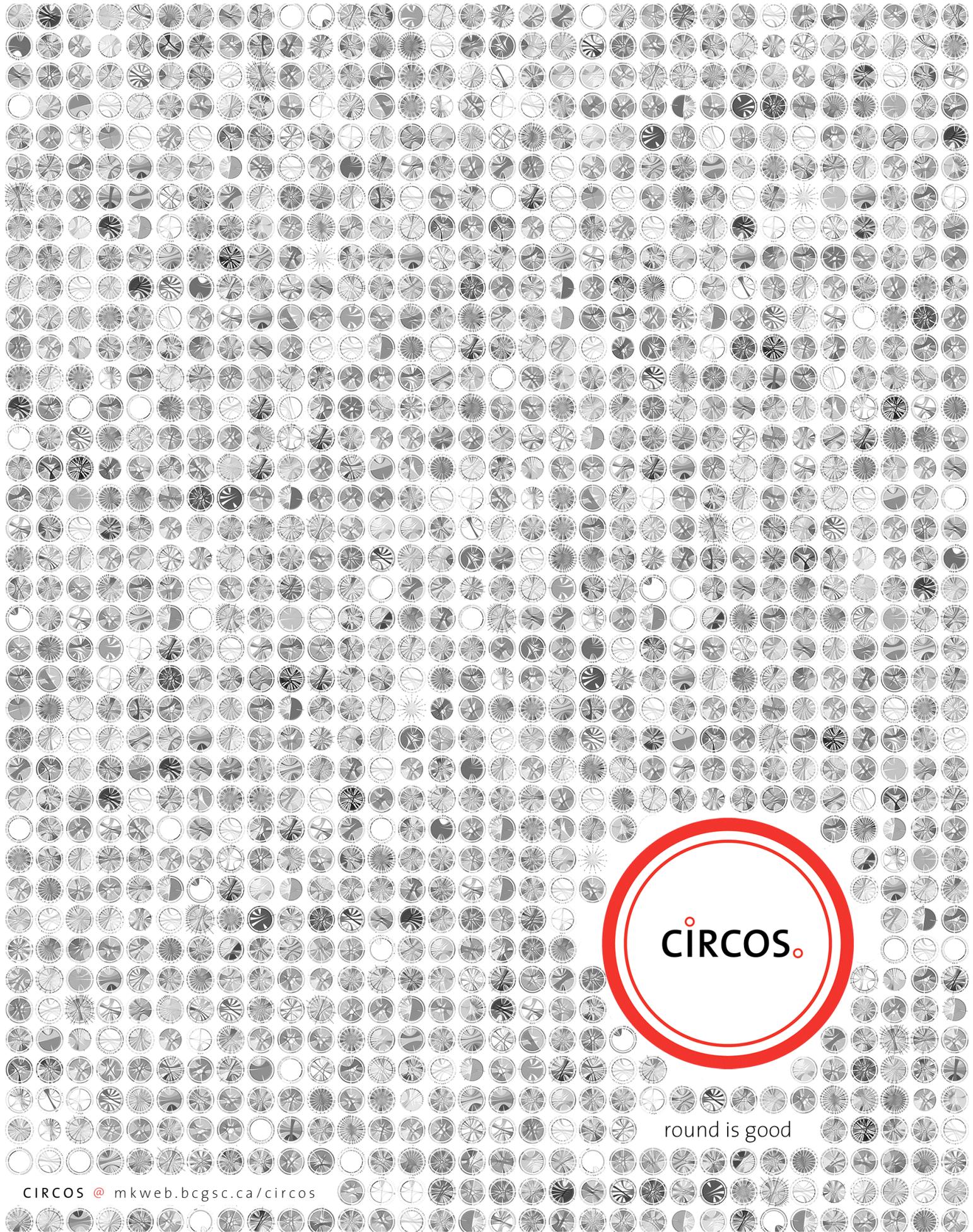**Version History**
v0.15 12 Jul 2010
v0.14 30 Jun 2010
v0.13 30 Jun 2010
v0.12 29 Jun 2010
v0.11 29 Jun 2010
v0.10 15 Jun 2010

CIRCOS.

round is good

CIRCOS @ mkweb.bcgsc.ca/circos

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Purpose of Practical Sessions

During the practical sessions you will have an opportunity to work with Circos. Each session will cover a different aspect of Circos.

Session 1 will show you how to draw ideograms, and adjust their spacing, size, order and scale. In Session 2 you will add data tracks, including histograms, heat maps and links. In Session 3 you will see some advanced features, including bundling multiple links into a single, larger link and using dynamic rules to change the way data is displayed.

Each session is divided into multiple lessons. Each lesson is a self-contained example during which you can explore specific aspects of the configuration file. Lessons build on one another – usually the configuration file of the previous lesson is used as a template for the next lesson.

Session Files

Session files are found in your home directory under `circos/`

```
circos/
  sessions/
    1/        Session 1 – Examples from the lecture (9h00-10h30)
      1/          Lesson 1
      2/          Lesson 2
    ...
    2/        Session 2 – First practical session (11h00-12h30)
      1/      Lesson 1
      2/          Lesson 2
    ...
    3/        Session 3 – Second practical session (14h30-16.00h)
      1/          Lesson 1
      2/          Lesson 2
    ...
    4/        Session 4 – Third practical session (16h30-18h00)
      1/          Lesson 1
      2/          Lesson 2
    ...
```

During each session, you will be working entirely within the corresponding session directory. For example, for Session 2, you will be working from `circos/sessions/2`.

```
[user@workstation ~] cd circos/sessions/2
[user@workstation circos/sessions/2] ls
1  10  11  12 2  3  4  5  6  7  8  9
[user@workstation circos/sessions/2] cd 1
[user@workstation circos/sessions/2/1] ls
data   etc   s2-1.png

# you are now ready to proceed with Session 2 Lesson 1

# once you are done with Lesson 1, move to lesson 2
[user@workstation circos/sessions/2/1] cd ../2

# you are now ready to proceed with Session 2 Lesson 1
```

Within each lesson, you will see a etc/ directory. In this directory you will find one or more configuration files that are used to generate images for the lesson. A lesson will always have an etc/circos.conf file and it is this file that is used directly by Circos. Depending on the contents of this file, contents of other files may be imported.

Configuration files that are shared by all lessons in a session are found in circos/sessions/SESSION_NUMBER/etc. Examples of this are track data.

Configuration files that are shared by all sessions are found in circos/sessions/etc. Examples of this are color definitions.

Lesson Structure

The structure of each lesson will be the same. Files for lessons are independent – what you did in the previous lesson does not affect the configuration file of the next lesson.

When we start the practical sessions, I will ask you to navigate to the lesson directory (see above). Next, you'll load the relevant configuration file for that lesson into a text editor (e.g. emacs, vim). Typically this will be etc/circos.conf but sometimes we'll be working with etc/ideogram.conf or etc/ticks.conf. It will be easier if you can have each file open in a separate editor buffer, or window.

Once you have the file loaded in your editor, I will discuss parts of the file that are relevant to the lesson. You'll notice that there will be parts of the file that are commented out (lines prefixed with #). As we proceed through the lesson, I'll ask you to uncomment these lines (and possibly comment others, see below) to see how the change affects the image.

Whenever a change to the configuration file will be made, I will ask you to run Circos to generate a new image based on the changed configuration (see below). You can examine the image using *gThumb Image Viewer*, available from *Applications > Graphics* menu. You can also use Firefox to view the images, available from *Applications > Internet* menu.

If we don't have time to cover all the lessons for a session, I encourage you to finish the lessons on your own.

Editing Configuration Files

Let's use Session 2 Lesson 5 as an example of the kind of configuration file editing you will be required to perform. The etc/circos.conf configuration file for this lesson starts off as

```
<<include ideogram.conf>>
<<include ticks.conf>>

<image>
file = s2-5.png
<<include ../etc/image.conf>>
</image>

karyotype = ../data/karyotype.txt

chromosomes_units           = 1000000
chromosomes_display_default = yes

# explicitly define order
#chromosomes_order = chr1,chr2,chr5,chr4,chr3

# relative order
#chromosomes_order = chr3,chr5

# relative order
# chromosomes_order = chr1,chr4,-,chr3,chr5

<<include ../etc/housekeeping.conf>>
```

Notice the lines that are commented (they won't necessarily appear blue in your editor). If I ask that you uncomment the first `chromosomes_order` line, you'll need to remove the leading #.

```
# explicitly define order
chromosomes_order = chr1,chr2,chr5,chr4,chr3
```

If I ask you to uncomment the second `chromosomes_order` line, you'll need to remove the leading # of the second instance of `chromosomes_order`.

REMEMBER: Comment out any instance of `chromosomes_order` definitions.

```
# explicitly define order
#chromosomes_order = chr1,chr2,chr5,chr4,chr3

# relative order
chromosomes_order = chr3,chr5
```

By including in the file configuration items that we will be using, I've tried to help you avoid errors due to malformed configuration. If you get an error while running Circos (see below), make sure that you have not inadvertently added spurious content to the file.

It is also critical to avoid duplicate definitions of parameters. Each parameter (e.g. `chromosomes_order`) must not be defined more than once. Therefore, when uncommenting lines, make sure to comment out the previous instance of the parameter.

Running Circos

Circos is installed in `/usr/shared/circos-0.52`. The circos executable is in your `PATH`, which includes `/usr/shared/circos-0.52/bin`. To create an image during a lesson, execute the circos binary and use the `–conf` flag to specify the input configuration file.

```
# generate image for Session 2 Lesson 1
[user@workstation circos/sessions/2/1] circos –conf etc/circos.conf
...
created image at ./s2-1.png
# your image is ready!
[user@workstation circos/sessions/2/1]
```

A local configuration file sets up an alias to save you from having to always enter the long command (`circos -conf etc/circos.conf`) you can create an alias as a shortcut.

```
> cd ~/circos/sessions
[user@workstation circos/sessions/2/1]
> . setup.pasteur.sh
Setting up environment for BCGA2010 course.

# an alias is available to you now
> cd ~/circos/sessions/2/1
[user@workstation circos/sessions/2/1] runcircos
...
created image at ./s2-1.png
# your image is ready!
```

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