Your Paper Has Been Accepted!

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Simple rules virtually guarantee presentation of a clear, easily understood paper. Yet they are rarely followed by engineers presenting papers. Is it because they don't understand them or is there a subliminal reason?

Congratulations! Your paper has been accepted for presentation at the 1996 Microwave Theory and Techniques Society International Microwave Symposium (MTT-S IMS) in San Francisco, during the week of June 13. You can be especially proud of this professional accomplishment, since this year over 800 papers were submitted but only about 400 accepted. Yours was among the final 400!

The equivalent of that message has been received by 400 of you, to whom this article is directed. In a later issue I'll reveal to the other 400 what can be done to enhance their chances for the next Symposium.

Even though you may fit the engineer stereotype, who wears a button down shirt and drinks coffee or iced tea with meals, you're entitled to a little celebration. Maybe go out for nachos and beer this Friday evening or bring home a bottle of champagne to have with your significant companion. Better yet, why not take the whole weekend to celebrate in a manner that you enjoy. After all, this is a once a year experience, possibly even a once every several years experience, and it is very important to you professionally. Don't even finish reading this article; just mark your place and come back when you're done celebrating.

Why did you submit it in the first place?

While this paper deals with presenting the accepted and celebrated paper, that objective can't be addressed effectively without first deciding your motive for presenting it. First, ask yourself why you submitted the paper. Let me give you a tip, this is a trick question. Most engineers have a tough time dealing with this issue. Ask them and they'll answer something to the effect, "Well, this was a forward step in the state of the art and it (not I) should be placed in technology's limelight."

I was a technical director at a large company and would hear this answer from young engineers who wanted to publish. I'd bait them, saying "It would be better for the company if you kept these findings secret." They would squirm for awhile offering "reasons" such as "Everybody must contribute to the common knowledge if technology is to move forward." I was more experienced in this vein and would counter, "There will be sufficient others to reveal their findings and technology will move along nicely without your help." This Socratic process would proceed for about 30 minutes. Finally, in desperation the young engineer would shout, "Damn it, I did it and I want to take credit for it." To which I'd enthusiastically reply, "That's a motive, we can work with that!"

That's the bottom line, isn't it? You wouldn't want your paper read by an assigned reader who would announce that the author was anonymous, would you? Of course not! You want to stand up on the podium or on the Open Forum floor and announce what you have accomplished so that you personally, and indirectly your affiliation, will be held in higher esteem, by colleagues and even professionals who don't yet know you. Therefore presenting the paper should be done in a manner to accomplish this in the most efficacious manner. Now the conversation with the young engineer would take another turn. I'd say,

"Tell me about your paper," and the engineer would answer,

"First, I'm going to show the enormously difficult mathematics and physical reasoning that I went through. That will convince them of how smart I am, and esteem will be right around the corner." Then I'd ask,

"What if the audience can't follow all of the math, which took you months to do, and which they'll have only minutes to absorb?" The engineer would reply,

"Well, the six people in the Country working in this area will certainly follow it, and (assuming they're present) they'll be able to relay it to others. This two step process will be all the more impressive. Esteem from the most brilliant will be at hand. Forget the rest."

This, for all but a few, was the end of the conversation. I had done what I could. I had helped the engineer understand his purpose, *to snow the listeners*. Giving a paper, most engineers subconsciously feel, is a time for stunning the audience, keeping one step ahead of them so that they'll suspect he's done something phenomenal, but can't comprehend it completely. It is as if the speaker fears that were the audience to realize how simple and practical the result really is, they'd stand up and leave as a group, obviously disappointed that the answer to the problem was right there all along, something anyone, even with ordinary ability, could have conceived and performed.

That, I assert, is the real fear which results in so many incomprehensible papers. It's not that engineers can't make a legible vue graph. Think about it. Go to a convention of shoe salesmen. Their vue graphs are legible and understandable. They're not trying to snow each other with Bessel Functions of the unkindest kind. They'll just show pie charts indicating market size by shoe style or geographic area. Simple facts presented clearly.

Are we to believe that engineers as a group can't make vue graphs as well as shoe salesmen or a host of other professionals? I say, "Nonsense. Engineers' vue graphs are, taken as a whole, too difficult to read by design, the engineers' design." The fact is that most engineers want to impress by having the audience struggle to follow them. And the biggest problem is that this desire is subliminal for most engineers.

Since it's subliminal, it's hard to tell whether you might have wanted to present your paper in an obfuscatory manner had you not read this article. I'll ask you to bear with me in the tips to follow about presenting papers clearly. If you find yourself feeling nervous about them, chances are we found you just in time. You can be saved, preserved as a veritable fountain of lucid paper effluence. But should you discover that you prefer the mystic approach, read on anyway. The tips can be reversed easily to create as profoundly difficult to follow a presentation as desired. Either way you'll win, and the introspection will be a fringe benefit.

Years ago I wrote an article called "Presenting Papers" [1]. It was even distributed to all of the authors in the

acceptance letter for one of the IMS. On balance, I'd have to admit it that it was a failure. When I wrote it I thought that any engineer reading the article already had a desire to present his paper in a clear, easy to follow manner. As we've just discussed, this is not generally true and the motive for complexity, being subliminal, causes the prospective speaker reading the article to reject it (subliminally, of course). That's why we need to discuss motive before preparing a paper.

1) *Teach me something, and I'll hold you in esteem*

The instinctive inclination to present talks in a manner which leaves the listener groping, I claim, is not in either the speaker's or listener's best interests. Don't do it. This isn't the way to winning esteem.

Think about the people whom you admire professionally; a professor, a colleague. I assert that you esteem them because you remember learning from them, and to learn from them you had to be able to follow them. They had to present material to you in a sufficiently clear manner that you could understand. Having taught you something, you held them in esteem thereafter. I believe you can't hold someone in esteem whom you can't understand. All you could honestly say is "He may be smart, but I can't tell, because I can't understand him."

So perhaps you're saying, "All right already, I'll speak clearly." Good start, but let me warn you, as simple as this idea sounds there remain forces which mitigate against it. Often, for example, these questions go through the speaker's mind (Figure 1):

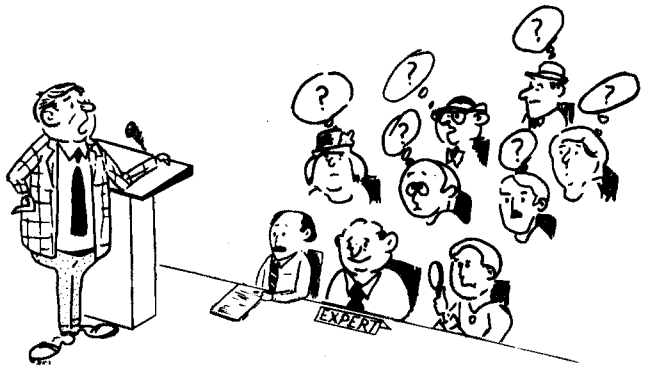

Figure 1. Often a speaker presents a paper designed for the other authorities in the field who, he fears, may be in the front row [1].

•Will this material seem significant to my peers? Will they think it advances the state of the art?

• Will someone in the front row ask an evident question that I've overlooked but which obviates the value of all my work?

• Will I be able to tell the whole story in 15 minutes? Or, actually, how will I fill up the 15 minutes? The whole thing is now obvious to me after the opening paragraph.

To give a successfully clear talk you must put these fears aside. To do it, focus on the fact that the reviewers who selected your paper and the listeners seated in the audience were attracted by the title of your paper. They want to hear it to be informed. Do that and you'll win their esteem, the real objective in presenting your paper.

2) *Tell why you did the work*

Get started by explaining *why you did the work.* For example, you might begin by saying,

"We undertook this superconducting filter to meet the needs of cellular phone users. With this filter, they can talk to Hong Kong directly at night. Signals will just zigzag around the world, bouncing along between the earth and ionosphere. The low loss, high isolation filter will permit the phone to pick up the cellular Hong Kong call directly, easily rejecting the noise and talk in adjacent channels. Since there's already a time zone difference, the night calls and ionospheric propagation will coincide nicely."

3) *What are the problems?*

Now we have a reason for doing the research. Next, get your bad news behind you. Discuss any issues that would otherwise occupy the minds of your listeners, distracting them from following the fine development work you've done. For example, you might continue,

"There are two issues we considered with using superconducting filters in cellular phones. First, to operate at low (77K) superconducting temperatures, we'll need evaporative cooling of liquid nitrogen. A 2 ounce flask will last only 24 hours, but we feel the cellular user will accept this minor inconvenience given the ability to talk directly and cheaply with Hong Kong.

"Second, the smelting of sufficient tertiary metallic compounds required for each superconducting filter consumes 2 kilowatt-hours of heat. Thus, to accommodate the 160 million user market will require an electrical output equivalent to that of the Hoover Dam for one week. This, too, we at our firm feel is quite acceptable given the pent up demand for cheap Hong Kong calls."

Now the audience knows where you're going. Even if they aren't convinced the cooling and electrical requirements are practical, they won't be distracted during your talk into making back of the envelop calculations regarding them, because you've anticipated and answered these obvious questions. After all, the same questions were raised by your office partner when you first described your work to him. Despite the evident value of this background step, it is surprising just how few presented papers include it. If you doubt it, just sit through a few conference sessions as a listener. Yours, however, will be the pleasant exception.

Next make a simple statement about what had to be developed. For example,

"We had to find a way to make the superconducting filter small enough for the shirt pocket phone. In this paper I'll show how we adapted existing filter theory, which would have produced too large a circuit at cellular frequencies, to use lumped elements that could be printed directly onto superconducting films."

Having laid this foundation, you are now ready to explain the development you undertook and its results. The audience is with you.

4) *Clear Visual Aids*

The first slide is the easiest to make. Prepare it with the title of your talk, your name (remember why you're giving the talk) and your affiliation (Figure 2). This can be used by the projectionist to focus the projector while you ascend the podium.

The second slide can be a brief summary of the talk to follow. For example, it might say,

Superconductor Filters

- Superconducting filters are essential to Hong Kong cellular calls.
- Problems of cooling and manufacture are surmountable.
- Test data shows 0.4 dB loss, 60 dB isolation with 30 kHz bandwidth.
- Miniaturization requires more development.

Don't worry about whether the titles are precisely correct. For example, we could have amplified the first point above by saying "Superconducting filters are essential to Hong Kong cellular calls when one considers that no terrestrial or satellite repeaters are employed." This is unnecessary. The bulk of the paper will convey this. Keep the titles short.

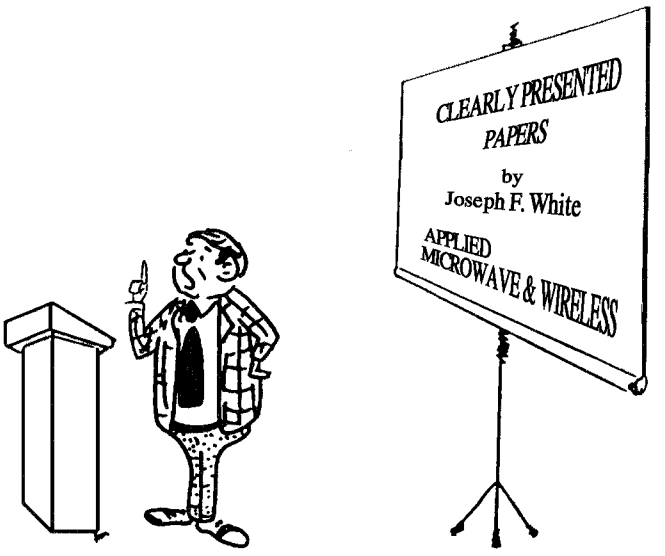

Figure 2. A title slide allows the projectionist to get ready with a useful message while you're mounting the podium [1].

How often have you heard, "Now you probably can't make out this slide too well but what it says is...," or,

"I made this vue graph from a copy of a figure in our report and it didn't come out too well, but ..." or, in the best muddling form,

"We got these results last night just before we caught the plane to the conference (the bulk of all research must be performed at the last minute, to hear most talks). I prepared this vue graph by writing on the bottom of a Petri dish with a magic marker. In fact, those little blotches near the edges are the left over superconducting film alloy."

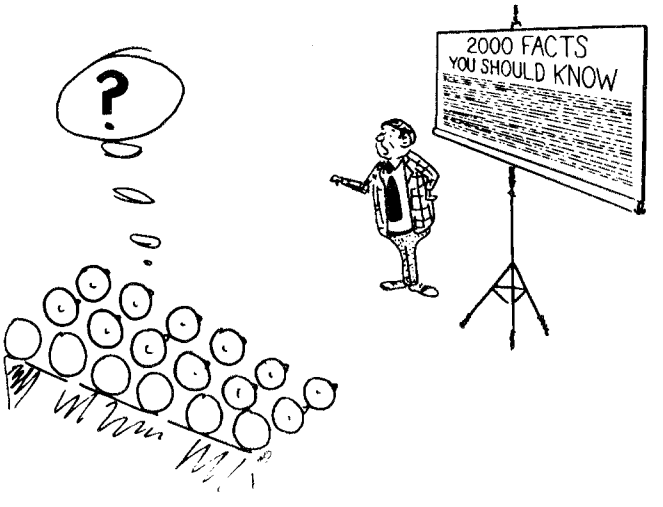

Figure 3. "You probably can't read this slide, but..." [1]

This is the point at which really good work can be scuttled by poor visual aids. The audience is ready to follow your development, so legible slides with clear, step at a time ideas are what you need.

5) *Prepare slides now!*

For a technical presentation, preparation of the talk is simply preparation of the visual aids. Well prepared visuals require only a running commentary by the speaker to deliver the talk. The trick to making good visual aids is to *prepare them early.* This way you have time to think about them and perform edits, making sure they are both legible and comprehensible. Waiting until just before your talk to prepare your slides on the presumption that they will include later work is a mistake. Delaying the slides delays the preparation of your talk. Since *your paper was accepted based on its content 6 months before the symposium*, stick to that content and *make the vue graphs or slides now*! Besides, its better to bank some of your new data. Additional results can become the subject of next year's paper. In fact, you can get double the promotional effect by saying, for example,

"This slide had to be ready for the submission of papers. It shows the 0.4 dB loss, 60 dB isolation filter result. However, recently we've been able to double this performance, permitting night time calls to the moon, thereby ensuring a follow on market for the product."

6) *The "Distance equals ten times height" rule*

This rule is so unknown it might as well have been locked in the fault with the formula for Coca Cola™ Go to any (engineering) conference and you'll see it violated by nearly every speaker. The others probably stumble onto the right approach, it's so seldom employed. If this idea were used in cellular phones, I'd try to patent it. The rule (Figure 4) is simple. Make your visual aids (vue graphs or slides) using sufficiently large lettering and other important details that they can be read at a distance equal to ten times their height.

If you prepare the vue graph as a standard 8.5 x 11 inch sheet, see if you can read it from a distance of 10 feet (usually the opposite wall of your office). This is also where the similar rule for slides is derived, by which you view a 35 mm slide at arm's length (about 10-20 times its height) to determine if it's sufficiently legible. In most auditoriums you can expect a screen size about equal to a tenth the length of the room. Thus, a 100 foot room will have at least a 15 foot high ceiling and a 10 foot high screen.

7) *Same content for vue graphs as slides!*

Here's a real presentational secret. *You can't put more information on a vue graph than you can on a 35 mm slide*, because *both are projected onto the same screen*! Many speakers overlook this simple fact, because a vue graph is easier to read when held in your hand than is a slide.

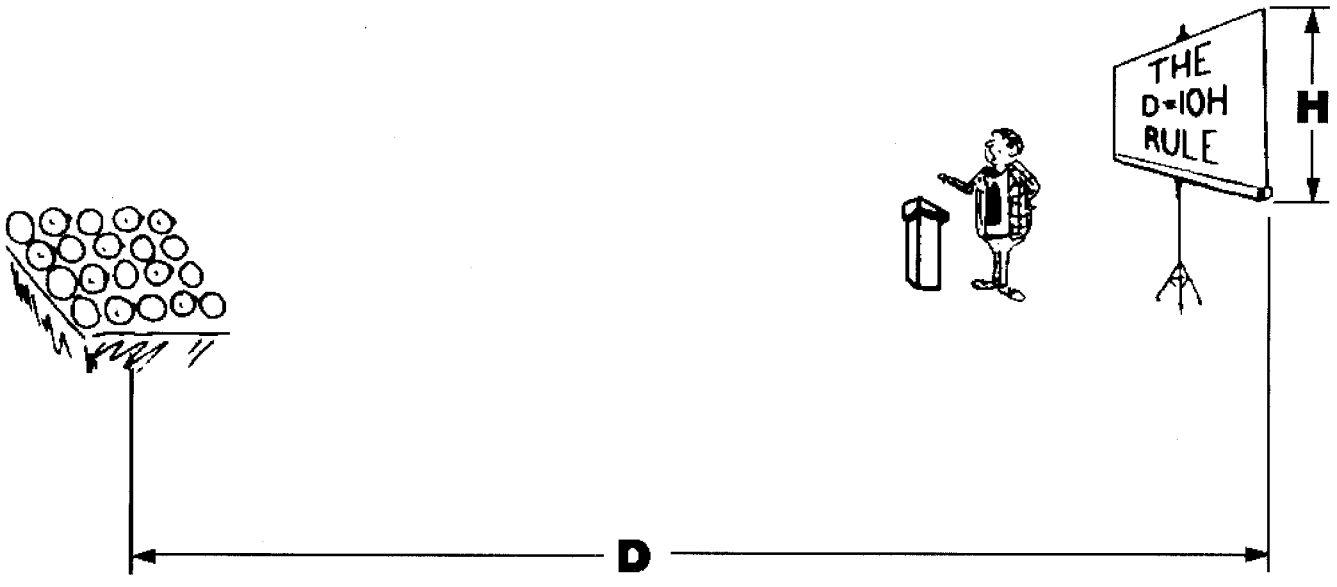

Figure 4. The D= 10H optics rule for slides and vue graphs [1].

8) *Don't make vue graphs from report pages*

Vue graphs made directly from the page of a report are not suitable for presentation. When you read an 8.5 x 11 inch size report page, you hold it about 2 feet from your eyes, a D/H ratio of only 2. You also have the option of moving it closer to you if some detail is hard to read. Reports usually use type similar to what you are reading on this page. If you make a vue graph of this page, as can easily be performed with a copy machine, the projected image will be unreadable by someone seated in the back of the room (D/H Ratio of 10)

EXCEPT FOR THIS LINE

Try reading this page from 10 feet away, all but the large type above is unreadable. Yet such vue graphs and slides occur regularly at conferences. I have proposed to the symposium planners a Socratic method of revealing this fact en masse to speakers by requiring them to present their talks from the back of the room; but so far this eye straining penalty, while acceptable for listeners, has been considered too cruel for speakers.

9) *The "One Slide, One Simple Idea" Rule*

Speakers often assemble the visual aids for a talk from already prepared charts, graphs and tables used in reports. This organizational economy is a big presentational mistake. To understand why, consider the phenomenon of "discretionary interpretive activities" for readers. These are the things that a person can do when what he is reading is not immediately comprehensible to him or her.

For example, as you read this page you are free to scan the text as rapidly as you like, to reread the previous page, even to scan the next page. You can make marginal notes and calculations to confirm the points you are reading. You can decide to grasp only part of this material now and reread it later should it be necessary for you to have a more complete understanding of it.

The listener in a darkened auditorium does not have these discretionary interpretive options. Each of your slides passes before him in about a minute's time, and he knows he must *absorb the content right away or not at all.* If he senses from the complexity of the slides (especially those with Bessel Functions) relative to his own familiarity with the subject that he can't catch them on the fly, he'll give up. His attention lost, he'll be bored with the remainder of your talk. He might feel that other papers he's heard, possibly with less technical content but presented more thoughtfully, are better than yours. This is the ultimate forensic inequity. It is the way to fail as a speaker.

So don't do it. Make each slide have one simple idea (Figure 5). Two ideas, two slides, Three ideas ... (you've got it). There is another benefit to the one idea per visual aid rule. You'll be able to follow your own talk without need for notes. Just look at the screen and comment your way through the talk. By "explaining" each slide you'll convey what was done and what was learned.

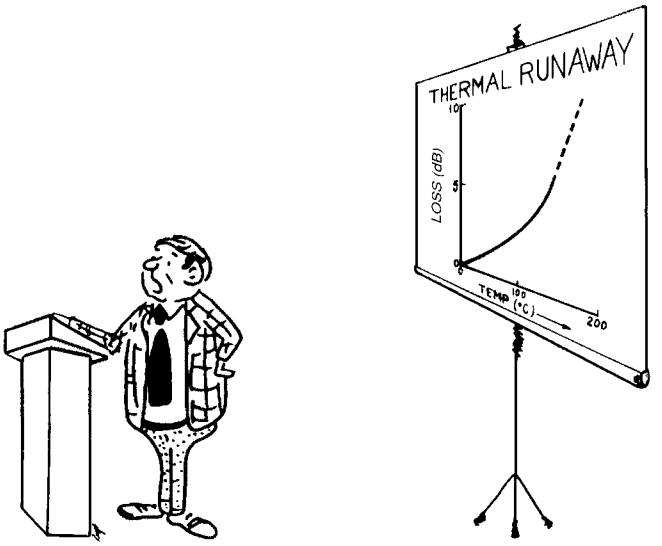

Figure 5. The "one slide, one simple idea" rule [1].

10) *No derivations in your talk*

Don't try to cover mathematical derivations in your talk, even if the talk is intimately tied to them. You can and should place needed derivations in an appendix of the summary of your paper printed in the symposium digest. While the mathematical development can't be covered in the talk, the results can. For example, you might say,

"This slide shows the final equation for the electric field in the air above the lumped element induction along with a sketch of the field under the center frequency (see Appendix A for derivation) resonance condition. Notice that the metallic cover for the circuit must be separated by at least 10 times the substrate thickness to cause less than a 0.1% passband frequency shift."

11) *Use short summary slides*

You can place short summary slides in the sequence. For example, you might have a slide which says,

Superconducting Film Requirements

- Must be pliable enough to resist cracking when cooled to 77K.
- Must adhere to a substrate (so film does not flake off over temperature)
- Must be etchable to create desired circuit pattern.

Then separate slides to follow can address how these objectives were met

12) *Plan about one slide per minute*

For a 15 minute talk, plan about 15 slides, about 1 per minute. If you need to show a slide more than once, put in duplicate copies where needed so the projectionist and audience are not inconvenienced working backward to find an earlier view.

13) *Make a dry run*

Throughout this paper I've assumed you'll go this preparation alone, but it's better to dry run your talk before an audience. A colleague or two are ideal but even non technical listeners, such as your secretary or wife can help. Ask your preview audience to note how long each slide is screened. Any slide shown for more than 2 minutes probably should be replaced with 2 or more slides, breaking the content into bite sized ideas for your audience.

Try to include photographs in your slides. If you have nothing better, at least take photographs of the test set ups. Photos lend an air of reality to the talk and provide the opportunity to make comments about the work, such as,

"This photo shows the superconducting filter under test. We could only find a 50 gallon stainless dewar at the time so the unit is bigger than what would fit in a shirt pocket cellular phone."

These photos are also good to add when submitting a paper since they reveal that experimental work was performed and the paper is not just a theoretical exercise.

14) *Use a summary slide*

At the conclusion of a talk some speakers feel it's now final exam time. "See if you can remember what my talk was about." This is not the approach to follow. Give your listeners a break. Finish with a summary slide, clearly stating what was accomplished. This is the message with which you want to leave your audience. An example might be,

Superconducting Filters
Make Hong Kong Calls
Possible & Affordable

Then just say, "Thank you for your attention," and await the applause and interested questions.

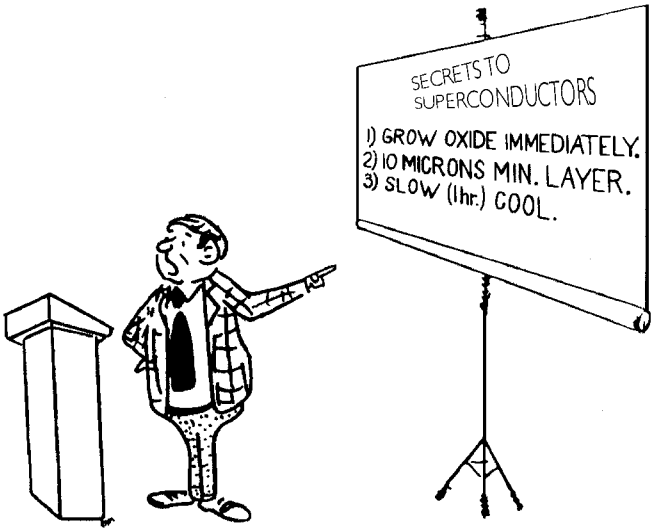

Figure 6. "Tell 'em what you'll say. Say it. Tell 'em what you said."[1].

I look forward to hearing a clearly presented, interesting talk at the MTT-S IMS. Yours!

Acknowledgment

Portions of this talk were originally published in "Presenting Papers" [1]. I am grateful to Bart Adante who drew the original caricatures for the Figures.

Reference

1. Joseph F. White, "Presenting Papers," IEEE Trans on Professional Communication, December 1979, Vol PC-22, No 4, pp. 179-182.