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PUBLICATIONS AND MODERN SEARCH OF THE LITERATURE

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1. INTRODUCTION

A literature search is a thorough and systematic search of all types of published literature in order to identify good quality references relevant to a specific topic.

The term "literature search" is pretty self-explanatory as it refers to the process of searching for previously written literature. Literature searches are one of those skills that we assume students already have when they get into a PhD course. As a consequence, we rarely make time to explicitly teach them those skills [1, 2].

As a general rule, it is best to begin with an exhaustive literature search. Even if it takes a lot more time, this provides you the benefits of a complete understanding and a broad knowledge base of the research field as well as the option to eliminate references as you narrow your research topic. The success of your research project depends on a thorough review of the academic literature at the outset. It is therefore a fundamental element of the methodology of any research project. It is better to eliminate irrelevant sources than to attempt to stretch just a few into an entire structure of support and explanation of the research you will conduct [3, 4].

Effective literature search is a crucial skill in its own right and will prove valuable for any future information gathering activity whether in academia or not. Getting the literature search right will save hours of time through the course of your research project and will inform and improve the quality of the research you go on to do for yourself.

In practice, in addition to academic texts, journals are the main source of information for most in-depth literature searches related to an extended essay, dissertation or research project. However, depending on your topic, many other sources will prove equally valuable such as newspaper archives, images, primary data and conference proceedings.

2. PLANNING YOUR SEARCH

You can take a number of approaches to your search:

- Systematic – you try to find all relevant material,
- Retrospective – you find the most recent material and work backwards,
- Citation – you follow up references from useful articles, books and reading lists,
- Targeted – you restrict your topic and focus on a narrow area of the literature.

There are many types of articles and you need to be aware of the differences:

- Research articles, including systematic reviews, are the best source of evidence;
- Review articles give a summary of research articles on a topic;
- Commentaries and opinion pieces can include interpretations on research or letters to the editor and editorials;

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• Case studies are a type of research that focuses on one person or situation as opposed to a group of studies.

It is important to look for research in peer-reviewed journals. This means that the articles published have passed through peer critiquing before they are accepted for publication. This ensures that the articles have had some quality control [4-5].

3. CHOOSING YOUR SOURCES

There are many different sources of information. You will almost certainly need to use both books and journal articles, but you may need to use other information sources related to your subject, such as government reports or sources of drawings and figures [6].

General information is available at Wikipedia: https://www.wikipedia.org/
Looking for the *solar cell*, we can find a basic description on the topic (see Fig. 1).

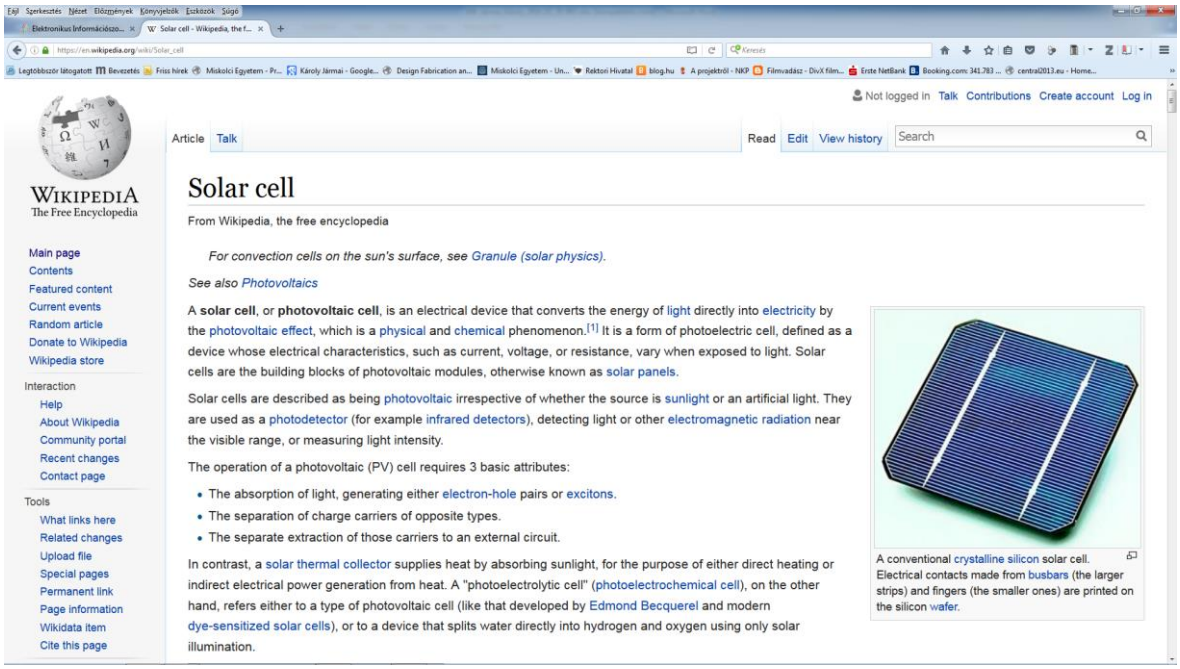

Figure 1. Solar cell description in Wikipedia

4. FINDING JOURNAL ARTICLES

Journal articles are one of the best sources of information as they can be selected for being current and specific. They are the principal place where research and practice are discussed and new work is presented. Additionally, most of the important and ground-breaking research is published in journals. Journal articles are best found using citation databases. This means that a specialist or a new topic will often be better covered by journal articles than by books. You will need to use databases to find journal articles on your topic. Some databases will give you references so you can trace an article, others allow you to access the full text straight away.

Scientific and professional articles are available on ScienceDirect: http://www.sciencedirect.com/ and SpringerLink: http://link.springer.com/

Google Scholar is also a relatively good professional search engine: https://scholar.google.com/

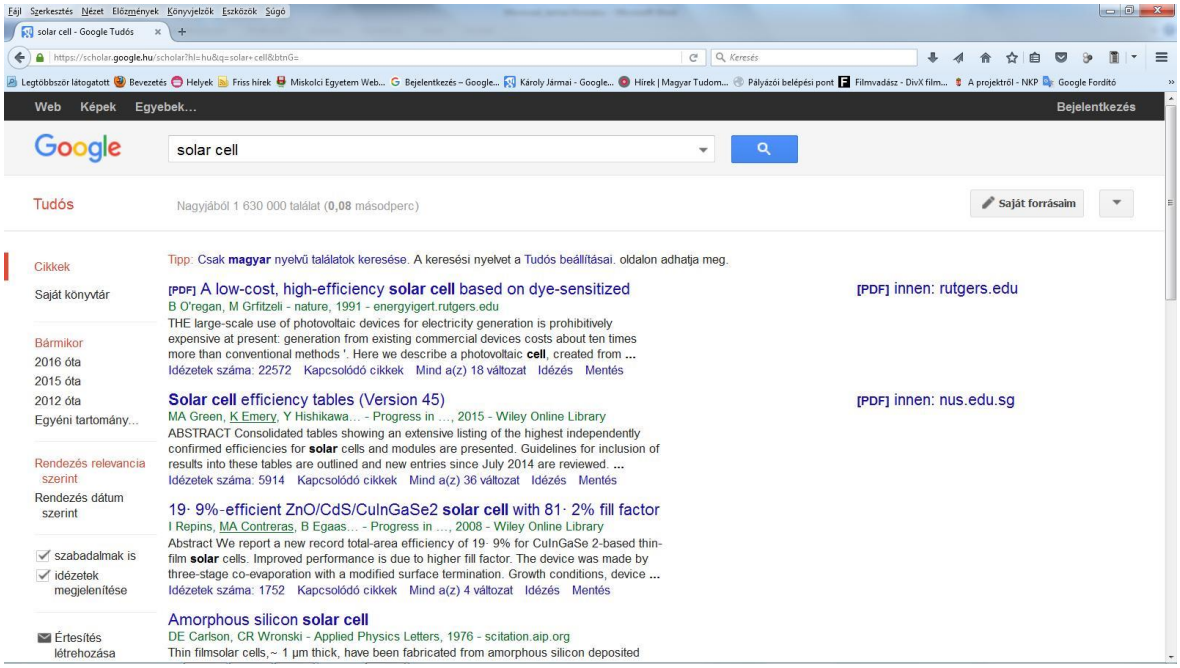

Figure 2. Solar cell search at Google Scholar

evidence, therefore, for the general supposition that electrons and/or holes can move rapidly along the axis of column-stacked π-systems[5,6]. The decrease in conductivity on going from the crystalline solid to the mesophase is attributed to a lower charge mobility. This is probably due to an increase in positional disorder of the porphyrin moieties[7] on melting of the hydrocarbon mantle.

We have found a similar decrease in the radiation-induced conductivity at the solid to mesophase transition of octa-alkoxy-substituted phthalocyanines. An isotropic liquid phase of these compounds is not, however, attainable within the temperature range of our equipment. They could not therefore be used to carry out the conclusive experiment of completely melting the material to see if long-range order was essential for conduction. The experiments on octa-*n*-alkoxy substituted phthalocyanines have, however, shown that the lifetime of the conductivity transient increases exponentially with the length of the alkyl tails[8]. This is taken to be strong evidence that the mobile charge carriers responsible are restricted to rapid diffusional motion along the phthalocyanine axis of a stack, with eventual charge recombination requiring stack-to-stack electron tunnelling through the hydrocarbon mantle.

The absolute value of $(\Delta\sigma/D)_0$ is related to the mobilities, μ, of the charge carrers, $\sum\mu = (\mu(-)+\mu(+))$, and the average energy required to produce one charge-carrier pair, E_p (in eV), by[3,4]

$$(\Delta\sigma/D)_0 = \sum\mu/E_p \qquad (1)$$

For organic compounds, the total initial yield of electron–hole pairs corresponds to a value of E_p of ~25 eV for high-energy radiation[9–11]. Only a fraction of the initial electrons and holes will escape rapid (subnanosecond) geminate recombination[8,9] and diffuse to separate columns, thus being observed in the present experiments. Using a value of $E_p = 25$ eV together with the experimentally determined value of $(\Delta\sigma/D)_0$ will therefore yield a lower limit to the charge-carrier mobilities. For the solid phase of ZnP at room temperature, assuming electrons and holes to have almost equal mobilities[12], this gives $\mu > 2.6\times10^{-6}$ m^2 V^{-1} s^{-1} and for the mesophase, it gives $\mu > 0.6\times10^{-6}$ m^2 V^{-1} s^{-1}.

This order of magnitude of the mobility indicates small polaron motion[13] corresponding to the hopping of a more or less localized charge between neighbouring sites with an average jump time between sites of τ_j. The mobility measured in the present, randomly orientated columnar materials is related to τ_j by

$$\tau_j = ed_j^2/6k_BT\mu \qquad (2)$$

where d_j is the distance moved along the columnar axis per jump (4.9 Å for the present systems). The minimum values of the carrier mobilities given above correspond therefore to

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A low-cost, high-efficiency solar cell based on dye-sensitized colloidal TiO_2 films

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THE large-scale use of photovoltaic devices for electricity generation is prohibitively expensive at present: generation from existing commercial devices costs about ten times more than conventional methods[1]. Here we describe a photovoltaic cell, created from low- to medium-purity materials through low-cost processes, which exhibits a commercially realistic energy-conversion efficiency. The device is based on a 10-μm-thick, optically transparent film of titanium dioxide particles a few nanometres in size, coated with a monolayer of a charge-transfer dye to sensitize the film for light harvesting. Because of the high surface area of the semiconductor film and the ideal spectral characteristics of the dye, the device harvests a high proportion of the incident solar energy flux (46%) and shows exceptionally high efficiencies for the conversion of incident photons to electrical current (more than 80%). The overall light-to-electric energy conversion yield is 7.1–7.9% in simulated solar light and 12% in diffuse daylight. The large current densities (greater than 12 mA cm^{-2}) and exceptional stability (sustaining at least five million turnovers without decomposition), as well as the low cost, make practical applications feasible.

Solar energy conversion by photoelectrochemical cells has been intensively investigated[2–11]. Dye-sensitized cells differ from the conventional semiconductor devices in that they separate the function of light absorption from charge carrier transport. In the case of *n*-type materials, such as TiO_2, current is generated when a photon absorbed by a dye molecule gives rise to electron injection into the conduction band of the semiconductor, Fig. 1. To complete the circuit, the dye must be regenerated by

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Figure 3. The first article on *solar cell* in Google Scholar

5. FINDING BOOKS

Books are often a good starting point. Textbooks summarise key theories and more specialised texts often present research findings in a clear and comprehensive way. The technical books are available at OMIKK
http://www.omikk.bme.hu/en/library.html

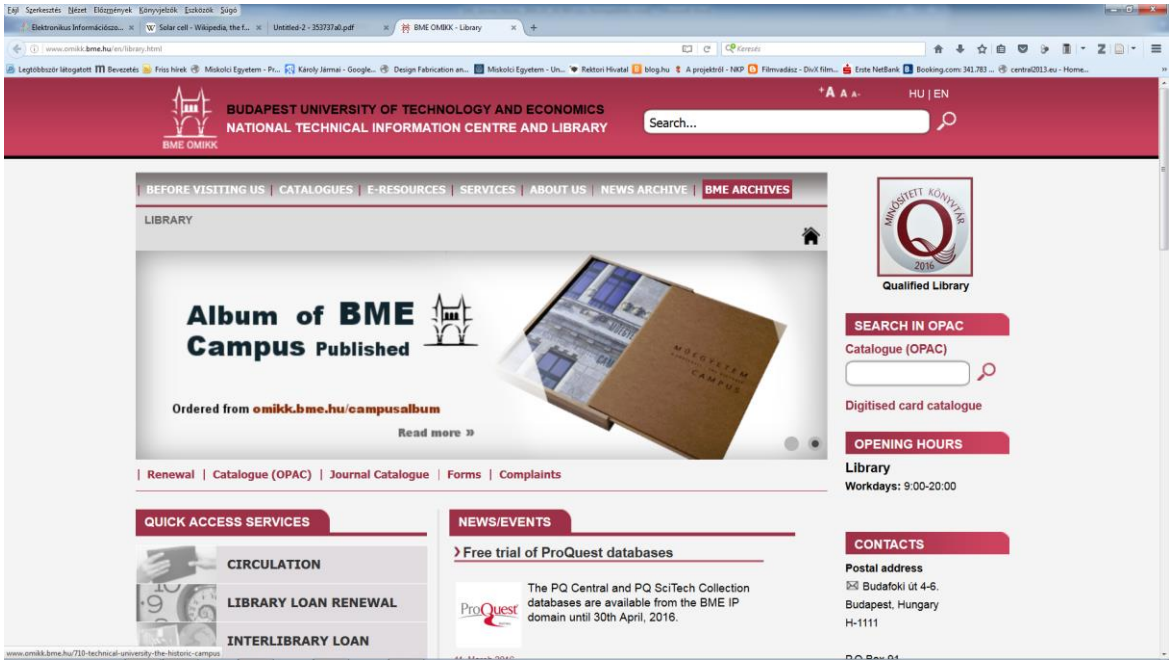

Figure 4. Search at OMIKK database for *solar cell*

Search MATARKA, Hungarian Periodicals Table of Contents Database,
http://www.matarka.hu/

Figure 5. The list of articles on *solar cell* in MATARKA

A good search for books is on the GoogleBooks website: https://books.google.co.uk/

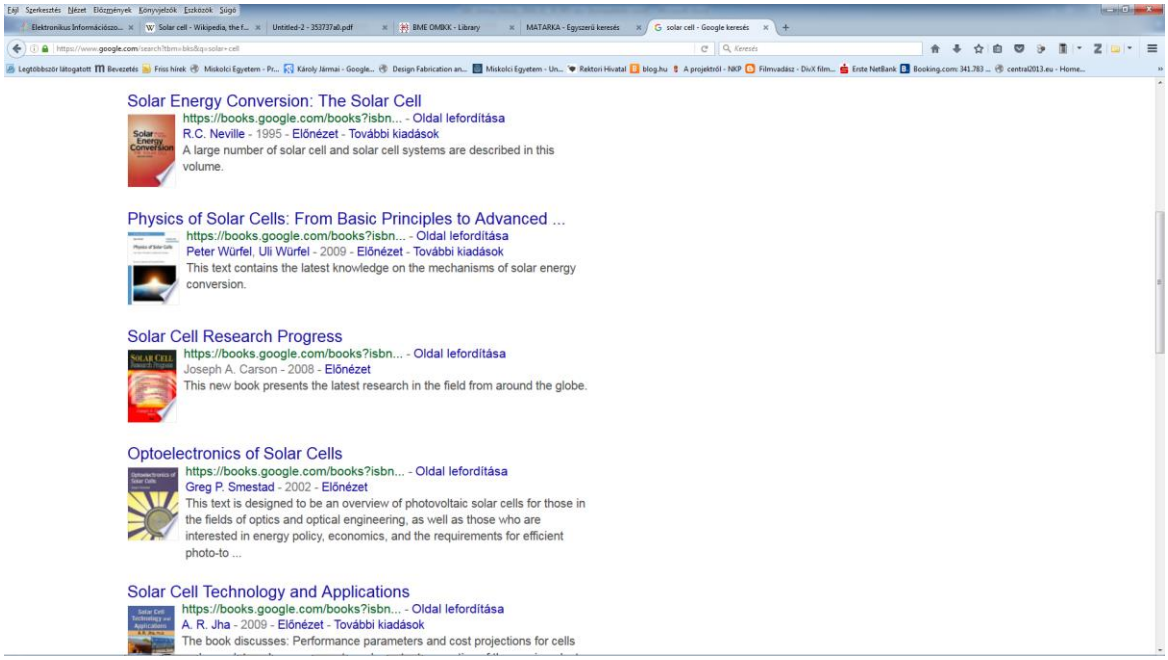

Figure 6. The list of articles on *solar cell* in Google Books

Other library catalogues list what is available in libraries elsewhere. COPAC (www.copac.ac.uk), a combined catalogue of the biggest libraries in the United Kingdom and Ireland, is comprehensive and highly recommended.

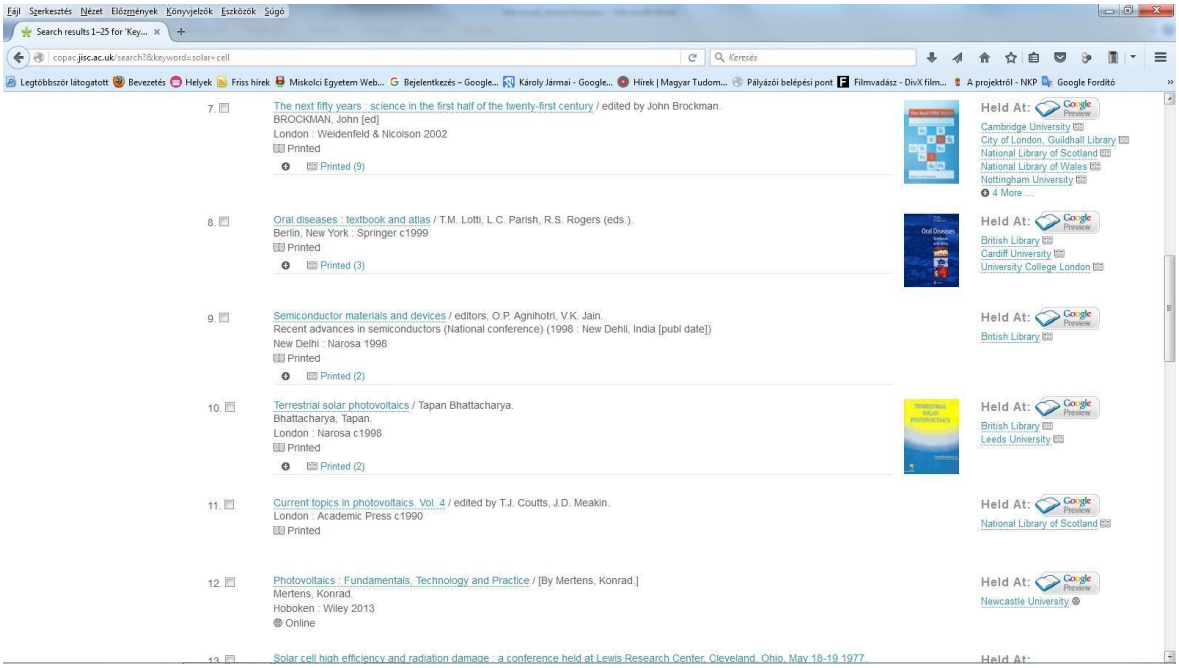

Figure 7. The list of articles on *solar cell* in COPAC

Internet booksellers (e.g. www.amazon.co.uk), may have the details of newly published books.

Microsoft Academic Search is also a good site to start making searches http://academic.research.microsoft.com/

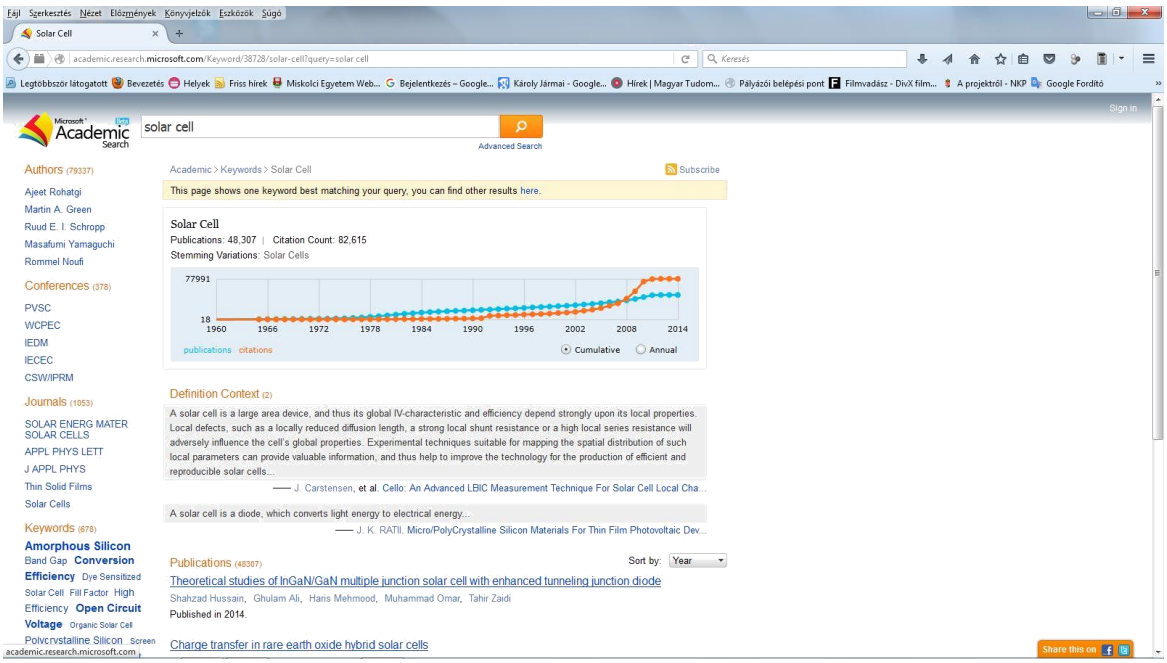

Figure 8. The list of articles on *solar cell* in Microsoft Academic Search

The Library of Congress can have many articles on different technical fields https://www.loc.gov/

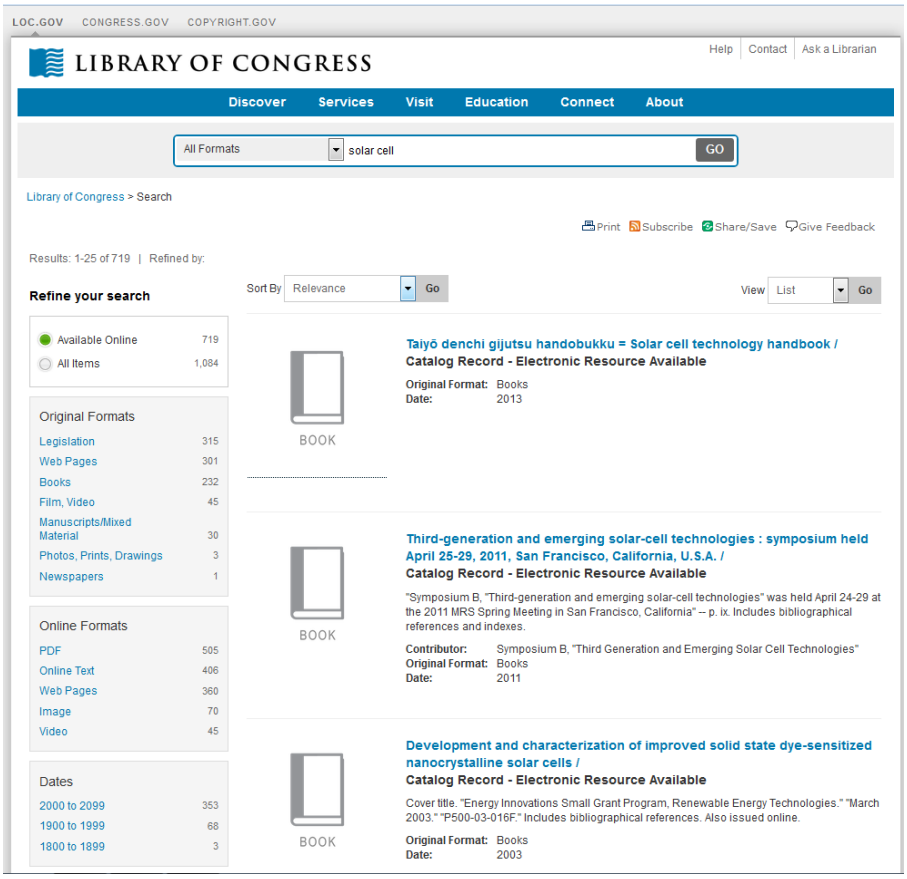

Figure 9. The list of articles on *solar cell* in Library of Congress

The EISZ.hu page is a good collection of databases, which are prescribed by the universities.
EbscoHost is one of the best-used reference resources in the world. EbscoHost offers five free resources accessible to any researcher at any time free of charge: https://www.ebscohost.com/
The JSTOR Archive features the complete back runs of over 1000 scholarly journals across over forty disciplines http://www.jstor.org/ .

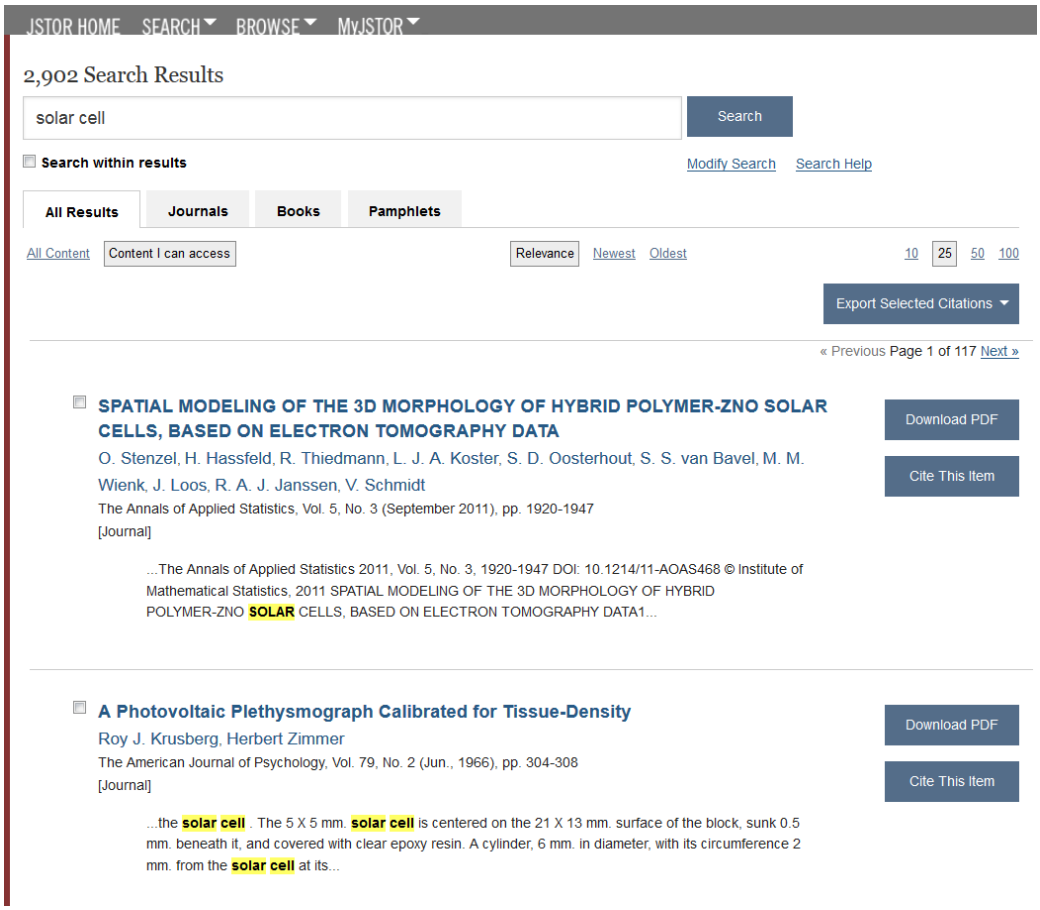

Figure 10. The list of articles on *solar cell* in JSTORE

There are several blogs on how researchers are getting to grip with the myriad of new tools. Many of the tools in our database of scholarly communication tools were created since 2013 [7].

6. KEYWORDS

When using either library catalogues or databases you need to pick your search terms carefully. Search engines and library databases are not intelligent and will match up words without considering their meaning. Selecting keywords – words or phrases that describe your topic as simply and distinctively as possible – can make searching much easier. Selecting keywords can be a straightforward process if the words describing your topic have a single meaning but more often you need to think carefully about the keywords you use to express your ideas.

7. EVALUATE WHAT YOU FIND

An important step in the search process is to evaluate the information you find.

When you start finding useful resources, you will want to keep a record of them. Be sure to record full bibliographic information: title, author, year of publication, journal title and volume number (if applicable). This is called a citation or reference. Keeping good records helps you to locate your resources at a later date.

The search of the literature is the cheapest way of carrying out a research. You have to keep in mind, which are those databases that need subscription and which are free of charge. More and more journal articles are open access so anyone can download them. Many articles are uploaded to repositories for instance such sites as MIDRA http://midra.uni- miskolc.hu/jadox/portal/#result_anchor

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All internet accesses are at 29th of February 2016.