Seminar on Seminars *(notes by Bob Bryce)*

The seminars I talk about today are mathematics seminars, though the principles are the same for all seminars. The talk will be divided into three parts, like Caesar's Gaul. First I say a few words about the seminars that you must give as part of your fourth year course in mathematics honours; then I talk in a general way about giving a mathematics seminar; finally a few practical words about seminar giving.

1. The 4th Year Seminars

- Practice in giving a seminar: it may concern the project work that you are doing, but that is not necessary. Other possibilities are:

  – Report on some work you have done previously;
  – Take a piece of mathematics from a course and expound it in the light of your

  – Expound a famous theorem, E.g. the Fundamental Theorem of Algebra has many proofs; a comparative account of these and their history would be a very acceptable seminar.

- The aim of these seminars is to give practice in giving a seminar not, primarily, in doing mathematics. Mention Nick Buchdal's geometry seminar of 10–12 years ago.

- Of course you can concentrate on your essay topic; perfectly acceptable. BUT see my comments below.

2. Giving a seminar

- Primary aim of a seminar is to inform. It can be used to survey an area of mathematics, or to present the details of the proof of a theorem, as two extremes. You must have a clear aim of what you want to do with the seminar; broadly speaking is the one or is it the other? Is your lecture on the Hahn Banach Theorem intended to give a complete proof of it? To compare several different proofs? To explain its importance in analysis?

- How many points can you make in a seminar? Recall Sir Lawrence Bragg's story of giving a public lecture: make at most one point. Not quite the same here, but something of the same principle applies.

- Remember your audience: you are there to inform them, not to show off. It is worth remembering that, even in such august company as here, *you* probably know more about the topic you are expounding than any one in the room, certainly more than most. (I have never studied general relativity but I am willing to be informed about its problems and methods, and you have my attention for one hour.)

You know why the topic you have chosen is interesting to you, but why should the listener be interested in it? Give a simple, general introduction, which raises the problem, says why it is interesting and worthy study, if possible with some history and motivation and connexions with other things. A seminar to this type of audience that starts out: "Let ... be an elliptic differential equation ... " has probably lost me right at the start. By the time I have remembered what this object is and dredged up long forgotten reasons for studying it, I am lost.

A better start would be. "Elliptic differential equations arise naturally in various physical problems; e.g. ... Today we are interested in the following class of problems ... which have connexions with ... Finding solutions with certain properties to these equations would enable us to stand on our heads more easily ..."

In short try, at the start of your seminar, to catch the interest of your listeners by building on things they know, or can easily see are interesting mathematically. The introduction could easily occupy 15 or 20 minutes: for most people in a general semeinar it will be what they remember.

- Your seminar now has a beginning: it also needs a middle and an end. The middle develops the theme you have advertised in the introduction. The end summarises what you have done. The end might, possibly should, contain a reference to open problems, current work etc etc. Leave a few minutes for questions.

If you have chosen to expound the proof of one result don't fall into the trap of trying to prove every last lemma involved. Try to pick a small number of the most important ideas – one may be enough – and labour them. The skeleton of the proof may get more across to the audience than all the detail. The wood and the trees!

If you are surveying an area pick the results with care: you will need a theme. Possibly one or two related results which somehow sum up the area. Talk of their connexions, their histories, earlier results. Avoid the temptation of trying to tell everything you know about the topic.

- To sum up:
  - Remember the audience; you are there to inform them.
  - Have a clear theme for your seminar which you state in your introduction;
  - Choose the content of the middle part of you seminar to develop the theme,
  - Summarize in the last five or ten minutes, and look to the future.

3. Practical points

- Length. It is much more likely that you will under, rather than over, estimate the amount of time you need. Problem common to all mathematicians: I can estimate how much time I need in an A22H lecture to within a few lines; in seminars I usually overshoot.

  You can estimate better if you have got your aim clear.

  Another tip: arrange your seminar with modules that can be jettisoned if you are running behind time. It is a modular world these days: write a modular seminar. E.g. if you are proving a theorem highlight the proof of a lemma, for example that can be put in, or omit, without interrupting the flow of your talk, as time permits.

Practice run through. Use your supervisor or fellow students. Make this run through realistic.

- Don't read your seminar, even if you have a complete text written. BUT it may be helpful to read the first paragraph or so until you get over being scared. HOWEVER in general I think it best not to write the complete text out: stick to some notes with full detail only where you need it: it is very hard to get a complicated expression accurately onto a blackboard, so have such things written out where you can easily find them. Also any text you want to get just right. What ever you do don't be for ever dashing back and forth across the room picking up and putting down your notes.

- Organizing the blackboards. Think out in advance what you what to keep displayed for the whole seminar. Or use an overhead projector.

- Over head projectors: give people time to read what is there to be read. Ideal for this type of seminar if properly used. Practice first and make sure your writing is legible and large enough to be read in the back row of the room.

- Speak to the back row of the room, clearly and not too fast.

- Seed a few questions: but if you are asked a question you can't answer, don't

- To sum up: prepare well in advance; practice, if possible in the room, and with the equipment, you will use on the night.

4. <u>Summary</u>

- Your seminar does not have to be related to your project;
- Have a clear, limited, theme;
- Remember your audience: don't snow them;
- Prepare well in advance;
- Practice!