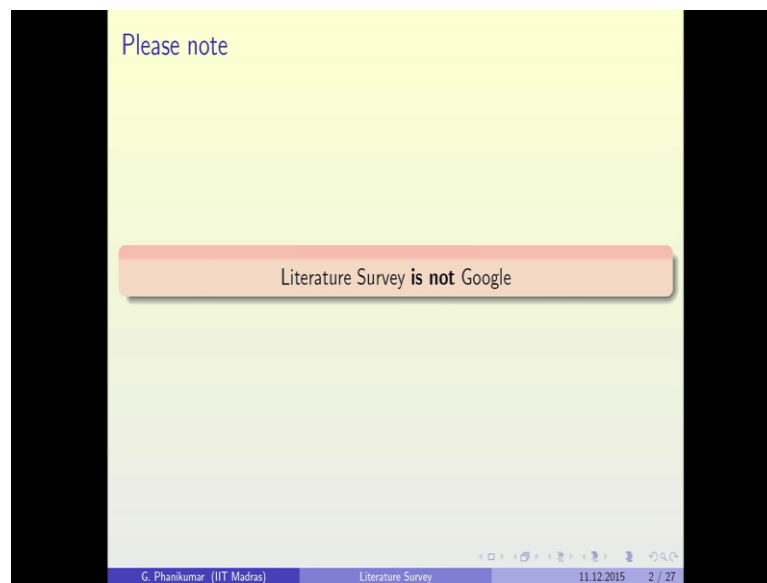


Introduction to Research
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Lecture - 06
Overview of Literature Survey

We are going to look at literature survey in the next three modules, each compressing roughly about twenty minutes.

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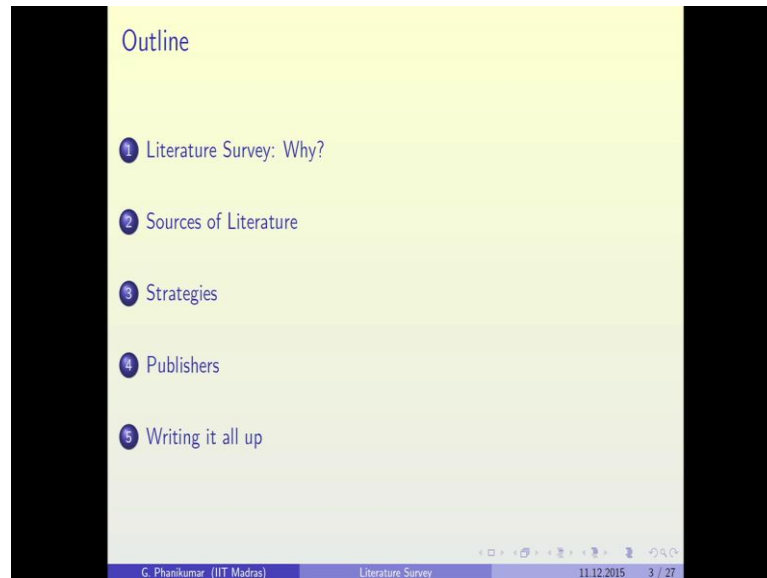


The first twenty minutes is going to be slides on the background of literature survey. And then, the next twenty minutes roughly will be on actual demonstration of the various literature sources. I am going to show you how you can search for literature, organize them in set of tools that you can use. And then, in the last twenty minutes, I will see how you can use these literature data in a document that you want to write up.

So, we will start off the literature survey by first making a disclaimer. Literature survey is not just googling for some information. The reason is Google search engine is going to look at private websites of various individuals. Whereas, by literature survey, what we basically mean is a survey of technical literature that is of authoritative in nature, pertaining to the scientific enterprise that is going on across the world in universities, research labs and so on. So, what comes closest to available, what is available in Google

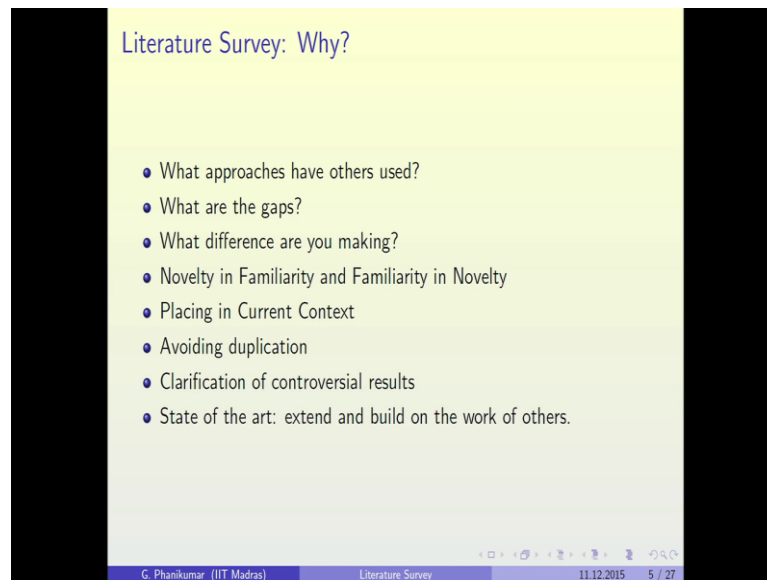
would be perhaps Google scholar. So, please note that literature survey is not the same as googling out the information.

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So, we are going to look at the literature survey in this manner. First, a very brief background on why should we get into this literature survey at all; and then, where are the sources of literature that we could look up; what are the ways by which we can go about searching; and then, who are all the publishers who host the scientific archival literature that is being used by scientists all over the world. And then, towards the end, how to collect and store it in a manner that we can use it to write up a document.

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Literature Survey: Why?

- What approaches have others used?
- What are the gaps?
- What difference are you making?
- Novelty in Familiarity and Familiarity in Novelty
- Placing in Current Context
- Avoiding duplication
- Clarification of controversial results
- State of the art: extend and build on the work of others.

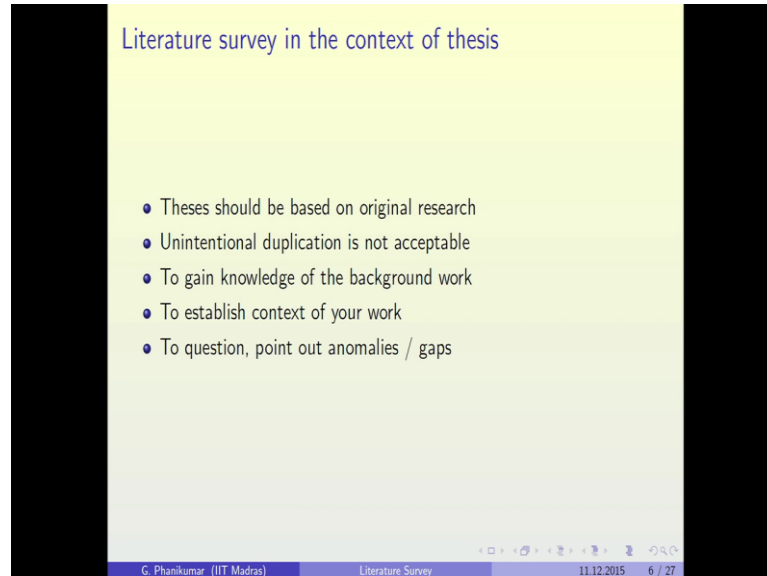
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Okay So, why do we want to do literature survey at all? So, essentially the first requirement that we need to do is every scientist cannot replicate the entire history of how a particular topic has evolved. So, we must use approaches that are going beyond what others have done till now; which means that we must know what others have used; what kind of approaches people have used; where are the gaps that have come up; and, where is it that we can contribute. And then, what is the difference that we are making to the existing knowledge. And, very often a very novel technique used in a very familiarized area would be a good addition to the literature. And, sometimes a very familiar technique used in a totally novel area of research would also be valuable. So, novelty in familiarity as well as familiarity in novelty require you to know what is familiar and what is novel. And therefore, literature survey is necessary for you to know that.

And then, very often a study is valuable or seen as valuable by our peers when we are able to place that study in a current context, where people look at it as valuables. So, it is important to avoid duplication; and, it is also important to clarify certain controversial results that may be coming up. And, if you want to know what is the state of the art in the literature that is currently there and we want to extend and build on the work of others, definitely we need to know what is done till now. And, literature survey should help us in getting that status quo of the subject we are a trying to do research on. So, literature survey that way is a very important aspect. It should be done not only at the beginning of

the research but also throughout. But, at the beginning, it definitely makes a very important point.

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Literature survey in the context of making a Ph.D. thesis or a research-based degree is important, because very often the research degrees are given based upon original work that is done by the student. And, duplication is not acceptable even if it is not intentional. So, it is important to know what is out there, what have people done elsewhere in the world on the research area that we are working on. And, sometimes **it's** also important to establish the context for your work, and **its** also important to have a background knowledge of the topic that we are working on **okay**. And, to also point out anomalies and gaps, we must know what has been done till now. So, in the context of a research thesis also research analysis and literature survey is very important.

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So, where do we look up this literature? So, very often we have various ways and I am going to look at them in one by one. The first way is obviously what is available for everyone in the world – open access. Unfortunately, the cost of keeping a journal publication or a conference proceeding in an archival manner, that is available in a reproducible manner over a long period of time is going to make the respective publishers spend money for that; so, which means that there is a subscription cost associated with every journal access. And therefore, open access - that is publicly available information from scientific archival data - is very limited. But, definitely, they are increasing in number as we go along. So, open access is very much available and we will see what kind of journals are available under open access.

And, in India, there is an arrangement made by the Ministry of Human Resources Development under the so-called INDEST program, which is being coordinated by IIT, Delhi, which provides access to a large number of literature sources to various education institutes in the countries. They are categorized into various groups: tier 1, tier 2, tier 3, etcetera. And, which means, that if your research organization or university is funded by government, then most probably, quite a few of literature survey can be done using the sources that are paid for by INDEST program. We will see what are all available on INDEST for our institute. And then, we also can see what is available in other institutes, where we could perhaps go visit, take permission, and do the literature survey there. Very often the literature sources that are subscribed by INDEST are not adequate. So, some

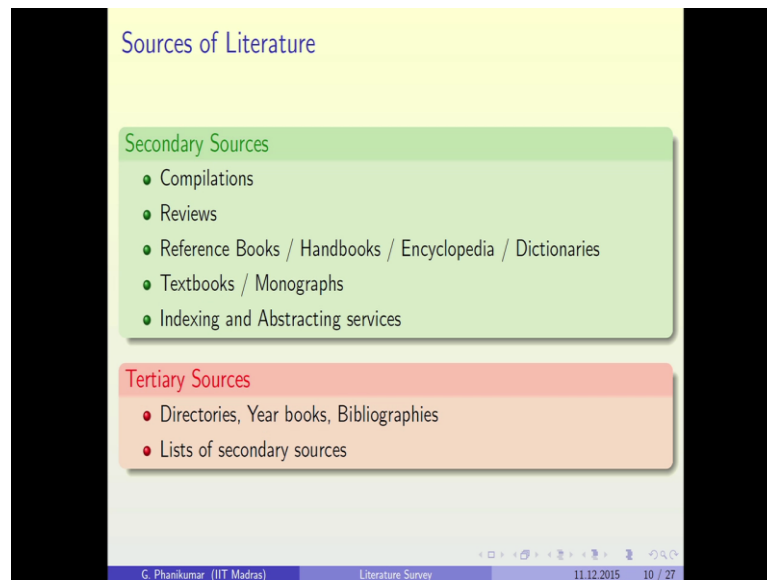
libraries do spend additional amount of money to make subscriptions beyond that set. And, this is something that will be available from your library. So, you definitely must get in touch with your librarian and find out what are all the journals that are subscribed by your library. And, of late, there has been also an effort to use some of the possibilities of authors being allowed to share their own publications on a portal, where upon request, it is possible to have the literature shared. So, these are called as peer sharing sources. So, Research Gate and academia.edu are such peer sharing sources, which also may be able to provide some amount of literature.

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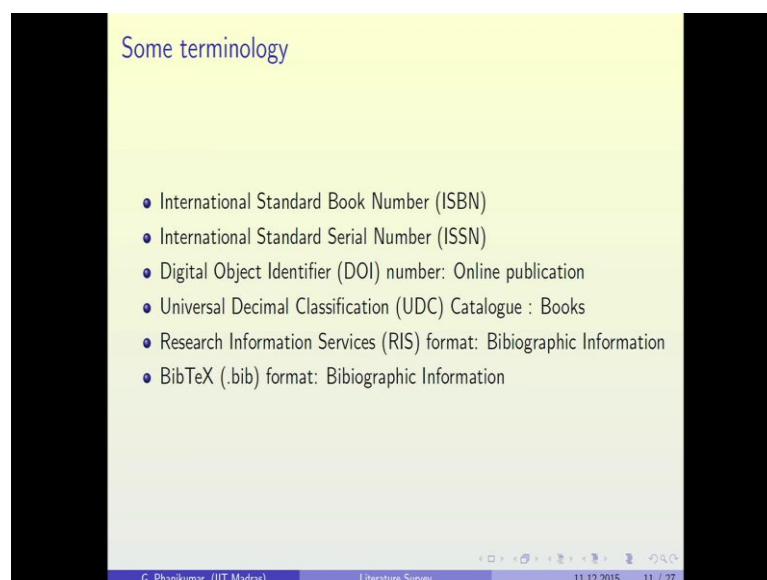
So, what are these literature sources that we are talking about? We are basically going to look at periodicals, research reports, conference proceedings, official publications, standards, theses, dissertations, etcetera. Sometimes even publications that are going to come up in future can also act as a source of literature. We must, of course, have a pointer to refer to them, so that whenever they are complete, bibliographic details are available, we will be able to update them in our document.

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And, there are also secondary sources of literature such as compilations of works done, and reviews, reference books, hand books, etcetera; text books, monographs, and abstracting services - all these can be also acting as literature surveys. And tertiary sources like dictionaries, year books, bibliographies, lists of secondary sources also can be used as sources of literature.

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So, when we go ahead with literature survey, we must be familiar with some terminology. Every book that we want to refer to must contain what is called an ISBN

number – International Standard Book Number. This number is basically going to allow anybody in the world to identify the book and also possibly source it if it is available in print. Any book that does not have an ISBN, is essentially not traceable after sometime. And, it is important to note it down whenever we want to refer a book. Similarly, any journal that we want to refer to should have an ISSN number. And, these are also applicable for newspapers. And, ISSN number is going to be in ranges. We must pay attention to this when we are also referring to conference proceedings, which will usually have an ISSN number.

And, today in the digital world, we would like to have an identity for each document such that we will be able to access them directly. And, such an initiative is now available and the number is going by a name called Digital Object Identifier, namely, the DOI number. So, every document that is available online in the literature - open literature - will have a DOI number. And, there is an agency which translates the DOI number into a URL, where that particular full text resource is available. And, whenever the full text resource moves, the mapping will be modified by the agency – DOI agency. And therefore, we will be able to access the resource as the resource keeps moving its actual location; **and** that means that if you are going to refer to an online resource, make sure that you have a DOI number for the particular resource, so that you can refer to it by that number.

And of course, there are also other things that we must be familiar. They are something called UDC catalog. This is basically to physically be able to refer to that book in a library. And, the format of a bibliographic information comes in several methods. And, two such formats are very popular: RIS format and BIB format. We will look into the format of these two types of specification and what kind of fields are available etcetera as we collect literature survey through the demonstration that I will do briefly later on.

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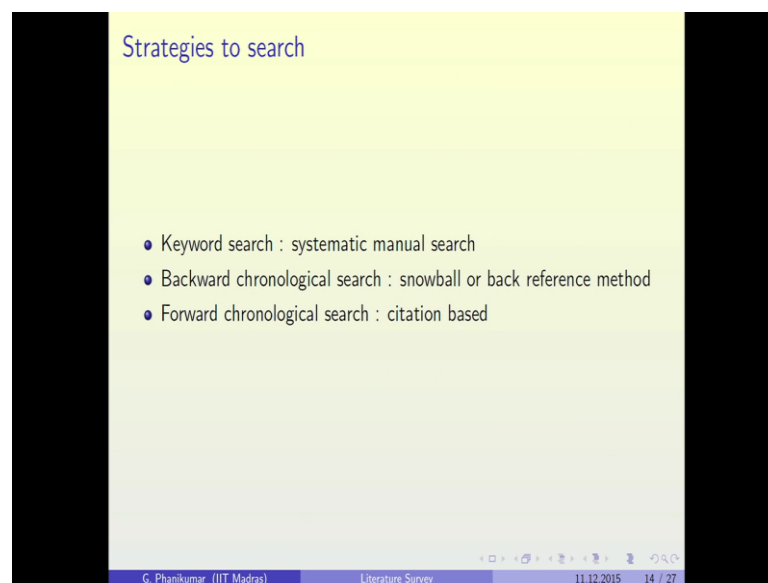


And, there also some other things that we must be aware of while doing literature survey. One such thing is journal impact factor. What we mean by journal impact factor is that to see how many times the articles in a particular journal are being referred by other journals and other articles. It basically gives you a sense of how often these articles are being read and being used by other scientists. So, if you want to compare two journals in a particular area, then the one with the higher impact factor is being accessed, read, and referred more often. And, this is a number which is controversial; one cannot compare these impact factors across research areas. Very often it is seen that a research area in which the research is very actively being pursued, there are a large number of researchers that who are working. Then, normally, it will have journal impact factors, a little bit on the higher side. And, in communities - research communities - where the number of journals are limited, the number of scientists are limited, then the journal impact factor tends to be on the lower side. So, it is not an absolute method by which we can say a journal is less or more important. But it gives you a relative sense to compare two journals in a particular area of research.

There is also something called citation index. This is about a journal article; how many times has it been cited. We do call some articles as citation classics. What we mean by that is there is an article that has been referred by so many people, maybe hundreds, that you could now call it as a classic. And, citation is basically how many times it has been referred by other successful journal publications. h-index is something again a

controversial index; it basically refers to how many times a particular author's publications have been cited and how many of them exceed the number of publications; that is, basically when we say that an author has an h-index of say n, then he has n papers that are cited n times or more. So, which also means that an author, who has higher h-index, is an author whose papers are being read widely and are being referred widely. And, most probably, he is a more successful scientist.

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So, what are the various strategies to search literature? **Its** very important for a newbie in research to be very effective in searching the literature in his or her area, because the amount of time available to come to the focus area is very limited. And, we must identify the gaps very quickly, so that we can focus on the research that we want to pursue.

So, there are three major strategies that we can use to search literature. The first strategy is basically using a keyword. What we mean by a keyword search is using a word to identify the topic of the research result that we are looking for, or to use the author's name. We could also use a keyword that is mentioned by the article itself. So, essentially, it is like coming up with words that would describe and identify a particular research paper; and, which means that there are variants that may be available that point to the same article. We will see how we can do that shortly.

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Strategies to search

- Keyword search : systematic manual search
- Backward chronological search : snowball or back reference method
- Forward chronological search : citation based

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There is also two other ways of searching, what is called the backward chronological search and a forward chronological search. What we mean by these two will be evident as we do the searching when we go ahead with a demonstration. Citation is something that is going to be playing a role in the forward chronological search.

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Systematic manual search

Abstracting databases

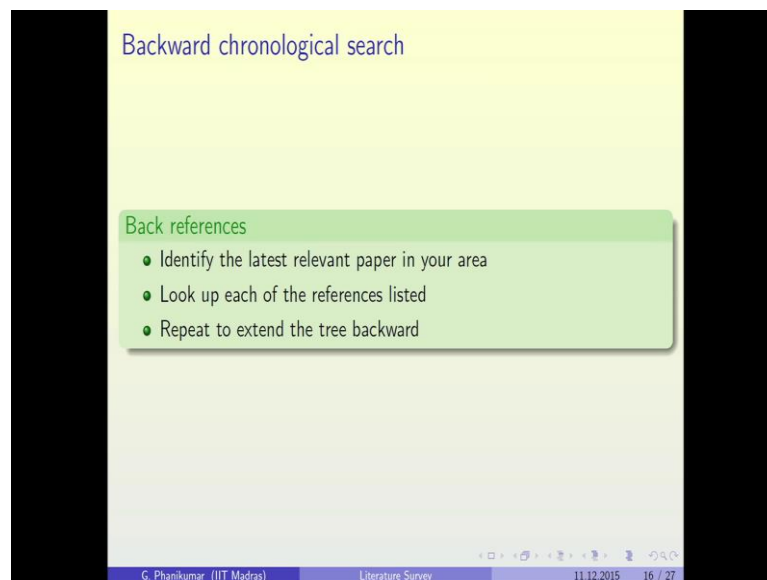
- INSPEC and COMPENDEX (EngineeringVillage)
- PubMed
- MathSciNet
- Chemical Abstract (CA) Service

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And, where do we do these kinds of searches. So, there are certain databases that are available, which contain the entire collection of journals and conference proceedings that will be collected together. And, one needs to have a subscription for these services to

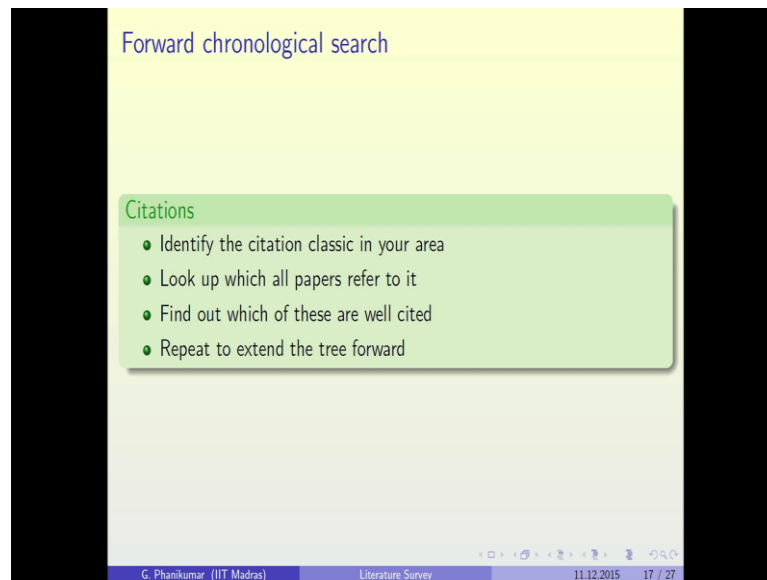
have access - INSPEC and COMPENDEX are some such databases. PubMed is relevant for the medical community. And we have, of course, MathSciNet and Chemical Abstract services. So, if our libraries have access to these databases, then we can have an ability to search a large number of articles and conference proceedings in one place.

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The backward chronological search basically what it means is that we are going to look at an article, and see what are all the papers that it is referring to, which will be basically older than the article. And then, look at among those references, what are relevant for that topic, and then, going recursively back in time. So, this way actually we can go and discover the entire background of a particular research area.

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Forward chronological search

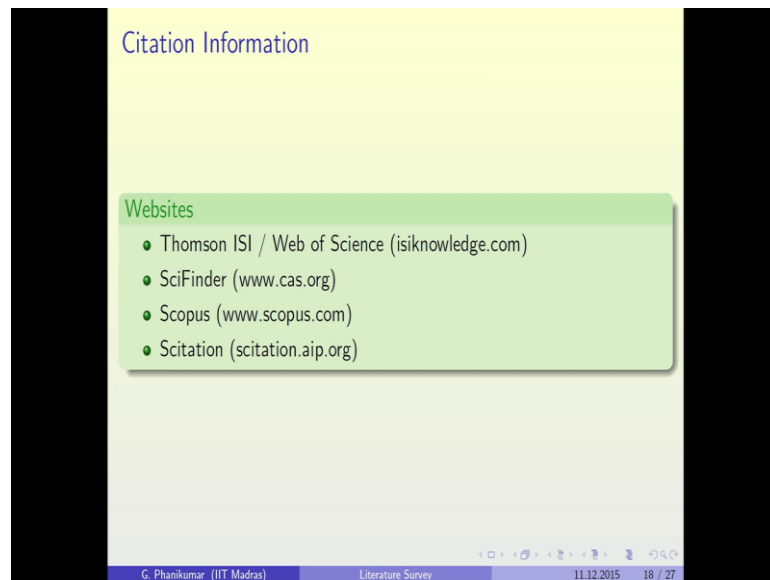
Citations

- Identify the citation classic in your area
- Look up which all papers refer to it
- Find out which of these are well cited
- Repeat to extend the tree forward

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Forward chronological search is something that works in a different manner. We basically first identify a very important paper in our area of research, and then, we will see what all those publications that are citing this particular paper, which means that they are going to come in the future, in the sense, let us say we have identified a very good paper in 1994, then all those papers that are published after '94, which are referring to this particular paper. And, among those there will be some which will be very relevant to us. And then, we are going to pick them, and then, we will see which of the papers after those have cited those particular papers. And, that way we can go forward in time. Obviously, we can come only up to the year that we are searching, because the paper that will be published in future are not yet available to us at this point. Maybe by the volume number wise may be one year ahead, we may be able to see the papers that are coming in, but not beyond.

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So, what are the kind of information sources that we can use, where the citation information will be available. So, here again subscription is required, and two such sources I am going to show you: one is the Thomson ISI company's Web of Science and the other is Scopus. And, these two are seen as the most popular resources of information for citation. And I am going to show you a demonstration of how to look up the important research results in a particular area using these sources.

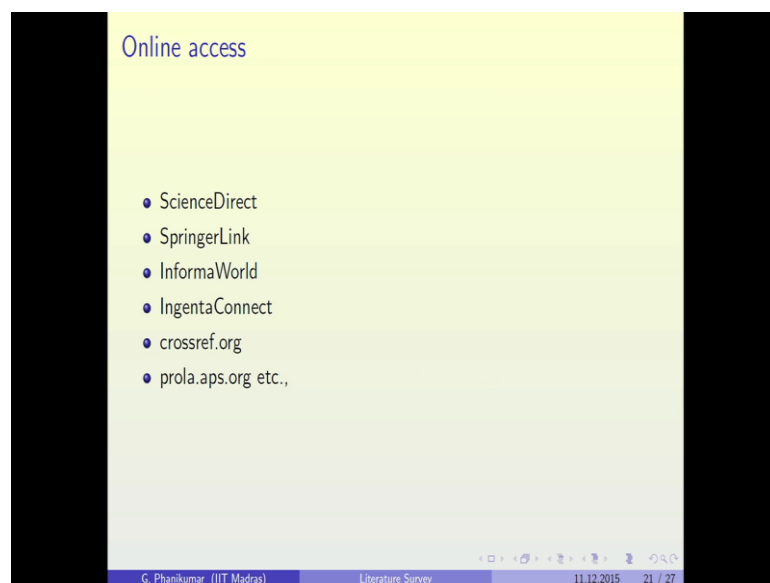
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A word about publishers; roughly about eighty percent of the publications in the journal

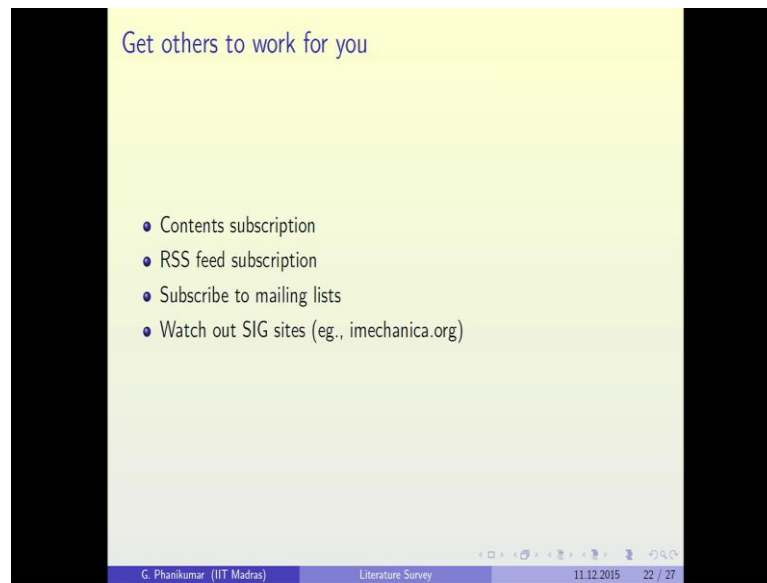
forms are done by a very limited number of companies that I have listed here. Elsevier and Springer together they take up majority of the journal publications in the world. And then, comes the Taylor and Francis group, Nature Publications group and Maney Publishing. And then, there are a large number of journals that are published by societies: American Physical Society, American Institute of Physics, etcetera. So, there are journals that are published by societies and they are also publishing houses. So, we must know where to find the websites of online resources for these publishers, so that we can search for our articles there.

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Online articles are also available in a full text form from portals that are run by the respective publishers. So, ScienceDirect is one such portal that is run by Elsevier. SpringerLink is a portal run by the Springer publishing group. And, we have many such online sources that I am listing here. We will open up some of those sites, and then, see how we can capture those full texts that are available against subscription.

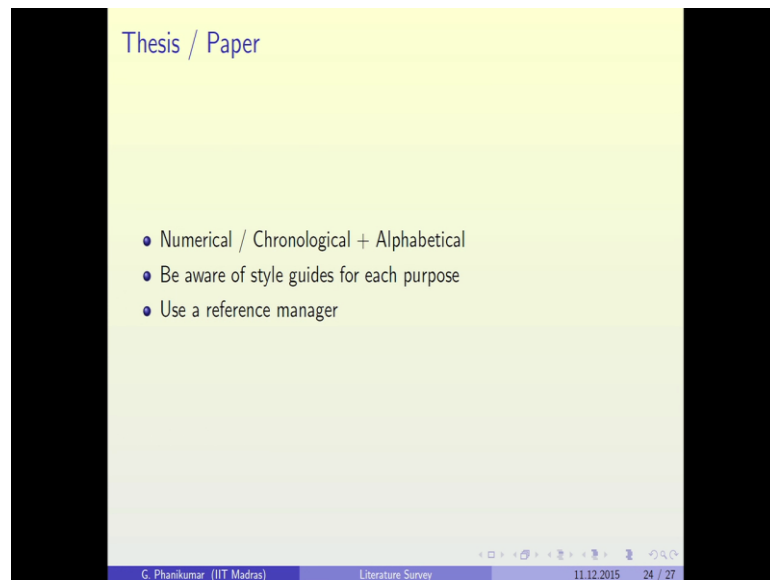
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So, sometimes it is also possible that the articles that are being published can come to our desk without our intervention. So, what we mean by that is we **don't** have to go to the journal website every month to check what is new. There is something called RSS feed subscription or content subscription. So, we can enroll our email with those respective publishers, and then, they will actually update us if there are new articles or if there are new issues every month. And, that way we can see that the literature survey is being pushed to our inboxes rather than we going and searching.

Naturally, accessing the articles that come with links in our emails through the subscription will require a subscription from our library; however, the basic information such as the title, authors, and the article details such as volume issue number and page number, etcetera will be available in our inbox through these subscriptions. Sometimes it is also very useful to visit special interest group websites. One example is imechanica.org which is an interest group for mechanical engineering community. These groups or these group websites will basically discuss about ongoing work in that particular domain. So, it is a very good idea to check out some such sites that may be active for your research area.

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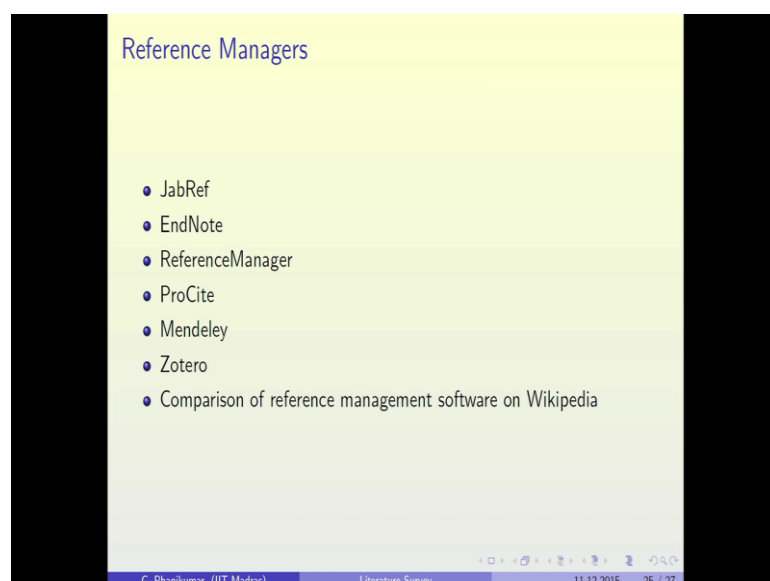
Thesis / Paper

- Numerical / Chronological + Alphabetical
- Be aware of style guides for each purpose
- Use a reference manager

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So, when we want to then write up, we need to basically organize these references in a numerical manner, one after other in the sequence of referencing the document, or maybe chronological order or alphabetical order. So, we must be aware of what are the different styles in which the references are required for a particular document. This may be varying from university to university and also from a publisher to publisher when we want to send our manuscript for publications. So, **its** very important, for example, to use a reference manager to be able to change the style depending upon the source of information and the target where we want to send our document.

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Reference Managers

- JabRef
- EndNote
- ReferenceManager
- ProCite
- Mendeley
- Zotero
- Comparison of reference management software on Wikipedia

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I will be introducing some of those reference managers. My favorite one is JabRef, which is **a** open source and freely available software. I will be actually doing a brief demonstration of this software. There are many paid ones also which I have listed here. And, some of them may be subscribed by your library for your university; you must check with your library what are available for your university as far as reference managers are concerned. There is also a very nice comparison of all the reference management softwares on wikipedia. You may want to have a look at it before you decide which ones to use.

And, I would like to thank Professor K. Ramamurthy and my colleagues for helping me with some of the pointers for **this** slides till now.