

STEM Society Meeting, January 10, 2017

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1 About the STEM Society and the STEM Society Website

STEM is an abbreviation for Science, Technology, Engineering and Mathematics. The acronym STEM is commonly associated with K-12 education, but our use of the term is only slightly bound to this meaning. There are over one hundred people on the mailing list, although a much smaller group attends any one meeting. We meet on the second Tuesday of each month at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The meetings are open to all. The start time is 6PM. We make presentations, have discussions, and have demonstration experiments. These relate to Science,

the History of Science, Mathematics, Engineering, Philosophy and Technology at all levels. The topics have ranged from a technical discussion of the Mathematics of General Relativity to scientific experiments for young students.

These meeting notes contain links to many other documents, which may be viewed or downloaded by clicking the link. A partial list of documents can be reached by clicking the heading **Documents**. The meeting notes may also be viewed in an archive file (archive.pdf), which is in the list of documents. Many of the documents are PDF files. They may be viewed or downloaded to the computer by clicking, provided Adobe Reader, or another program capable of reading PDF files, is present. There are many more documents available at the site than are listed under **Documents** because the documents.htm file is not at all up to date. The last time I checked, about March 2014, there were about 350 document files on the site. We are in the process of creating better techniques for finding documents and authors. The first meeting of the STEM Society was in November of 2006. For several years we used the content management program called Joomla. It had a fancy looking interface, but was hard to use. It overran the space somehow at our internet provider Bluehost. So we now have a very simple HTML site. It is not so slick looking as Joomla, but is very easy to maintain and modify.

The web site is:

<http://www.stem2.org/>

Direct to the documents list:

<http://www.stem2.org/je/documents.htm>

Direct to the archive file:

<http://www.stem2.org/je/archive.pdf>

2 The January 10, 2017 Meeting Announcement

The January meeting of the STEM Society will take place on the second Tuesday of the month, January 10, 2017, at the Trailside Center at 99th and

Holmes in Kansas City, Missouri. The starting time is 6PM. Also look at our website for past meeting notes:

The web site is:

<http://www.stem2.org/>

Possible Topics and Discussions:

(a) Jim Emery can talk about techniques and programs for searching our website for documents including meeting notes. He will also talk about techniques in Python for transforming the bytes of a file, which are used in searching and displaying results.

(b) Jim Emery has been asked to review the use of Lagrange multipliers in constrained optimization, and also to review the calculation of real and complex integrals using the techniques of contour integration.

(c) Jim Emery can talk about writing and producing a book called "Computational Mathematics," using LaTeX, and creating software for making an index and techniques for creating figures. And he can also talk about creating a bound paperback book using the Espresso book machine located at the Woodneath Branch of the Mid-Continent public library, as well as getting books printed cheaply through Amazon.

(d) Ken Schimtz will discuss the following:

"In the December 25 2016 issue of Parade Magazine (Sunday Paper) was a 30 year anniversary to Marilyn vos Savant column Ask Marilyn. It is was a revival of the Monty Hall Problem which gained fame when she received over 10,000 letters saying she was wrong 1000 of them from mathematicians. I would like to give this problem and solution to the group the next time STEM meets."

(e) As always, attendees are free to bring, and should bring additional topics, things, ideas, and presentations, which, subject to time constraints, can be presented. You should let me know at the meeting if you have material to present.

3 James Emery: Finding Documents on Our Website

To search stem2 documents, go to the website stem2.org, Then click the tag called *Stem2 Documents*. Depending on your browser the stemdocs.txt file will be displayed on your browser page. You page down searching for files and descriptions or perhaps do a search on a string. Once you have found a file you want, say **beryllium.pdf** you can copy it and paste it to the address line of your browser, and so perhaps getting

`http://www.stem2.org/je/beryllium.pdf,`

on the browser address line. Then we type return to display the file.

To download the entire stemdocs.txt file to your computer, from the file menu of your browser select **save page as** . Once you have the file downloaded you can search it at your leisure and find say pdf files to download from the site.

My software can be used to search stemdocs.txt on your computer to do a multiple keyword search. To do this search you use the program called *stemdocs.bat* on a pc, or *stemdocs.sh* on Linux, Unix or macOS. This batch file or shell program uses the unix program called *grep*, which is a program for searching lines of a file for lines that contain words or strings. You can get information on how this works from books on Unix or from the internet. So the PC batch file for doing this search is called **stemdocs.bat**. If there is interest in this I can put together a zip file containing the necessary programs and instructions for installation. Here is a listing stemdocs.bat:

```
@echo off
rem stemdocs.bat, Version 8/2/14, by Jim Emery
rem lists those lines in file \txt\stemdocs.txt containing specified words
if "%1"==" " goto help
grep -i %1 c:\txt\stemdocs.txt > \tmp\tmp1.txt
copy \tmp\tmp1.txt \tmp\tmp2.txt
:search
shift
if "%1"==" " goto list
grep -i %1 \tmp\tmp2.txt > \tmp\tmp1.txt
copy \tmp\tmp1.txt \tmp\tmp2.txt
goto search
:list
semi2nl \tmp\tmp1.txt \tmp\tmp2.txt
type \tmp\tmp2.txt | more
```

```

goto end
:help
echo stemdocs.bat, by jim emery, Version 8/2/2014
echo Lists file names, and titles, for documents on the stem society website: stem2.org
echo Prints lines in the file \txt\stemdocs.txt that contain key strings
echo Uses the text data file called stemdocs.txt
echo Usage: stemdocs string1 string2 string3 ...
:end

```

For example we can do a search looking for the "words tom grant indians" typing the search command:

```
stemdocs tom grant indians
```

and getting:

```

stemsoc071216.pdf
James Emery: Some Mathematics
James Emery: Book Review, "Visions of Technology," by Richard Rhodes Editor, 1999
James Emery: Book Review, "The Bourbaki Gambit," by Carl Djerassi, 1994
Future Talk on Thermodynamics
James Emery: Kansas City Maker Faire 2016
James Emery: The Johnson County Maker Space
Rich Kaufman: CRISPR
Tom Grant: The Vanishing of the Anasazi Indians
John Gamble, Theta Functions
References

```

The Unix script file for Mac or Linux is:

```

#stemdocs.sh modified 9/14/2014
if [ $# -eq 0 ]
then
echo Lists file names, and titles, for documents on the stem society website: stem2.org
echo Prints lines in the file \txt\stemdocs.txt that contain key strings
echo Usage: stemdocs string1 string2 string3 ...
exit
fi
cp ~/txt/stemdocs.txt tmp1
while [ $# -gt 1 ]
do
grep -i $1 tmp1 > tmp2
cp tmp2 tmp1
shift
done
perl ~\bin\split1.pl < tmp1 > tmp2
cat tmp2 | more

```

We also talked about how multiple lines in stemdocs.txt are compressed into a single line for location with grep. This is done by having multiple lines in a block to be found with grep being encoded with a semicolon signaling a newline, and then when a block line is found it is expanded back to multiple

lines using a C program called *semi2nl.c* in the case of the PC, and using a program Perl program **split1.pl** in the case of the Unix script.

Also I wrote a program called *semi2nl.py* for doing this task with Python.

These programs of course run on the command line. Understanding how these programs work might prove educational.

Here is a listing of the program *semi2nl.py*:

```
#semi2nl.py replace semicolons with newline 12/29/16
import sys
#print sys.argv
#print sys.argv[0]
na=len(sys.argv)
#print "number of arguments",na
if( na < 3):
    print "semi2nl.py, read a text input file, and write each character"
    print " to an output file, while converting each semicolon to a newline"
    print " Usage: python semi2nl.py infile outfile"
    sys.exit(0)
#f1 = open("aa.txt", "rb")
#f2 = open("bb.txt", "wb")
f1=open(sys.argv[1],"rb")
f2=open(sys.argv[2],"wb")
c13=chr(13)
c10=chr(10)
try:
    byte = f1.read(1)
#    print " byte= ",byte," ",ord(byte)
    while str(byte) != "":
#        print " byte= ",byte," ",ord(byte)
        if(ord(byte) != 59):
            f2.write(byte)
        else:
#            g.write('\n')
            f2.write(c13)
            f2.write(c10)
            byte = f1.read(1)
finally:
```

```
f1.close()
f2.close()
```

4 James Emery: Creating an Index for a Book in LaTeX

Latex has a built in procedure for generating preliminary information for an index. To do this we put a command at the top of the latex file

```
\makeindex.
```

Then at each location where an index item is to appear one places a command, for example

```
\index{hilbert space},
```

so that an index item and page number is generated for the word "hilbert," on whatever page it occurs during the latex typesetting process. I then have written software to sort the resulting file, then to make it into an appropriate double volume Latex document to be included into the original document using a LaTeX input statement in that document. I went through how this is done.

5 James Emery: Contour Integration and the Computation of Real Integrals

We handwaved through the process of computing real integrals using complex contour integration computed by evaluating residues.

stem2.org/je/complex.pdf

6 Ken Schmidt: Monty Hall Probability Problem

Ken Schmidt presented several aspect of this problem.

See

<http://marilynvossavant.com/game-show-problem/>