

STEM Society Meeting, August 9, 2016

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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 August 9, 2016 Meeting Announcement

The August meeting of the STEM Society will take place on the second Tuesday of the month, August 9, 2016, 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) A review of some Physics and Engineering.
- (b) Topics in computing: Installing Python on the Trailside computer, using Python for Engineering and Physics problem solving, using Maple and Mupad, the Raspberry Pi and Linux, the secure shell SSH and secure FTP, Putty and such.
- (c) Electronics from the new addition of "Make: Electronics," by Charles Platt.
- (d) Molecular Biology: CRISPR, Clustered Regularly Interspaced Short Palindromic Repeats.
- (e) Book Reviews.
- (f) As always, attendees are free to bring, and should bring additional topics, things, ideas, and presentations. We need more presentations from our very diverse and experienced fellowship.

3 Using Python

Below is given the first few sections from my document called **Scientific Programming in Python**. This document is available as:

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

You might find this useful, but you will probably also need to consult various tutorials and books.

The First Few Sections of python.pdf:

There are not many choices in choosing a good programming language for presenting Scientific Programming and Computing. Fortran was created for Scientific Programming, a long long time ago, and I still use it. The first compiler was written for Fortran. Fortran has been modernized many times, while keeping the language somewhat compatible with earlier versions. But the latest version might be a bit hard (or expensive) to come by for personal computers. It is still widely used in science and engineering and for programming supercomputers.

Guido van Rossum (born 31 January[5] 1956), is a Dutch programmer who is the author of the Python programming language.

In teaching a class on Scientific Programming I chose to use Python. It is an interpreted language rather than a compiled language, so programs are not stand alone, but require an interpreter. Interpreters seem to change rapidly, so that running a program at a later date might require an interpreter that no longer exists. There are a lot of things I like about the language, and a few that I don't like at all. I detest using tab characters for alignment because they are invisible. Version 2 and version 3 are incompatible. This is very irritating. Still I chose Python. Python is built into the operating system for many computers, Unix computers and Macintosh. This document was written for version 2.6 of Python. Scientific Computing should be done using the command line. Graphical User Interfaces are invaluable for many computing tasks, but I think it is a giant mistake to make them the primary computer interface. Among other things, it makes computer users computer stupid.

So Scientific Computing should be done on a system with a command line interface. Thus perhaps a good choice for learning Scientific Programming and Python is to use the Raspberry Pi, which was constructed to be a cheap computer, and a computer for teaching science and giving an understanding of computing itself. It had in mind especially young people, and those with not yet dead brains in general.

Writing user manuals for computer languages and applications is quite difficult and tedious, so one might have to consult many books and guides to get complete detailed coverage. However, by learning a few of the major facts, you can get quite far. The best way to learn is to try out example programs, and make some changes to see what happens.

This is probably not a good technique for learning medicine.

3.1 Installing and Running Python

Versions of Python can be downloaded for free for Windows system. On many other computers Python is natively installed. I recommend getting either version 2.6 or 2.7, rather than one of the 3 versions. Versions 2 and 3 have some incompatibilities, including the fact that some of the modules have not been updated to version 3, but I don't really have much knowledge about the incompatibilities.

3.2 Hints for Installing Python 2.6 on a Windows XP System

See my document **Python Programming**, `python.tex`, `python.pdf`. On my main machine, the installation file called `python-e2.6.4.msi`, is contained in directory

```
C:\scitools\python2.6.4
```

This directory also contains a documentation file:

```
Volume in drive C has no label.
Volume Serial Number is 8C1E-DA95

Directory of C:\scitools\python2.6.4

05/14/2016  08:41 AM  <DIR>          .
05/14/2016  08:41 AM  <DIR>          ..
05/14/2016  08:41 AM                0 out5
01/20/2010  02:51 PM                16 outzzz1
01/20/2010  02:51 PM                20 outzzz2
12/11/2009  11:27 PM          9,092,317 python-2.6.4-docs-pdf-letter.zip
12/11/2009  11:34 PM      14,890,496 python-2.6.4.msi
              5 File(s)      23,982,849 bytes
              2 Dir(s)  27,915,841,536 bytes free
```

To install type the file name python-2.6.4.msi, which creates a directory called python26 containing the executable file, and which was a version older than the version 3.0, which has the latest version then, but which was at that time somewhat incompatible with older 2 versions of python?

After Python version 26 is installed on Windows, add directory **python26** to the path variable for one session using

```
set path=%path%;C:\python26
```

To add this to the path permanently, modify the path variable in the windows control panel. For some of the computers listed below we do not have administrative permissions, so we must use the one session method. You can put this set path ..., in a batch or script file to avoid too much typing.

3.3 Hints for Installing and Running Python on the Windows 7 Machine at the Trailside Center

First to get a command line prompt, go to the box at the bottom of the start menu and type in it

```
cmd.exe
```

Sometimes "command prompt" appears in the list of Accessories, after you click "all programs." Some times you can find "command prompt" using Windows help. On this computer add the directory containing "python.exe" with the command

```
set path = %path%; c:\program files\python35-32\
```

To see if this has been accomplished type **path** at the command line.

Version 3 of Python differs from versions 2. One difference that must be changed is that the print statement in version 2 has for an example the form:

```
print " a = ", a
```

Which may produce an error in version 3, which must have parentheses around the things to be printed:

```
print( " a = ", a)
```

3.4 Hints for Running Python on a Windows 10 Machine at the Johnson County Maker Space

Python 2.7 occurs on the list of APS. Clicking this opens a Python Shell where you can do Python interactively. To use an editor to write a python program on a file, click Idle. A python shell opens. Choose new in the file menu. Write your program. Run it by selecting "run module." If your program uses command line parameters, you might want to run it from a DOS or Windows command prompt. To get a windows command prompt, scroll down the list of APS to the bottom, finding **Windows Sys**. Click to little arrow to find an icon for the command prompt. Create, for convenience, a directory from the root directory of c: called py to work in. Type python and you should see the python command prompt, but you won't see it, because on this machine the python program is in a directory called

```
c:\python27
```

and this directory is not in the **path**. To correct this do the following to add the python27 directory to the path (This is not permanent):

```
set path=%path%;c:\python27
```

3.5 Hints for Running Python on a Macintosh OS10 System

Python is already installed. You run it from the command line. To get a command prompt click **GO** from the top of the screen, then click **utilities**, then click **terminal**. If you have a python program, say **myprogam.py**, then at the command line type

```
python myprogram.py
```

To run interactively just type **python**. To test it, type **a=2**, then type **b=a+a**, then type **b**. You should get 4. To end python type **quit()**.

3.6 Some Differences Between Python 2 and Python 3

We present commnds that are different:

Print Statement differences:

In 2:

```
print ' x= ', x
```

In 3:

```
print(' x=', x)
```

Division of Integers Differences:

In 2:

```
m=27
n=42
# k=m/n produces k=0
```

In 3:

```
m=27
n=42
\\ k=m/n produces k = 0.6428571429,
\\use // for integer division, when you want an integer 0 for an answer
```

3.7 Running Python 3 on the Command Line of the Raspberry Pi

Both version 2 and version 3 of Python are installed on the Raspberry Pi. At the command line type python to start version 2, and type python3 to start version 3. This may be valid for all Debian versions of Linux.

4 Using Maple and Mupad

We also covered Maple and Mupad briefly. I do have some documents on these topics, but I have used these programs on several different computers,

originally on mainframes and UNIX workstations, and other older computers as well as PCs. So the documents I refer to might be a bit confusing. Also the versions I use now are quite old: Maple version 6, and Mupad light. I should do some editing of this material because it does have historical interest. Current versions of these programs are much too expensive for me. There are many many books on Maple, and MuPad is now the official symbolic computer language for Matlab, which is another very expensive program. But Octave is nearly a clone and is open source.

5 Book Review: *Conquering Gotham*, by Jill Jonnes

Jonnes Jill, **Conquering Gotham, A Gilded Age Epic: The Construction of Penn Station and Its Tunnels**, 2007, Viking. I did not give a complete review, but only presented the following:

The original Penn Station was constructed between 1901 and 1910. It was built on the west side of manhattan destroying part of the **Tenderloin District**, which was a famous area of vice, prostitution and crime. New York Police Department Captain Alexander S. "Clubber" Williams gave the Tenderloin area its nickname in 1876, when he was transferred to a police precinct in the heart of this district. Referring to the increased number of bribes he would receive for police protection of both legitimate and illegitimate businesses there, especially the many brothels, Williams said, "I've been having chuck steak ever since I've been on the force, and now I'm going to have a bit of tenderloin."

Several american cities have a "vice" area, what they call their "Tenderloin District." One such city is San Francisco. It is interesting that it all came from Clubber Williams, and his taste for steak.

The book is historically very interesting, although it is mostly about people, rather than about the interesting technology, of railroads, tunnels, bridges, and the infrastructure of cities.