of a similar technique at the same time by Ergenzinger, Schmidt, and Busskamp (1989), for tracing pebble movement in a natural river in Bavaria, Germany.

REFERENCES

Burrows, R.L., E.F Chacho, Jr., and W.W. Emmett. 1988. "Tracking coarse sediment with radio transmitters." (abs), EOS. 69(44):1218.

Butler, P.R. 1977. "Movement of cobbles in a gravel-bed stream during a flood season." *Bull. Geol. Soc. Am.* 88:1072-1074.

Emmett, William W. 1980. "A field calibration of the sediment-trapping characteristics of the Helley-Smith bedload sampler." U.S. Geol. Survey Prof. Paper 1139, 44 p.

Ergenzinger, P.J. and S.G. Custer. 1983. "Determination of bedload transport using naturally magnetic tracers: First experiences at Squaw Creek, Gallatin County, Montana." *Water Resources Research.* 19:187-193.

Ergenzinger, P., K. Schmidt, and R. Busskamp. 1989. "The Pebble Transmitter System (PETS): First results of a technique for studying coarse material erosion, transport and deposition." *Z. Geomorph. N.F.* 33:503-508.

Leopold, L.B., M.G. Wolman, and J.P. Miller. 1964. *Fluvial Processes in Geomorphology.* San Francisco, CA: W.H. Freeman.

Reid, I., A.C. Brayshaw, and L.E. Frostick. 1984. "An electronic device for automatic detection of bedload motion and its field applications." *Sedimentology.* 31:269-276.

Schick, A.P., J. Lekach, and M.A. Hassan. 1987. "Bedload transport in desert floods: Observations in the Negev." In: *Sediment Transport in Gravel-bed Rivers.* Thorne, C.R., J.C. Bathurst, and R.D. Hey (eds.). Wiley, Chichester. pp. 617-642.

ABOUT THE AUTHORS

Edward F. Chacho, Jr. is a Research Civil Engineer with the U.S. Army Cold Regions Research and Engineering Laboratory at Ft. Wainwright, Alaska.

Robert L. Burrows is a University of Alaska Fairbanks Civil Engineering graduate. Working as a Hydrologist for the U.S. Geological Survey, Water Resources Division in Fairbanks, Alaska, Mr. Burrows has been involved in sediment transport research in Alaskan rivers since 1977.

William W. Emmett has been a Hydrologist for the National Research Program, Water Resources Division, U.S. Geological Survey, for more than 30 years. Dr. Emmett received his engineering degree from Georgia Tech and his Ph.D. from The Johns Hopkins University. His research interests are in fluvial geomorphology, especially river-channel behavior. Much of his work has focused on sediment transport with emphasis on bedload processes and measurement techniques.

Tips on Talks

or

How to Keep an Audience Attentive, Alert, and Around for the Conclusions at a Scientific Meeting

by

H. Edward Clifton

"Breathes there a speaker with soul so dead,
who never to himself hath said,
as he hears his name from the podium read,
I wish to hell I stayed in bed!"

"First slide, please." The hall lights dimmed, the audience hushed, and the speaker launched into his paper—the culmination of 15 years of painstaking research. An important talk, it included everything he knew on the subject. Flitting from point to point, he realized that he was running out of time and read the paper even faster. He didn't have much time to dwell on his complicated slides, which was unfortunate for they tabulated years of data. By the end of the talk he was going so fast that there wasn't time to reverse the seven slides that were projected backwards. After the chairman finally got the speaker's attention, he closed the talk and stood back for the accolades. The lights came on. Two thirds of the audience had left under the cover of darkness; the other third was asleep.

Our speaker is obviously a caricature—hardly anybody is *that* bad. But then again, at a recent meeting—well, never mind. The point is that although few speakers do *everything* wrong, even fewer do everything *right*. As a member of the scientific audience, I find far too many talks are disappointing. Generally, the problem is not due to the quality of the material presented, but rather lies in the quality of the presentation.

The suggestions offered herein are, for the most part, elementary—the sort of thing one would expect every speaker intuitively to know. Yet, virtually all are founded on shortcomings observed in recently presented papers (some of which, unfortunately, were my own). They deal with three basic elements of a talk: content, organization, and delivery; and conclude with some suggestions on preparation. The viewpoint is primarily that of a member of the audience, but this seems appropriate, as the audience of course is the ultimate critic.

CONTENT

Why give a paper anyway? It is a remarkably inefficient method of disseminating scientific information. A speaker can reach only a handful of potentially interested colleagues, and time constraints at most meetings rarely permit an extensive exploration of a subject. A talk is an ephemeral event, of which the only lasting elements lie in a brief abstract and the fading memories of the relative few who attended the session.

Yet, oral presentations are a time-honored means of transmitting the fruit of scientific research and scientists will no doubt be speaking at professional meetings for a long time to come. It is a way to quickly reveal our most recent thoughts and discoveries to colleagues—a way of informing the world that we are into a specific aspect of research (staking out a bit of scientific territory, if you will). It is too often a prerequisite for obtaining funds to attend these meetings, but we won't go into *that*. A scientific talk unquestionably is highly effective for developing fruitful discussion with others interested in the subject. So we will continue to give talks; the question is how to insure that we give **good** talks.

Consider an audience—part of it is there specifically to hear your paper, the rest because they have nothing better to do. It will, in most cases, be composed of a few people as knowledgeable (or nearly so) as you on your subject, a majority who know at least something about it, and many who are totally unfamiliar, or nearly so, with it. A successful talk provides something of value (although not necessarily the same thing) to all these groups.

How does one leave most of an audience with a feeling that they have profited from the talk regardless of the level of knowledge from which they approached the subject? All the memorable talks I have heard, regardless of my familiarity with the subject, shared one common trait: **simplicity**. The speaker convincingly presented a few conclusions, which I retained for a long time. It is more important to get across a few memorable points than to tell *everything* you know about a subject. Better to save the detailed account for the printed text.

Too often speakers waste precious time presenting unessential data. Few listeners care for, or will remember, numbers or lists. Of far more interest are significant trends, relationships, or differences—in other words, the *interpretation* of the data.

A speaker must also gauge the background of the prospective audience relative to the topic of the talk. It is well to begin a talk from grounds that nearly everyone will understand. No one, of course, wants to "talk down" to an audience. But sounding condescending is probably more a matter of style than content, and a thoughtful speaker can briefly explain some of the more esoteric terms and concepts without alienating the audience. Terms that are perfectly useful and acceptable within a specialty may be frustratingly mystifying to a larger audience. A listener is distracted by pondering, "Now what does **that** word mean?" And if too much of the talk hinges on "that" word, the listener will start to wonder how things are going in the other session across the hall or at the bar.

Finally, don't build your talk on the assumption that the audience is conversant with the accompanying abstract. More likely, 70 percent have not read it at all, 20 percent have read, but can't remember it, and the remaining 10 percent read and remembered it, but are somewhat confused as to what it means.

ORGANIZATION

A well-conceived talk, carefully tailored to fit audience interest, can still fail if it is difficult to follow. There is a distinct and important difference between written and oral presentations. A confused reader can regress as needed to wade through an obscure passage; a confused listener is likely to be lost forever. A talk must be carefully organized so the information flows in a totally logical pattern. There should be no gaps, short circuits, or unnecessary convolutions. When an audience stumbles in making a mental leap, it is the speaker who falls flat. The best structured talks are those where the audience correctly and continuously anticipates what is coming next.

It is well to indicate early in your exposition just where you expect to go. There is merit in the old Army training dictum "Tell 'em what you're gonna tell 'em, tell 'em, then tell 'em what you told 'em." Surprise endings may be dramatic, but they are rarely useful in a scientific paper.

A colleague won the AAPG Matson Award for Best Paper at an annual meeting by using the following structure for his talk:

- A brief introduction setting the stage and providing perspective on the problem, its importance and the state of knowledge about it. Lights are on and eye contact is established with the audience.
- The body of the talk, first giving descriptive data and following with the interpretation of this data.
- A few (four or five) conclusions, one of which points out the significance of the material presented. Lights are again on to permit eye contact with the audience.

This format may not guarantee you the Matson Award, but it will assure simple and coherent overall organization. Incidentally, note how simplicity in content facilitates smooth organization.

The coordination of text and slides is highly important. A talk offers a far greater potential for integrating illustrations than does a written paper, but many speakers never fully utilize this potential. A well-conceived slide quickly and wordlessly projects the speaker's point (Fig. 1). A speaker should not assume, however, that the audience intuitively grasps a slide's meaning; but rather, one should succinctly point out the salient features of the slide, especially indicating the physical meaning of non-standard mathematical phrases or symbols.

The number of slides that can be shown during a talk depends primarily on their complexity. Having too many slides creates confusion and obviously should be avoided. Having too few slides poses a different problem: the speaker must turn the lights off and on (which is disruptive), or leave the room totally dark (which can be soporific), or leave on the last slide while continuing to talk about unrelated subject matter (which can be both distracting and confusing). It is better, I think, to illustrate virtually every point in a talk with a different slide. This approach not only serves to hold audience attention, but also provides the notes or reminders from which a talk is given. Of course, slides appearing for only brief periods must quickly convey their message. As a matter of principle, I prefer to see a series of similar slides, each focusing on a separate aspect, than a single complicated slide requiring much explanation.

One excellent way of coordinating slides is to show two of them simultaneously on separate screens, an option offered with increasing frequency at major meetings. One slide can serve as a reference, such as a location map, stratigraphic section, or panoramic view, providing perspective for a series of slides on the other screen. The use of two screens demands that the instructions to the projectionist be absolutely clear, in the format standard for that particular meeting (a good practice in *any* event).

DELIVERY

Of the three elements of a scientific talk, delivery is probably least important. A well-conceived, logically organized paper will to some degree survive the dullest presentation, whereas the most articulate delivery cannot salvage a talk that misses audience interest or one that cannot be followed. This is not meant to imply, however, that delivery can or should be neglected; a poorly delivered talk is unlikely to be well-received. Even though delivery is, to a degree, frosting on the cake, it can, like frosting, get attention and make the whole thing more palatable.

Reading a paper from a prepared text may be the easiest way to deliver it for many people—but it almost certainly is the most difficult way of delivering it *well*. I think papers are most often read because of insecurity—the speaker is afraid he will lose his place, omit some important point, or perhaps does not trust his ability to sound "learned" before his colleagues. All of these concerns are generally invalid. No speaker with good notes (or better yet, carefully organized slides) will get significantly lost during his talk. *R*eally *I*mportant *P*oints are rarely forgotten by a well-prepared speaker during a presentation, and those that are will either be raised during the discussion following the talk or never be missed. Perhaps the best thing that could happen to readers of talks is for a vagrant breeze to carry their text out the window seconds before they ascend the podium. After the initial panic subsides, nearly all would sail through their talk with little difficulty. Their presentation would likely be far more effective and they would recognize written text for the crutch it is.

How does one deliver a paper without reading it? Basically by thoroughly knowing the subject. All of us can clearly explain our slides informally to a small group of friendly colleagues. The same style of exposition works nicely before a larger (and potentially less friendly) audience. Audiences almost always give a speaker the benefit of the doubt. Usually at worst they are merely polite. I have never seen a speaker bodily assaulted at a meeting, although some of my colleagues have (Fig. 2).

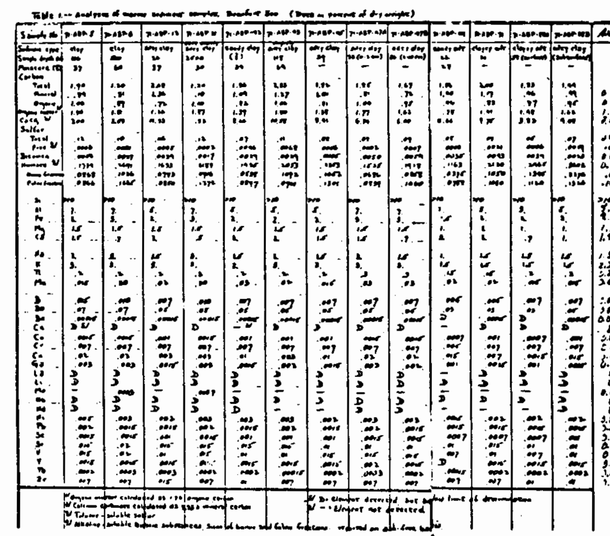

Figure 1. ***A poorly conceived slide.***

The process of referring to slides during a talk can pose special problems. It is too easy to turn from the audience (or microphone), and have one's voice diminish to an inaudible mumble. Some speakers, forgetting to release the switch on flashlight pointers, splash the beam about the walls and ceiling in a fascinating display that is potentially more interesting than the talk itself. Small nervous tremors in the speaker's hand are amplified in the pointer's spot on the screen and betray a shakiness that most of us would prefer to hide.

Many of these problems can be obviated by having a colleague or co-author employ the pointer from the front row of the audience. Such a confederate *must* be totally familiar with the talk. Occasionally a pointer from the floor gets disconcertingly out of phase with the speaker. Regardless of who handles the pointer, it is probably best used sparingly, spotting key points on the slide and otherwise kept off. Holding a flashlight pointer with both hands or in the crook of the arm will help to steady it and salvage that image of comfortable composure regardless of how unsteady the knees are.

Stage fright in one form or another is probably universal. Who has not known a shallowness of breath, a racing pulse or sweaty palms before mounting the stage? Slow, deep breathing superimposed upon a concentrated effort to relax the body's muscles will greatly reduce these symptoms. The knowledge

Figure 2. A rather unfavorable audience reaction.

that you have thoroughly prepared for a talk adds much confidence. Experience is probably the best teacher. I know that my stage fright will largely dissipate once I begin talking, and nightmares to the contrary, all appropriate zippers *will* be closed and I will not, part way through my talk, abruptly switch to a recitation of "Mary had a little lamb."

PREPARATION

The obvious key to a successful scientific talk is adequate preparation. The number of speakers who seem to be ill-prepared is therefore surprising. Perhaps part of the problem results from the predictable situation whereby a speaker, having gained experience, requires progressively less time for preparation. Unfortunately, this last phrase can also be translated "gets by with less and less preparation," and the speaker who falls into this trap will ultimately be caught with a substandard effort. Probably every experienced speaker skirts this pitfall and some of us fall into it. Over-confidence is a common reason, but poor excuse, for inadequate preparation.

Preparation consists of two parts: composing the talk and rehearsal. The first part is probably the more important, but is also easier to slight. The skillful speaker begins planning well in advance of the presentation. The level of audience interest and background is assessed, and the talk content determined accordingly. The talk is ordered into a sequence of flowing logic. Slides are conceived to convey their message quickly and directly and knit tightly into the fabric of the text. If all these things are done well, the speaker is almost assured of some success.

Rehearsal is both valuable and necessary. It is valuable in that it allows the speaker to develop a smooth delivery by incorporating key words and phrases; valuable because it offers a means of checking content and organization before a group of friends prior to the presentation. It is necessary because it is almost the only way to establish timing. Even if the paper is (God forbid!) read, rehearsal is vital to staying within the time frame. I know speakers who, preferring an informal delivery, eschew rehearsal. They are also the ones most likely to get caught in the "Migawd!—it's-the-two-minute-warning-and-I'm-only-half-way-through" panic. Observing a speaker thus trapped can be entertaining, but it doesn't do much for the communication of scientific information.

It does not pay, however, to attempt to memorize a paper word for word. A paper obviously presented by rote sounds stilted and unnatural and is as distracting as one that is read.

The last feature of preparation is so elementary that it scarcely seems worth consideration; yet, by ignoring it, many speakers run into trouble. Virtually every meeting has talks marred by slides that are out of order or disoriented. I've noticed that the audience laughs at the first upside-down slide, mutters at the second, and begins to leave at the third. This and other projection problems are easily obviated by arriving at a session early and asking the projectionist to run the slides through the projector. (It helps if you bring your own loaded slide carrier.) Projectionists always seem eager to comply with such a request (they don't like fouled-up slides any more than speakers do). It gives you a chance to insure that your instructions to the projectionist are clearly understood, and also provides a chance to critique your slides from an audience's viewpoint, incorporating any last-minute clarifications seeming appropriate. Finally, I like to stand on the podium prior to a talk and check out microphones, slide control buttons, and pointer; that way, it seems less strange when I ascend the podium in earnest.

SUMMARY

If I had to express the points of this exercise in a single sentence, it would be "Never force an audience to think for itself." This can be accomplished in a variety of ways:

1. Keep the content of the talk simple, containing only a few major points.
2. Be sure the audience understands all your terminology.
3. Have the talk simply arranged in a logical sequence.
4. Use simple slides.
5. Avoid distractions.
6. Know your talk well.

There are substantial differences between a spoken and a written paper. The wise speaker recognizes these differences and develops a talk accordingly. The focus should be on the audience—its interests, level of knowledge of the subject, and ability to assimilate the information. Just as beauty is in the eye of the beholder, success in a scientific talk is in the mind of the audience. The speaker who deliberately caters to the audience is almost certain to keep them interested, alert, and present when the lights come on, convinced that they have heard, finally, a **GOOD TALK.**

This paper was originally printed in 1978 by the Journal of Sedimentary Petrology, 1(1):1-5. TNE would like to thank the Society for Sedimentary Geology for allowing us to reprint it.

ACKNOWLEDGEMENTS

A host of colleagues read this treatise and offered many valuable suggestions. I must also acknowledge those many others who unintentionally contributed to this paper in a way they probably would rather have not.

ABOUT THE AUTHOR

H. Edward Clifton has been a Geologist with the U.S. Geological Survey since receiving a doctorate in geology from The Johns Hopkins University in 1963. Clifton's research has focused primarily on coastal sedimentology. He received an *Excellence of Presentation Award* and *Honorable Mention for Excellence of Presentation* for papers presented at the Society for Sedimentary Geology Annual Meetings in 1983 and 1990, respectively.

Plea from a Symposium Goer

by

Daniel H. Janzen

The following article appeared in the "Letters to the Editor" section of the "Bulletin of the British Ecological Society," 11(1):2-3.

I am sitting in the eleventh incredibly boring 30-minute "paper" in two days, nodding my head in somnambulistic time, drowsily wondering how we are going to break this cycle.

Head on attack. Get off your larded minds, my fellow scientists.

What right do you have to ask for the attention of 200 people for 30 minutes? It is certainly not to orally repeat what you have written. I can read three times faster than you can talk; give me the manuscript, let me read it and spend 20 minutes asking you questions. It is certainly not to present prose through extemporaneous babble; you can never orally present a paper as clearly as you can write it. It is certainly not to convey 30 minutes of data; I have no hope of remembering more than 3 minutes worth of numbers more than an hour after your talk. It is certainly not to document your research conclusions; you don't have to show me a table with numbers on it for me to believe you when you say that you have found that elephants can eat baobab fruits faster than baboons.

The function of asking for my time is so that you can send me off carrying 30 minutes worth of punch lines that I can use to better understand other people's work, that I can use to improve my own research, and that will inspire me to do things I would not have thought to do on my own. So how can you do all these things?

1. Use no notes. If you, the person who knows more about the subject than anyone else, cannot remember something for 30 minutes, how do you expect me to remember it more than 30 minutes after the end of your talk? An oral presentation is the antithesis of the archival function of science.

2. If you need a prompter for the sequence of thought presentation, use an aid that is simultaneously perceptible to your audience. Draw them into your train of thought. When that slide pops on the screen reminding you to now take up the case of seed spitting by horses, you want your audience to get the same reminder; preparing them for that earth-shaking punch line. And remember you are talking to a TV generation.

3. Organize your talk by deciding the take-home messages and then dress them up with those devices necessary to make them sink in. It may be a table with a single enormous number in it, a photograph of a little girl spitting watermelon seeds, or a white slide in the projector that puts you and your depressed face in the spotlight.

4. Never give the same talk twice. Even if you simply have to change the order of the presentation, always have part of the talk totally new to you. If you are bored, the audience will be too. Introduce some slop, some error, some slight blur; make your audience work a bit, recover along with you when you have to back up two slides or repeat a point to state it more clearly.

5. Never tell a lie; that way you never have to remember what you've said. If you show five slides of five frogs in your study plot, and one of them is of the same species but taken 30 miles away, say so.

6. Never hesitate to simply stop and collect your thoughts, look at the clock, or state that you have simply forgotten the point you were going to make. Go on, it will drop out of the sky three slides later.

7. Listen to your audience; watch their faces. And pick out one friendly soul near the front row to become the other half of your discussion.

8. Every audience is different. Put your talk together for *that* specific audience. Even if you use the same slides as you would have for another audience, go through a dry run with today's audience in your mind's eye.

9. Never give a seminar on published work unless it is to draw attention to unappreciated or requested material. Your seminar should be on those things that are live, new, and fresh to you, right now. Incomplete, yes. Let your audience in on your research in the fun stage, before you have drained the

mystery from the problem. Remember, you don't have to prove to the audience that you know more than they do about the subject; that you do is self-evidenced by your presence. Perhaps the strongest kick you can give your imagination to spot an unnoticed potential solution is to have to face an audience of peers and tell them you don't yet have a hypothesis to test for this baffling problem.

10. Never apologize. We will make up our own minds whether to forgive you.

ABOUT THE AUTHOR

Daniel H. Janzen is a Professor of Biology at the University of Pennsylvania. When TNE asked Janzen for biographical data, he provided the following:

My research goal is to understand the interactions between animals and plants in the tropical dry forests of northwestern Costa Rica. My administrative goal is to promote conservation of tropical biodiversity through its understanding and use by the society that surrounds it. With animal-plant interactions, the focus is on dry forest leaf-eating caterpillars and seed-eating mammals and insects. What animals eat what species of plants when, and what parasitoids feed on these species of animals? Equally, how do the population dynamics of the participants reflect the biology of this interaction? With biodiversity conservation administration, the focus is on the mechanisms of integration of conserved wildland management with the desires of Costa Rican society, the mechanisms of coming to understand what biodiversity has been conserved (inventories, biodiversity prospecting, education programs in national parks), the process by which biodiversity can be used without destroying it, and the process of restoring trashed tropical wildlands.

You Can Compare the Bottom Lines of Different Products

This article is reprinted from the Winter 1988 issue of "Pipeline," a publication of the National Corrugated Steel Pipe Association, 2011 Eye Street NW, Washington, D.C. 20006.

Using *Least Cost* or *Life Cycle Accounting*, alternatives having different expenditures can be compared by restating them in terms of the present worth of the expenditures. Using this method, competing designs for, say, storm sewer projects which require different cost expenditures at intervals can be compared and the least-cost design on a present-worth basis selected.

A FAMILIAR METHOD

Most engineers are familiar with these principles. Anticipated future costs are discounted by using present-worth discount factors and are then restated in terms of *today's* costs.

Once discounted to the present value, all costs for one project design can be added together and fairly compared to costs for all other competing project designs.

THE BASIC DIFFICULTY

To make this method work, the assumptions which produce the fair comparisons of competing products must be unbiased. These assumptions must include:

1. Project design life.
2. Maintenance-free life.
3. Rehabilitation costs.
4. Inflation.
5. Interest rates.
6. Project residual values, if any, at the end of the design life.

ASSUMPTION 1. PROJECT DESIGN LIFE

In some cases, public policy may have already established this figure. For example, 50 years is a common design life for culverts on primary state highways.

The project design life is independent of, and has nothing directly to do with, the service life of competing materials available for the job. However, the least-cost analysis is directly affected by the project design life.

The temptation is to assign an arbitrary excessive design life since the pipe is buried out of sight. There rises the specter of extremely high replacement costs involved in future repair or replacement. Even if a product claims to have a 100-year life, and that claim is accepted, the use of a 100-year project design life is wrong for two reasons:

1. Design obsolescence; or
2. Availability of money.

Obsolescence

Accept that even the best estimates can go awry. How far into the future will the functional capacity of that pipe be adequate? Will site conditions require a larger structure? Or, perhaps it will not be required at all in the future and will simply be in the way of future development?

After all, bridges have been abandoned, railroads torn up, and stadiums razed.

Money

There is one phrase you rarely hear or see in advertising these days; "It will last a lifetime." Today's public regards a lifetime to be seven years, perhaps ten. No one's first home is their last home; and very few buyers want a product that will last "forever."

Investors, and especially taxpayers, are not eager to spend money on ventures that cannot possibly benefit them; call this a *political limit* on design life. In a population which is growing older, selling 100-year service life to taxpayers whose own life span is considerably shorter, is a hard sell at best.

Politically and practically, design life is about 50 years. What taxpayer can relate to anything longer than that?

ASSUMPTION 2. MAINTENANCE-FREE LIFE

This analysis' validity is only as good as the estimated maintenance-free service life selected. An objective evaluation must be made. The life of all pipes vary with the environment, effluent, and slope. There are published reports and other evaluations available to help develop a reasonable service-life estimate.

Considering pipe culverts and storm sewers, the end of the average service life does not mean replacement of the pipe. It does mean, however, expenditure of some funds at that time for maintenance.

ASSUMPTION 3. REHABILITATION

Rehabilitation does extend a pipe's service life. It is an economical and effective investment. Rehabilitation costs should be no more than 25 percent of the original pipe cost, if the pipe has been routinely and properly inspected and maintained.

ASSUMPTION 4. INFLATION

Some federal agencies do not consider inflation at all in calculating future expenditures. "Compute all costs at a *constant* level at the *same* price level as used for the computation of benefits. Base current costs on the price level *at the time* of the analysis" is the policy stated by the U.S. Water Resources Council Report (Feb. 3, 1983) establishing evaluation principles to be followed by the Corps of Engineers, Bureau of Land Reclamation, Tennessee Valley Authority, and Soil Conservation Service for water resource project plans.

The Department of the Army in Technical Manual TM 5-802-1 (Dec. 31, 1986) indicated the rate of inflation for the economy as a whole will be neglected in all least-cost calculations.

Some local agencies do consider inflation. Consider, then, that over recent years inflation in this country has averaged 5 percent per year. Since 1949, the Labor Department's All-Urban Consumer Index of Inflation has averaged 4.3 percent per year. Any figure higher than 5 percent per year is unrealistic.

ASSUMPTION 5. INTEREST RATES

Opportunity value (the idea that there are always more needs than the money necessary to fulfill them) and the cost of money are two general approaches to developing a realistic interest (or discount) rate for the least-cost analysis.

Consistent with the Office of Management and Budget's opinion, the Army's Technical Manual TM 5-802-1 states an annual discount rate of 10 percent "should be viewed as the minimum 'real' rate of return to be achieved by public sector investments."

Another common approach is to relate the discount rate to that paid on long-term federal, state, or municipal securities. Based on analysis of the Federal Reserve Bank's monthly summary of selected interest rates over a 15-year period, a minimum interest rate of 9 percent would be realistic to use in a life-cycle analysis.

Regardless of the inflation rate or interest rate selected, the difference should have some proportion of reasonableness. Approaches which promote the use of interest or inflation ratios and result in only very small differences between interest and inflation should be rejected as not sensible.

The chart below can be used to calculate the present worth factor with interest at 9 percent. Inflation factors at 0 percent, as used by some federal agencies, or at a maximum of 5 percent are also shown.

Year	Inflation Factor at 0%	Inflation Factor at 5%	Present Worth at 9%
40	$1.00	$7.04	.0318
45	$1.00	$8.99	.0207
50	$1.00	$11.47	.0134
55	$1.00	$14.64	.0087
60	$1.00	$18.68	.0057
65	$1.00	$23.84	.0037
70	$1.00	$30.43	.0024
75	$1.00	$38.83	.0016

ASSUMPTION 6. SALVAGE VALUE

If obsolescence determines design life, the product more than likely will have no salvage value at all after that time. For example, when projects are undertaken to increase capacity, there is little likelihood of any salvage value. In practice, most drainage products are not salvageable as prime, reusable materials and have little, if any, cash value.

A REAL WORLD EXAMPLE

To show how least-cost analysis works, the example of a storm-drain system designed for a public agency can be used. The engineer in charge has selected a 50-year service life for the system. He is considering three products for the job with these service lives assigned:

1. Plain, galvanized corrugated steel pipe (CSP)—40 years;
2. Asphalt-coated and invert-paved (CSP)—60 years; or
3. Reinforced concrete pipe (RCP)—75 years.

The plain pipe will be rehabilitated, not replaced at the end of its service life. "Rehab" cost is estimated to be 25 percent of the total replacement cost. There is no salvage value. A 9 percent interest rate is assumed and the inflation of future expenditures is to be ignored.

The bids are opened with these installed costs quoted: Plain galvanized CSP, $195,000; Asphalt-coated, invert-paved CSP, $214,500; and Reinforced concrete pipe, $260,000.

Which one will be the most economical for the agency based on present value?

Using least cost analysis, here is how they compare:

	CSP Plain Galv. (000)	CSP Plain Galv. (000)	CSP Coated/ Paved (000)	RCP (000)
Year	0	40	0	0
Original Cost	$195	$195	$214.5	$260
Rehab Cost	N.A.	25%	N.A.	N.A.
Inflation Factor	N.A.	1.00	N.A.	N.A.
Present Worth	N.A.	.0318	N.A.	N.A.
Present Value	$195	$ 1.6	$214.5	$260
Total Present Cost	——	$196.6	$214.5	$260

Neither the coated and paved galvanized CSP nor the RCP will require future rehabilitation expenditure. Their present value is equal to their initial cost. Even on this basis, either of the two CSP designs are a better buy based on the least-cost analysis. The plain galvanized with the rehab expenditure after 40 years still saves more than $60,000 over the use of the RCP.

FAIR BASIC ASSUMPTION THE KEY

Critical to effective use of the least-cost analysis method are the assumptions for project design life and estimated service life. The project-design life must be selected first. It must be based on probable obsolescence and recognized funding limitations.

The service life of a product is entirely independent of the project life. Service life must be based on objective data and experience for similar environment and service conditions. Rehabilitation costs should be used instead of replacement cost where applicable. Finally, realistic interest rates and, when necessary, inflation rates, must be used.

Northland

Northland, a bi-annual newsletter describing the research activities of the School of Engineering and its research arm, the Institute of Northern Engineering, will now be included in THE NORTHERN ENGINEER. In TNE, *Northland* will encompass the activities of our faculty and staff, and short descriptions of our current research, as well as including research or engineering solutions sent to us by others. *Northland* will be published twice each year—in the Fall and Spring issues. We would welcome any contributions to *Northland*.

Can Road Salts be Used to Reduce Frost Heaving?

by

Thomas C. Kinney, Ph.D., P.E.

Associate Professor of Civil Engineering

Salt reduces the freezing point of water and changes the physical and chemical characteristics of soil. It has been suggested that road salt added to the subgrade may reduce the frost heaving problem, resulting in longer road life, less maintenance, smoother roads, and fewer spring load restrictions. Unfortunately, the work that had been done to date left many unanswered questions, including whether or not the concept would work. Different researchers and practitioners have reported different results.

Research was conducted at UAF to answer the question once and for all. This is a situation where everybody was pleased with the result, namely–it depends! Under some circumstances, frost heaving was completely eliminated but under others it increased.

In areas where the frost heaving zone never got below the depressed freezing point of brine, frost heave was stopped; no freezing–no frost heave.

In some areas the frost heaving was limited prior to the addition of salt because the frost susceptible zone was frozen to the bottom. If the addition of salt kept unfrozen water in the pores throughout the winter, the frost heaving process would continue and the total frost heave could increase.

Other physical and chemical conditions have yielded increased or decreased frost heave under different freezing temperature gradients. In short, mixing salt in the frost susceptible material under a road can increase or decrease frost heave. In very few instances are the conditions of construction, maintenance, and weather such that one response can be counted upon.♦

INE Notes

Elisha "Bear" Baker, IV has become a permanent Associate Professor in our Engineering and Science Management Department. Baker was previously a visiting ESM professor, having moved to UAF in August 1989.

Dr. Baker is presently working on a textbook with Dr. Ted Eschenbach and Dr. George Geistauts (both with UAA). The book, *Technology Management*, will be published by IRWIN and is expected to be released in the spring of 1992.

Dr. Larry Bennett, Professor and Head of our Engineering and Science Management Department, is currently seeking funding for a program that will create a pre-engineering summer camp for Alaskan youth. The annual camp, planned to begin this summer, will introduce students entering the 9th and 10th grades to the world of engineering and encourage them to consider engineering as a career.

The Engineering and Science Management Advisory Committee will be meeting February 22, 1991. The committee will receive a status report on the ESM program and discuss the program's future direction.

Dr. John Aspnes, Professor and Head of the Electrical Engineering Department, recently traveled to Washington, DC. While in Washington, Dr. Aspnes served on a panel for the National Science Foundation, reviewing proposals related to electrical energy systems.

Dr. Charlie Mayer, Assistant Professor of Electrical Engineering, worked with the National Radio Astronomy Observatory (NRAO) during the summer of 1989 to improve the high frequency performance of a mm wave telescope, used to observe star formations. A mechanical joint in the support structure failed during the spring of 1990, causing the surface of the telescope to change. The change caused dis-

continued to next page

Making Good Use of Good-For-Nothing Coal

by
Yuri Zaritovski
Novosti Photo Review

Reserves of low-grade coals, seldom used as fuel and for processing, are vast in the world. Countries, such as the United States, West Germany, France, the Soviet Union, Czechoslovakia, Holland, and Finland, are trying hard to find use for them.

The U.S.S.R. Academy of Sciences' Institute of High Temperatures, based in Moscow, is the leading Soviet research institute in thermal physics and new power-engineering areas. The Institute is focusing on the development of promising power-generation technologies. It has come up with an experimental plant for pressure fluidized-bed coal gasification, developed and tested by a team of Soviet and Czechoslovakian specialists.

The TFR-300 plant converts low-grade coal into high-calorie producer gas, widely utilized by industry. The plant is environmentally friendly and can be called non-waste. The producer gas is used as designated, and the ash and slag, given corresponding additions, make good building materials.

Essentially, the TFR-300 operation is as follows. Crushed coal arrives at the reactor, where a steam-air (or steam-oxygen) mixture is fed. Under definite conditions and high pressure, interaction begins. The end product of this chemical reaction is producer gas. The high pressure affects both reaction velocity and product quality. In 1989, when the plant was put into operation, initial experiments involved normal atmospheric pressure and a steam-air mixture. Now in 1990, 300–500 kilograms of coal can be processed hourly. Next year, when the plant reaches full-rated capacity, the working pressure will be increased to 25 atmospheres and coal gasification will be done with steam-oxygen. Most importantly, producer gas can be used to power gas turbines and can also be used for steam-gas plants.

Based on this research, the Soviet Union is contemplating building its first commercial plant to process low-grade coal in the Ukraine.♦

The following was sent to us by the Press Office of the U.S.S.R. Embassy in Canada.

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tortions which degraded telescope performance. To correct the problem, NRAO asked Dr. Mayer to measure the surface change, using a technique called radiometric holography. Once the change had been measured, a sub-reflector was machined with the inverse distortion to compensate for the change.

Dr. Joe Hawkins, Assistant Professor of Electrical Engineering, is working with Dr. Lou-Chuang Lee (UAF Physics and Geophysical Institute) on a NASA 3-year Theory Grant. For the project, computers will simulate the interaction between the solar wind and the Earth's magnetosphere at the "magnetopause." This project will help give us a better understanding of the Sun's effect on Earth.

Dr. Hawkins has also submitted a proposal to NASA for UAF to become a Space Grant College. A unique aspect of our proposal is the UAF Student Rocket Program, in which an interdisciplinary team of graduate and undergraduate students will work together to design, construct, and launch a sounding rocket payload from the Poker Flats Research Range in Fairbanks, Alaska. The first payload will measure atmospheric parameters and provide an engineering test of the student-designed telemetry system. Several, more ambitious, projects for future payloads are planned as cooperative ventures with industrial affiliates of the Alaska Space Grant College Program. For example, the development of an instrument for imaging the aurora in the X-ray spectrum is planned as a joint project with Lockheed Space Sciences Laboratory.

Dr. Debendra Das, Associate Professor of Mechanical Engineering, is working on a project for Rheem Manufacturing Company, Fort Smith, Arkansas. The project, "Testing of gas fired heaters to eliminate icing problems," was undertaken in response to icing problems experienced last winter by some of Rheem's Canadian customers. The one-year project is currently testing four units, each utilizing a different "fix kit" to solve the problem.

Dr. Jonah Lee, Associate Professor of Mechanical Engineering, has recently completed a National Science Foundation project studying plastic instability and modes of failure in the uniaxial compression of porous cylinders.

continued to next page

Dr. Terry McFadden, Associate Professor of Mechanical Engineering, has begun work on a project funded by the State of Alaska Department of Transportation and Public Facilities, which will use thermosyphons to stabilize marginally frozen permafrost under new road construction in the Bethel, Alaska area. The project will measure the effectiveness of thermosyphons which were installed this fall. Monitoring will continue for the next several years with preliminary results expected in 1992.

Dr. Doug Goering, Assistant Professor of Mechanical Engineering, has undertaken a project which concerns the modelling of energy convection due to groundwater flow. The project will extend existing numerical models to account for energy convection. The completed model will be used to simulate heat transfer from a chilled pipeline.

Construction in Cold Regions, a new textbook, has been written by Dr. Larry Bennett and Dr. Terry McFadden. The book, published by John Wiley & Sons, is expected to be released in March of 1991.

The Civil Engineering Deparment will have two new faculty members for the Spring 1991 semester; Dr. Parviz Koushki and Dr. Mohamed Succarieh.

Dr. Parviz Koushki is a transportation engineer. He received his 1974 Ph.D. from the University of Wisconsin in transportation systems planning. Koushki's research interests include demand forecasting, environmental analysis of air noise pollutions, and mass transportation economics.

Dr. Mohamed Succarieh specializes in geotechnical and earthquake engineering. He received a Ph.D. from Rensselaer Polytechnic Institute in August of 1990. Succarieh's Ph.D. research involved seismically induced, localized permanent deformations in earth structures.

Dr. Kevin Curtis, Assistant Professor of Civil Engineering, is working with the UAF Polar Ice Coring Office (PICO) on a project funded by the National Science Foundation. The project's goal is to establish a base camp facility at the summit of the Greenland ice cap. At the ice cap, the ground is buried under some 10,000 feet of snow and ice. The challenge is to find a structural system which, when built on the snow, will remain stable for five-plus years. Presently, several structural systems have been deployed and their effectiveness is being gaged.

Dr. Mark A. Tumeo, Assistant Professor of Civil Engineering, has been nominated for a Fulbright Scholarship by the Council on the International Exchange of Scholars. The award will be officially announced January 15, 1991. If selected, Dr. Tumeo will travel to Peru to teach environmental engineering (in English) for ten weeks beginning in May.

Dr. Tumeo has recently completed two projects for the Fairbanks Municipal Utilities System; final project reports will be released in January, 1991. These yearlong studies considered water quality, benthos, and effluent.

Tumeo has also been working with two graduate students, Patrick Wheat and Bret Davidson.

Patrick Wheat has been looking at the use of ultrasonics to selectively de-absorb contaminants adsorbed on colloid particles. Their theory, if proven through experimentation, will be an important contribution to the contaminant treatment process.

Bret Davidson has been working through the Environmental Technology Laboratory (a new research center at INE). Davidson's project deals with the effect of freezing on hydrocarbon transport in soils and groundwater.

Dr. Timothy Tilsworth, Professor and Department Head, Civil Engineering, and researchers Larry Johnson and Jim Durst, have recently completed a project for the Alaska Railroad Corportation. The 2-year project studied the use of alternative methods for vegetation control along the railroad railbed. Two herbicides, Velpar and Garlon 3A, and seven physical treatments were evaluated. The effectiveness of the treatments, as well as migration and persistence of the herbicides were evaluated. Results of the research will be published in a report, scheduled to be released in January of 1991.

The project resulted in four sucessful master's degree theses: "Economic Analysis of Alternatives for Railroad Vegetation Control" written by Jill S. Chouinard, B.S.C.E.; "Vegetation Control on the Alaska Railroad" written by Tracey L. Preston, B.S.C.E.; "Laboratory Studies of Triclopyr and Hexazinone in Alaskan Soils" written by Adam H. Owen, B.S.C.E.; and "Herbicide Persistence and Migration Along the Alaska Railroad Right-of-Way" written by Darren F. Mulkey, B.S.

Dr. Tilsworth has been appointed Chairman of the UAF Chancellor's Search Committee by UA President Jerome Komisar. Tilsworth also chairs the UAF Graduate Council.

Mike Brodie, an EQE graduate student, has recently completed his special project "Hazardous Materials Management for Transporation Projects." The work was done in cooperation with the Alaska Department of Transporation and Public Facilities. Mike is currently employed by DOWL Engineering in Anchorage. ♦

BACK OF THE BOOK

• CONFERENCES

January 21 – 24, 1991—Construction Issues from a Contractor's Point-of-View—Aspen, Colorado.

Construction issues from a contractor's point-of-view will be the focus of this four-day conference. Dubbed a "work-hard, play-hard" conference, attendees will attend presentations for four half-days, which will allow adequate time for other activities. Subjects covered will include issues such as the general contractor's role when caught in the middle of a dispute, how to drive litigation toward a settlement, and how to control the cost of litigation.

This conference will also be conducted as two full-days in Lake Tahoe, NV on February 20 and 21, 1991.

For more information contact *Karen Villano, Wilson Management Associates, Inc., 80 Glen Head Road, Glen Head, NY 11545; telephone (516) 759-2300.*

January 30 – 31, 1991—1st Annual Groundwater and Soil Remediation RD&D Symposium—Ottawa, Ontario, Canada.

The Groundwater and Soil Remediation Program (GASReP) is a joint government-industry venture to promote research, technology development, and field demonstrations to address the issues of groundwater and soil contamination. Research findings which will be presented at this symposium will include: in-situ bioremediation; soil venting and off-gas treatment; evacuation and treatment; and pumping and treatment.

For more information contact *Susan Clarke, Technology Development Branch, Conservation and Protection, River Road Environmental Technology Centre, Ottawa, Ontario, K1A 0H3, Canada; telephone (613) 991-1956, fax (613) 991-*1634.

February 14, 1991—Seawater Desalination: Meeting the Needs of California's Coastal Communities—Santa Barbara, California.

The continuing drought in Santa Barbara and throughout the state of California has emphasized the need to develop reliable, cost-effective, and environmentally benign alternative sources of freshwater. The process of desalting seawater is increasingly being viewed as a viable method of producing a new source of freshwater.

For more information contact *Department of Science, Engineering, and Management, University of California Santa Barbara Extension, Santa Barbara, CA 93106; telephone (805) 893-4143.*

February 26 – 28, 1991—Sixth International Cold Regions Engineering Specialty Conference—W. Lebanon, New Hampshire.

The theme of the conference is "Cold Regions Engineering Technology for the 21st Century" and will focus on research and development that will impact the design, construction, and performance of civil works in 21st century cold regions. This conference is sponsored by the ASCE Technical Council on Cold Regions Engineering.

For more information contact *ASCE, 345 East 47 Street, New York, NY 10017-2389; fax (212) 980-4681.*

March 20 – 21, 1991—Nonpoint Source Pollution: The Unfinished Agenda for the Protection of Our Water Quality—Tacoma, Washington.

For more information contact *State of Washington Water Research Center, Washington State University, Pullman, WA 99164-3002; telephone (509) 335-5531, fax (509) 335-1590.*

• CALL FOR PAPERS

August 13 – 14, 1991—PILETALK INTERNATIONAL—Kuala Lumpur, Malaysia.

PILETALK INTERNATIONAL '91 will provide a platform for exchange of piling technology for engineers, contractors, and academicians. Topics for the seminar include: piling design, criteria, and codes; piling testing methods and equipment; piling systems and techniques, methods, and applications; related techniques and alternatives; materials for piles; development in and use of piling plant, piling equipment; contractual risks and responsibilities; and case studies.

Abstracts of 200–300 words may be submitted, before March 1, 1991, to Conference Director, Engr. John S. Y. Tan, CI-Premier Pte. Ltd., 150 Orchard Road #07-14, Orchard Plaza, Singapore 0923; telephone 7332922, fax 2353530, telex RS 33205 FAIRCO.

• NOTED

The U.S. Fish & Wildlife Service, Alaska has announced that written proposals for changes to subsistence hunting and fishing regulations on Federal public lands will be accepted until January 15, 1991. The Federal Subsistence Board has called for proposals regarding season and bag limit changes in regulations for Federal public lands and associated non-navigable waters.

Proposals should be submitted to *Federal Subsistence Board/Seasons - Bag Limits, c/o U.S. Fish & Wildlife Service, Subsistence Office, 1011 E. Tudor Road, Anchorage, AK 99503.*

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