

ROOT tutorial

— part III —

1st April 2015

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ROOT tutorial: goals

- * how to install it ✓
- * how to find/read documentation ✓
- * perform an interactive analysis with ROOT ✗
- * design and write own analysis macros ✗
- * how to store results of your analysis ✗

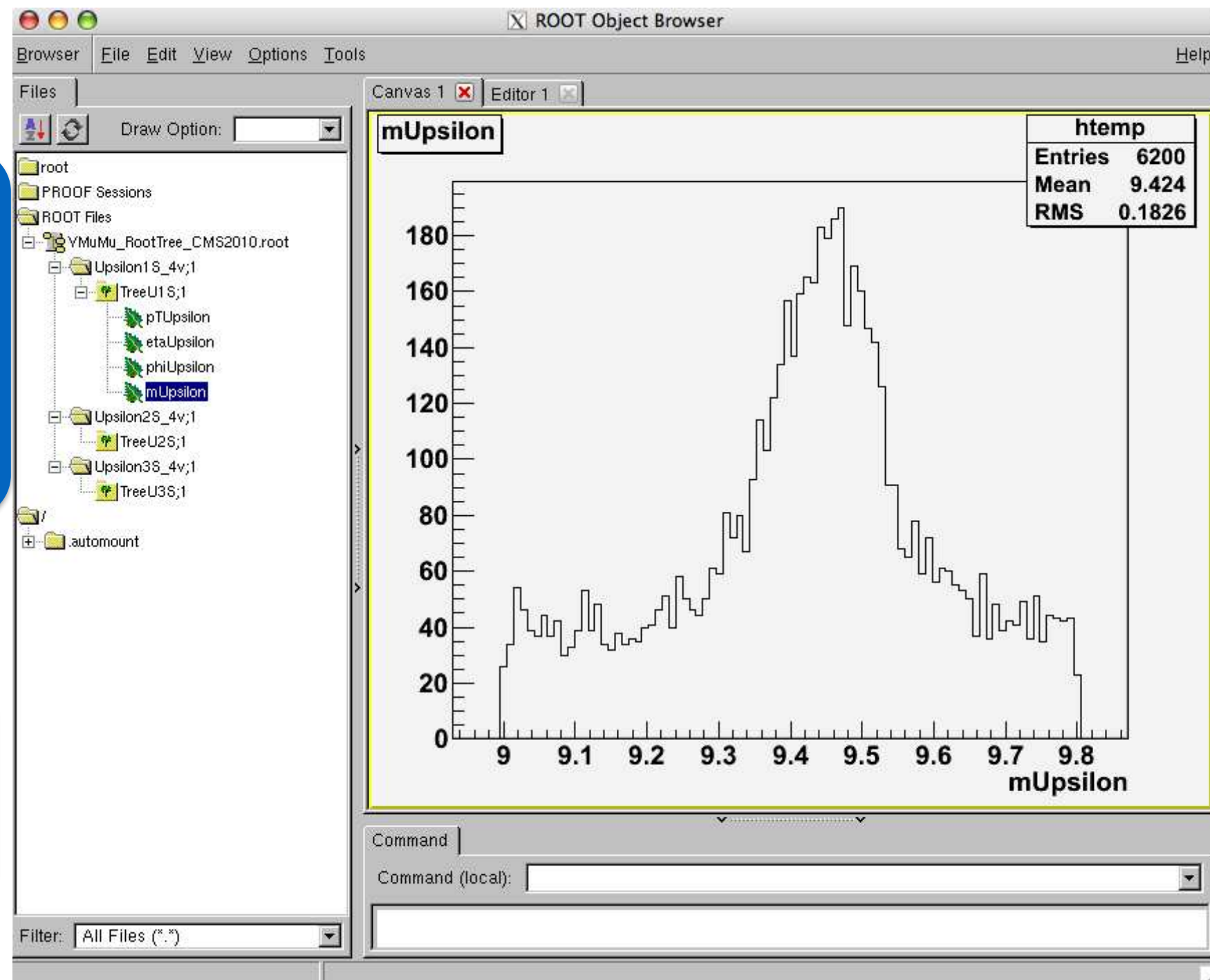
ROOT tutorial: interactive analysis

in a root file:

- **more root trees** can be saved (you can have your own forest 😊)
- a root tree can have more **branches**
- if you insist you can add also leaves

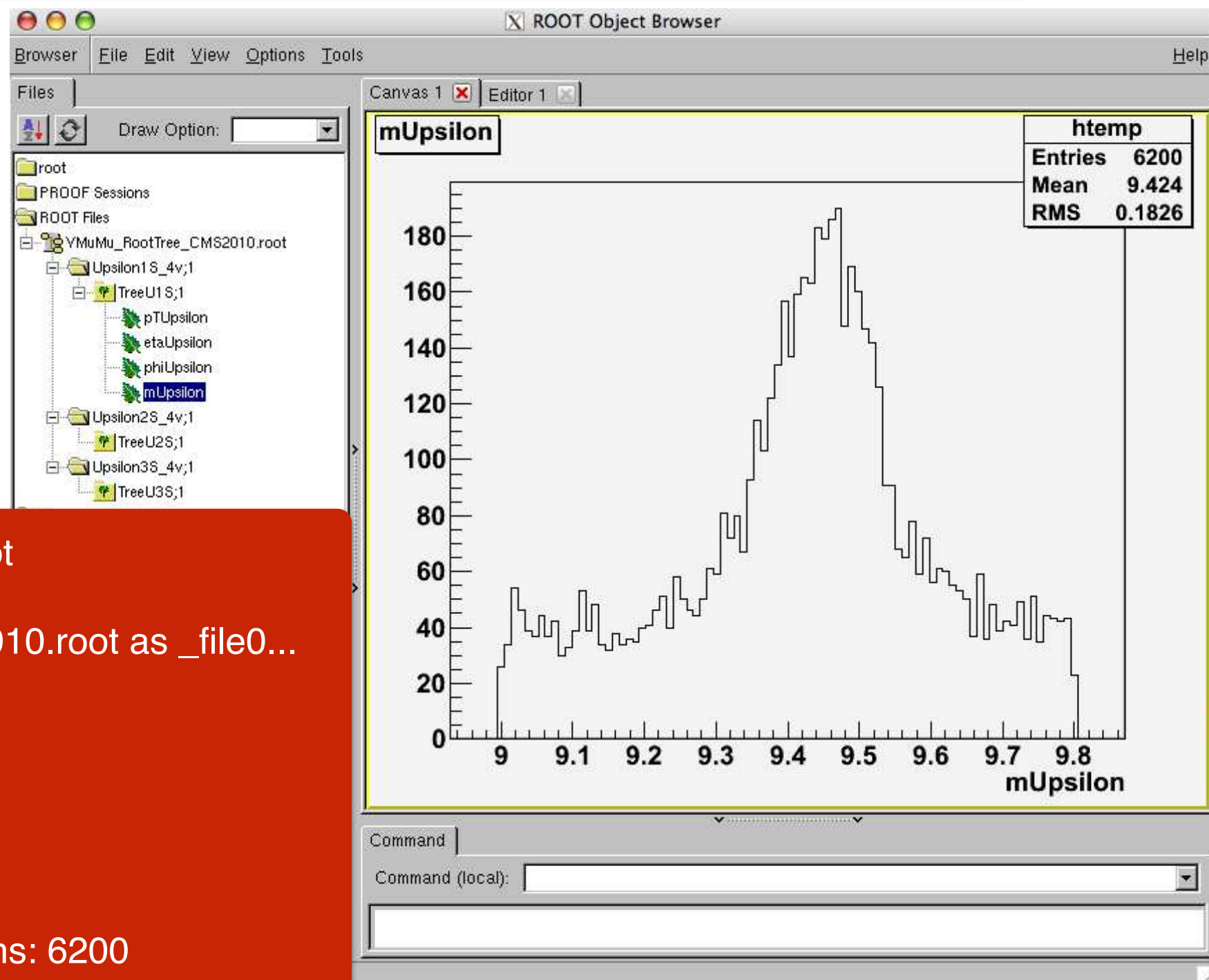
goal:

- **visualise effect of various cuts on the analysis**



**example of an invariant
mass distribution**

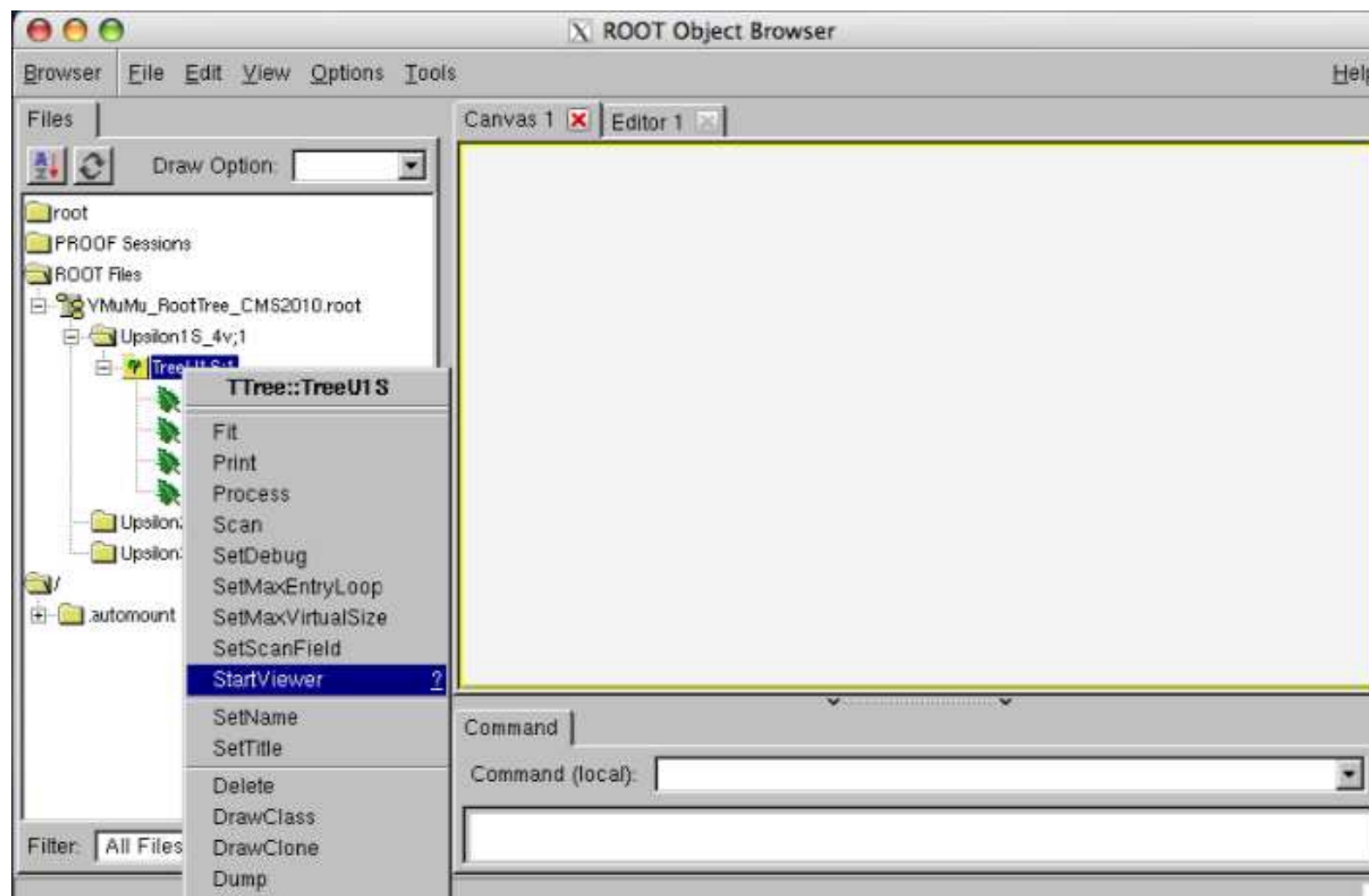
ROOT tutorial: open root file and navigate to the root tree



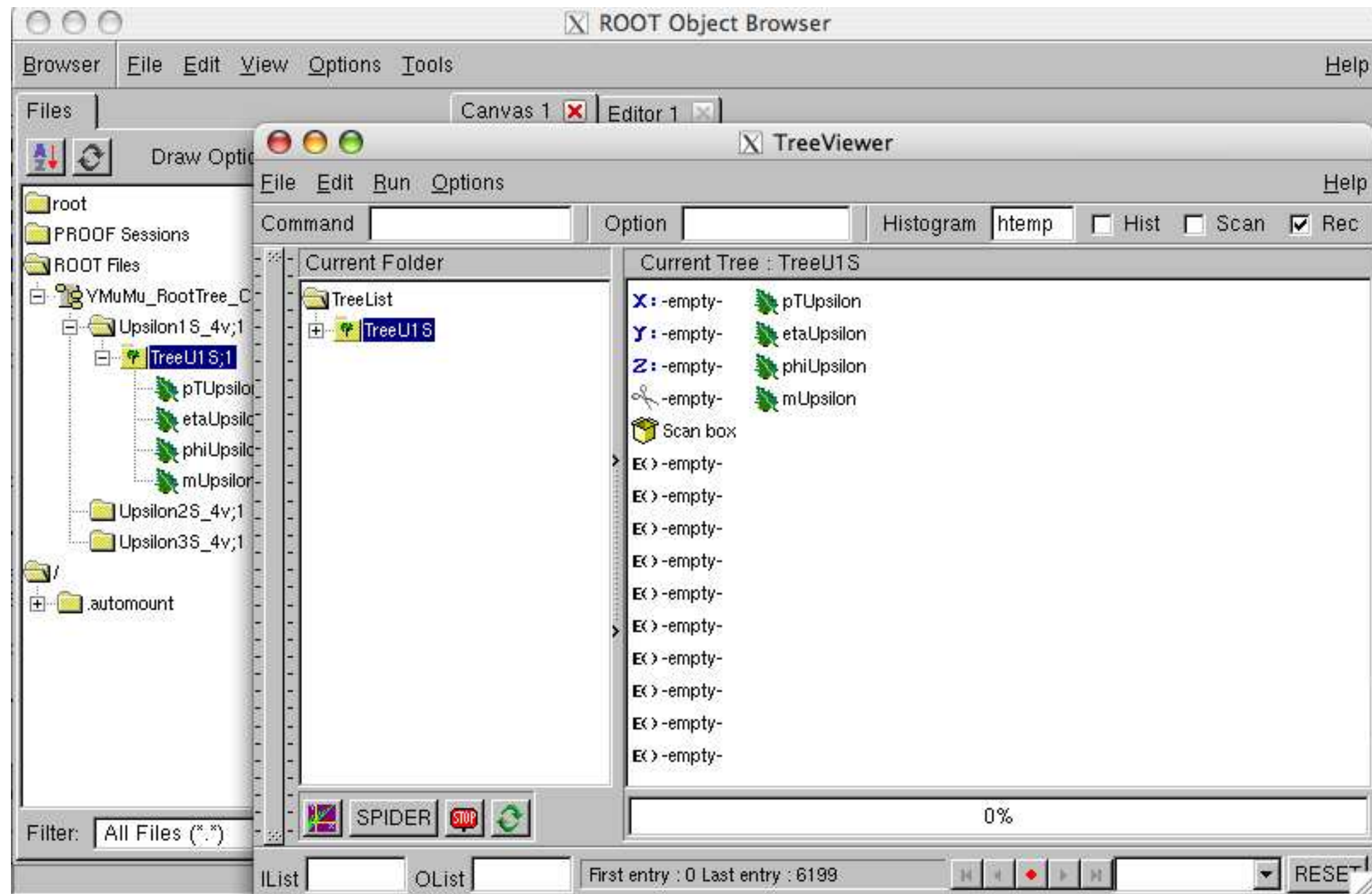
```
> root -l YMuMu RootTree CMS2010.root
root [0]
Attaching file YMuMu_RootTree_CMS2010.root as _file0...
root [1] TBrowser t
root [2]
% navigate to the Upsilon1S tree
% double click on it
% double click on "mUpsilon"
% notice:
— the number of entries in the histograms: 6200
— background level ~ 40 entries
— signal & background (peak) level ~190 entries
— signal width ~ 0.2 GeV
```


ROOT tutorial: open the tree viewer

% right-click on the selected tree & select “StartViewer”

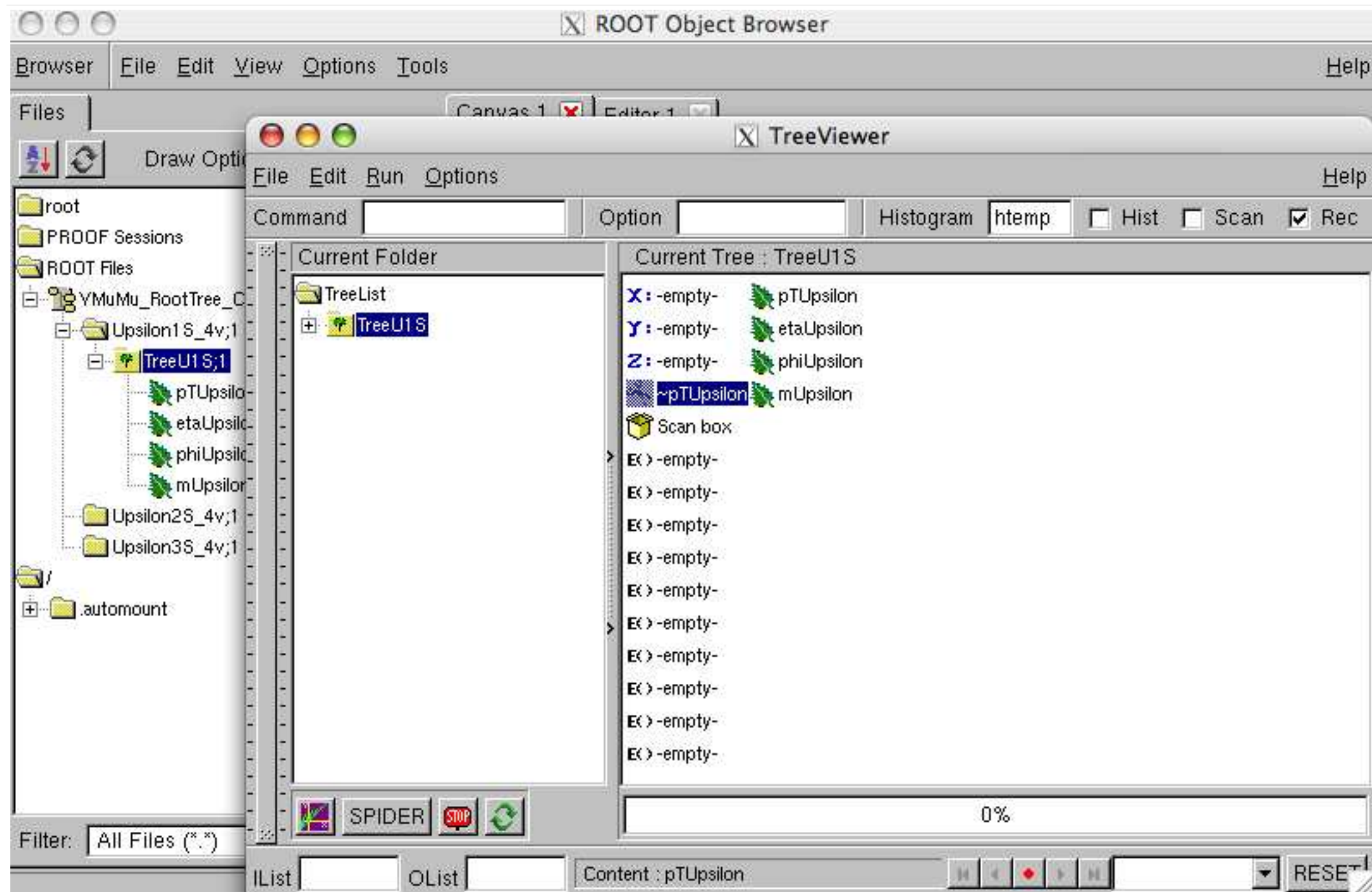


ROOT tutorial: how a TreeViewer looks like



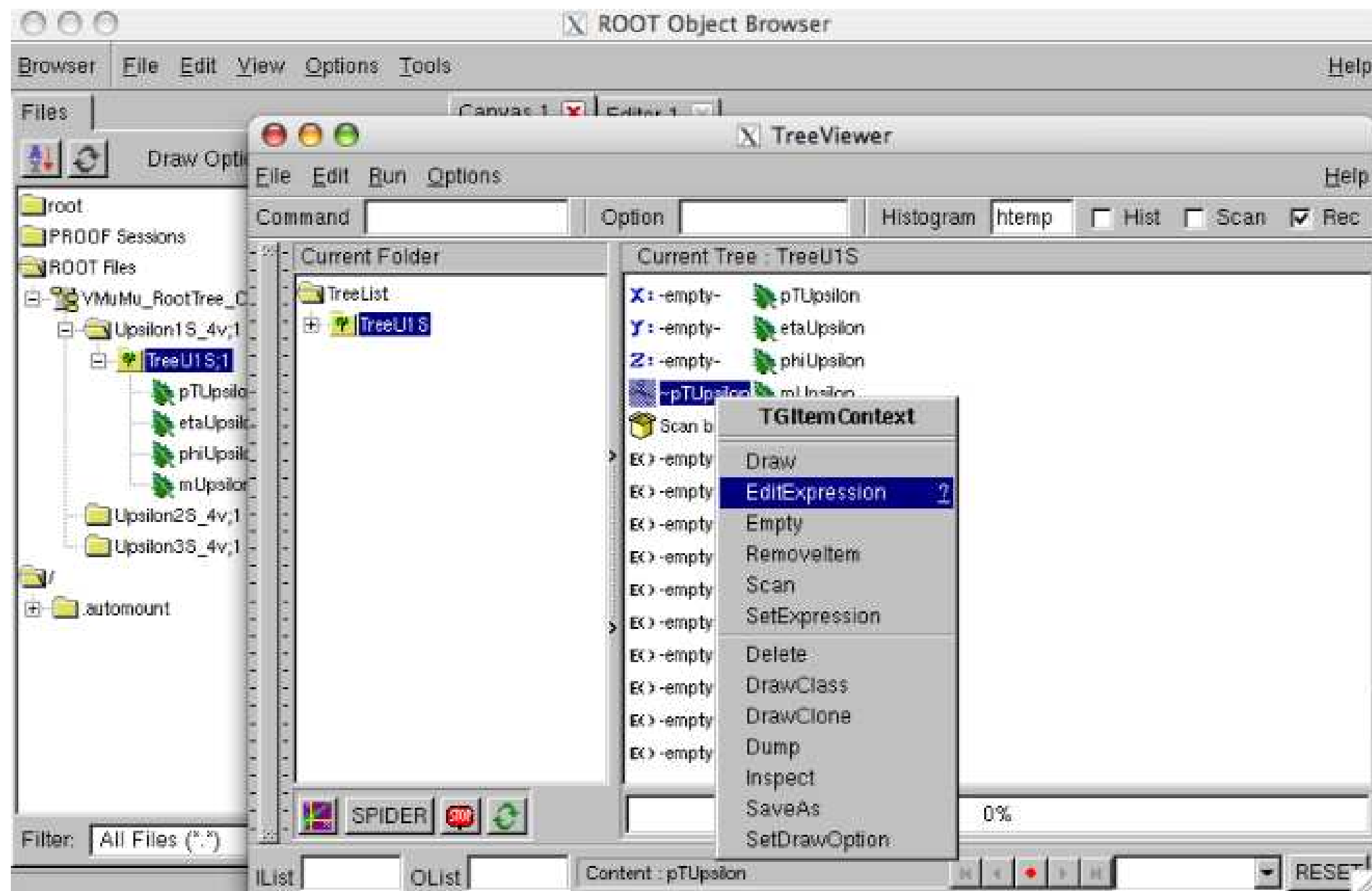
ROOT tutorial: let's cut on pT

% drag the pTUpsilon on the scissor



ROOT tutorial: let's cut on pT

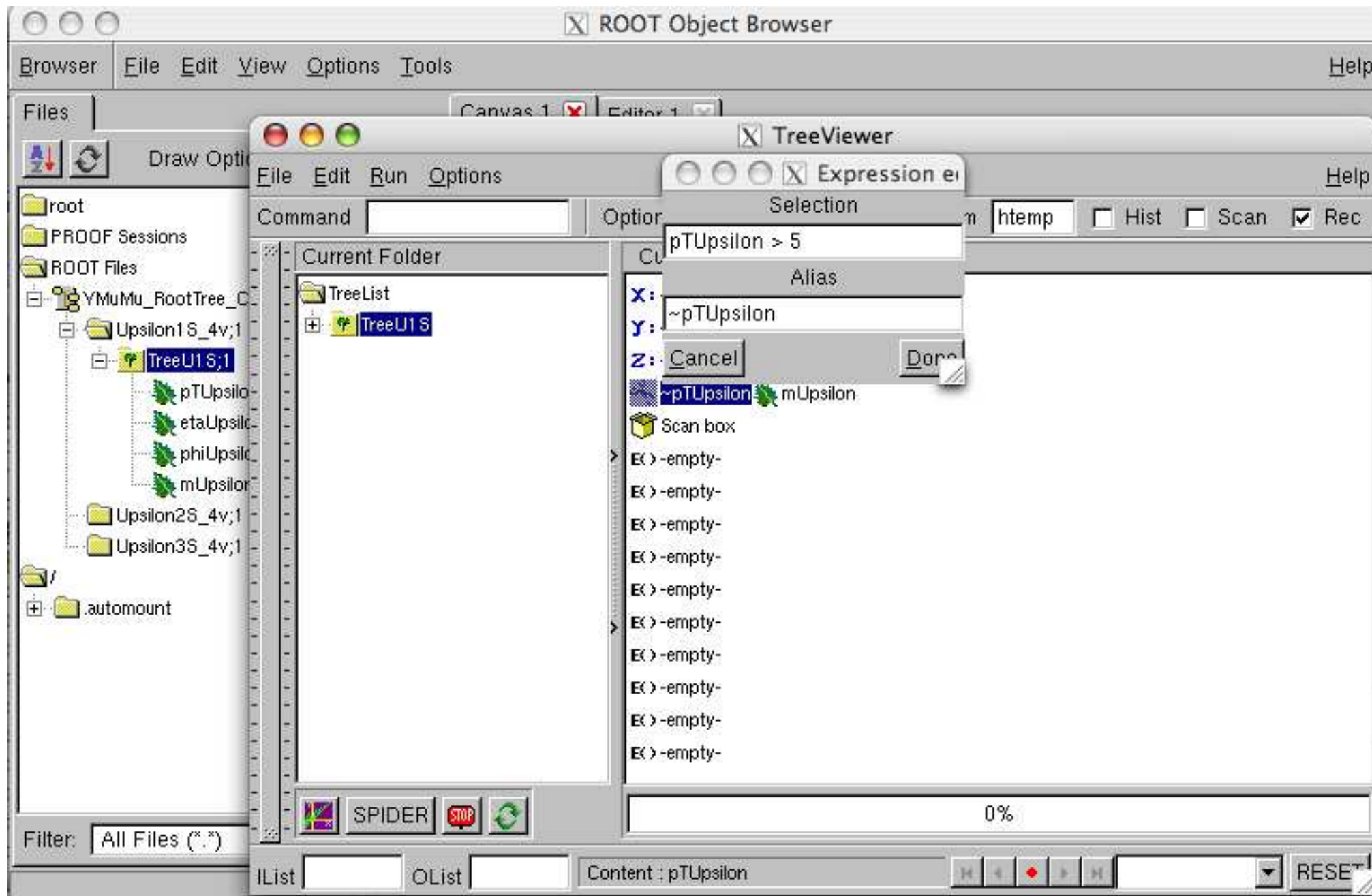
% right-click on scissor and choose to “EditExpression”



ROOT tutorial:

now we can set the value of the pT cut

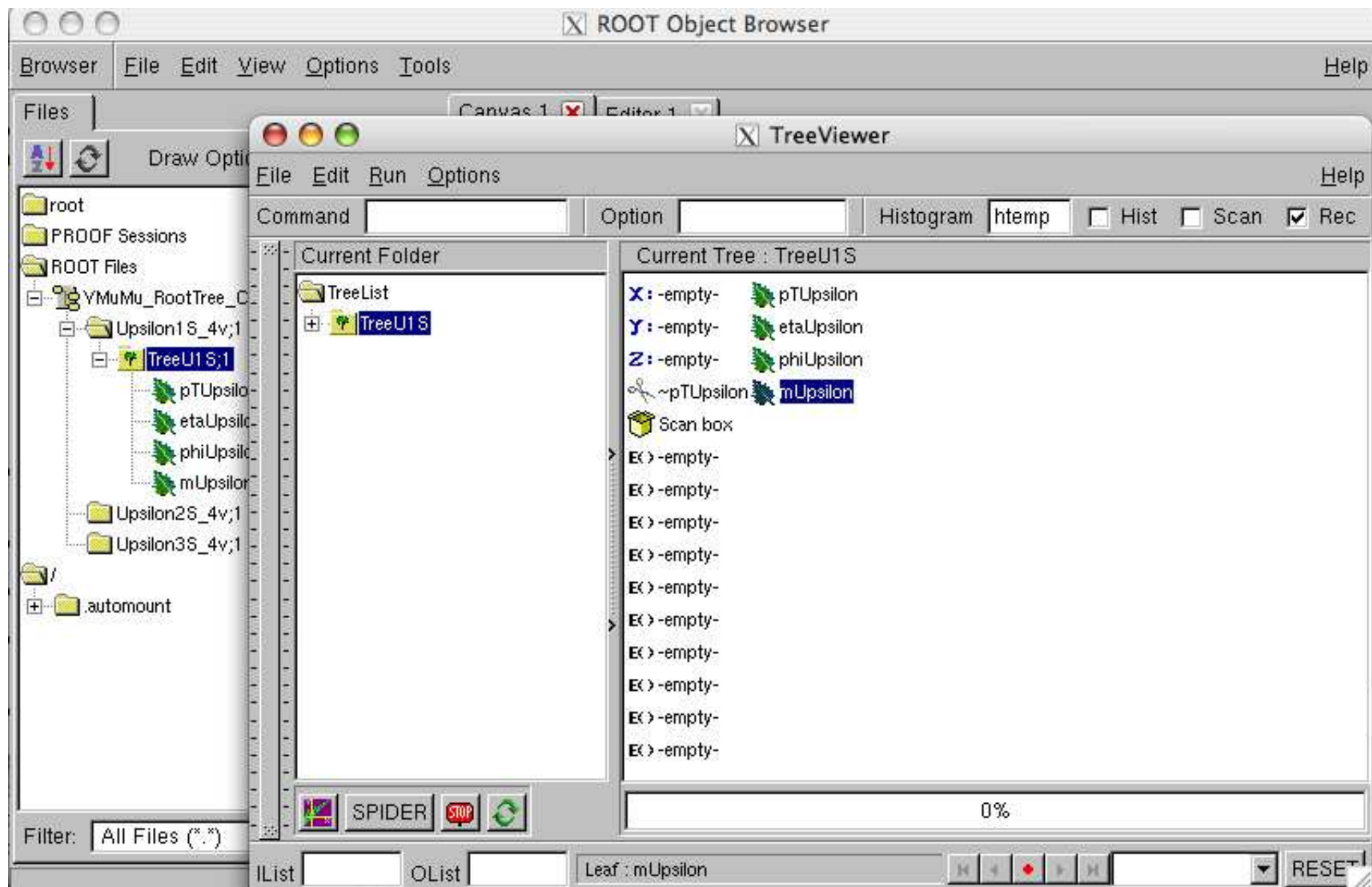
% set the cut on $pT_{\text{Upsilon}} > 5$ (GeV)



ROOT tutorial:

let's see the effect on the mass

% double-click on mUpsilon

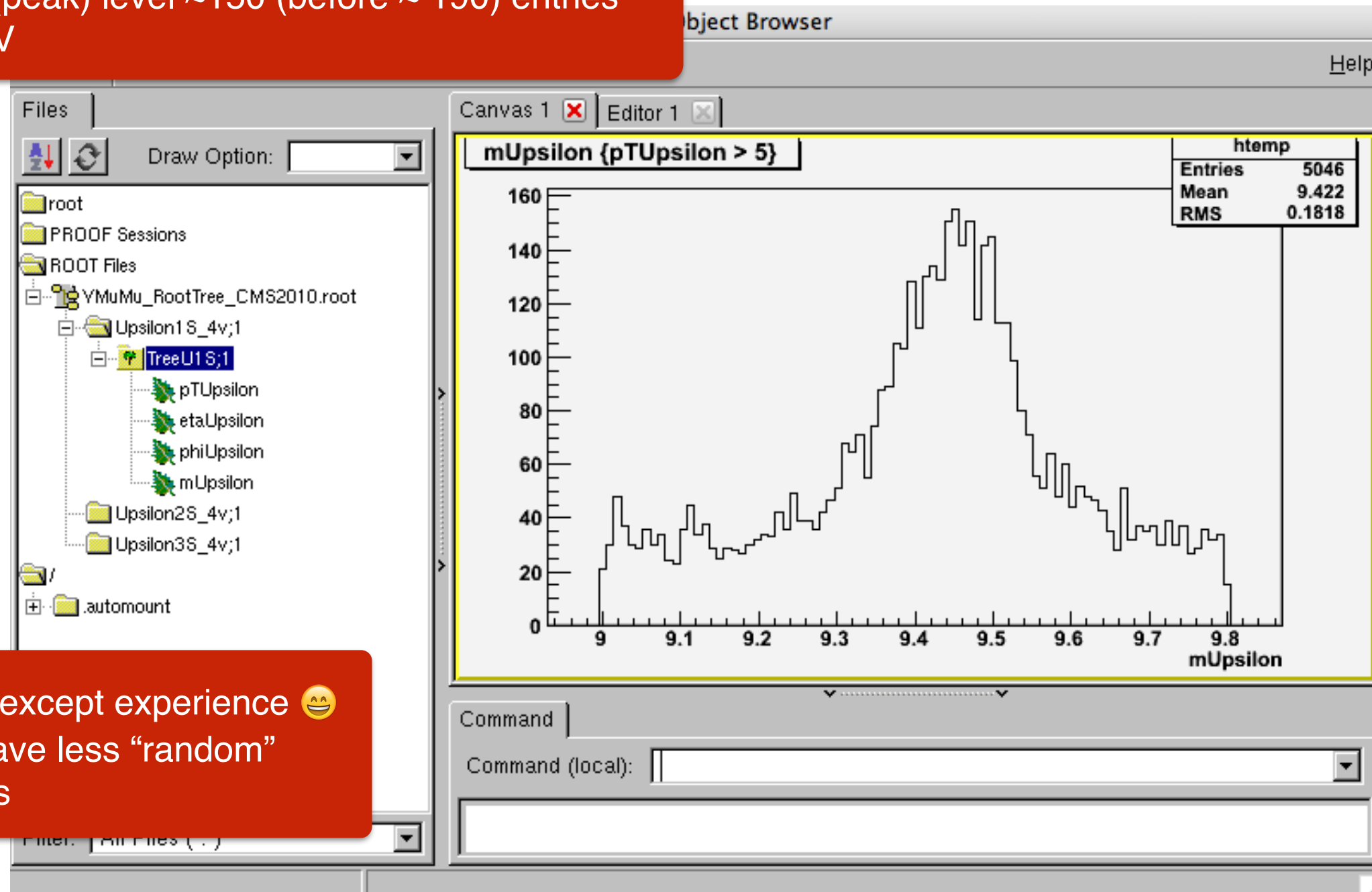


ROOT tutorial: let's see the effect on the mass

% double click on “mUpsilon”

% **notice:**

- the number of entries in the histograms: 5046(before 6200)
- background level ~ 30 (before ~ 40) entries
- signal & background (peak) level ~ 150 (before ~ 190) entries
- signal width ~ 0.2 GeV

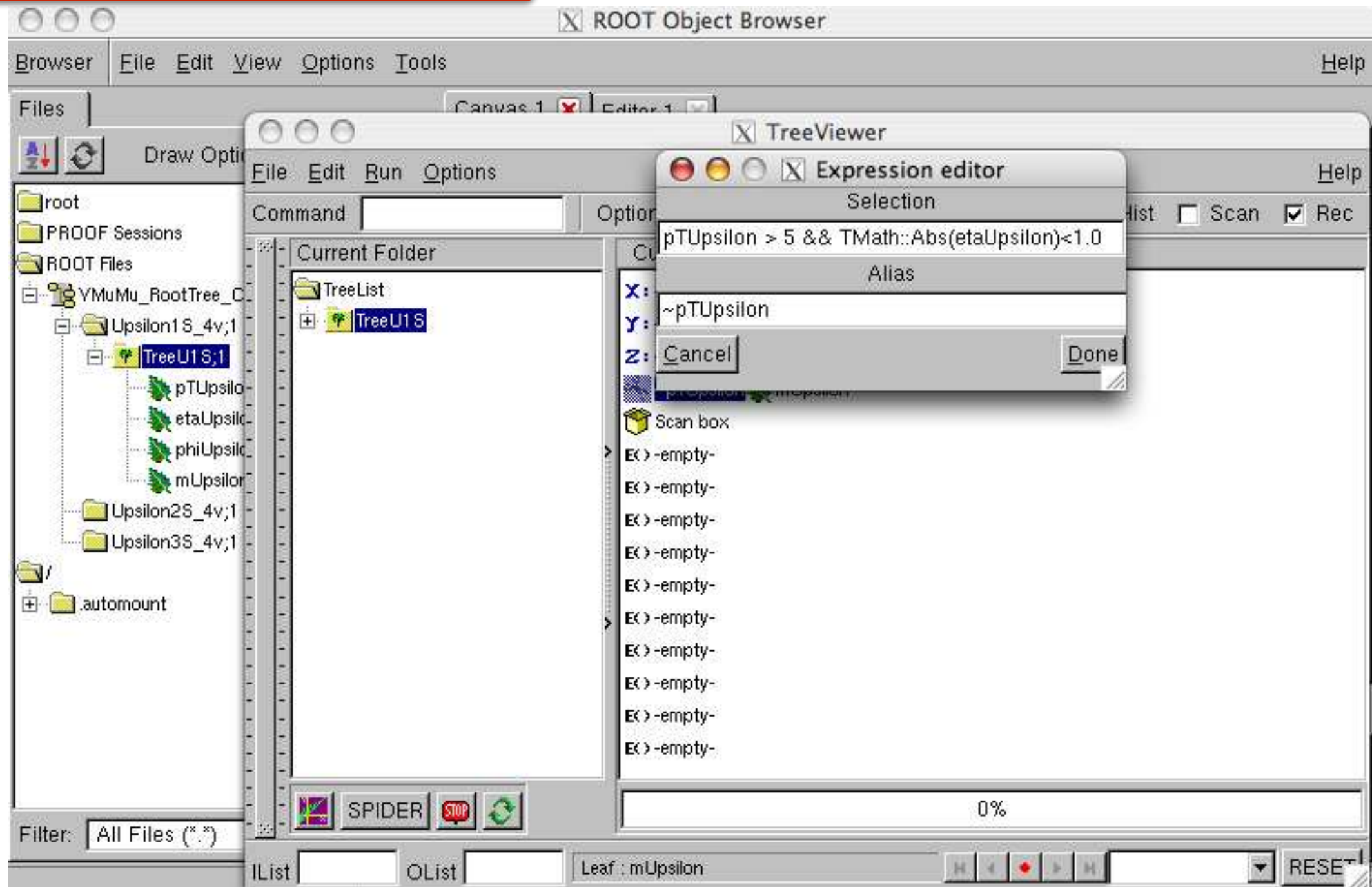


* did we win something? except experience 😊
— yes, our candidates have less “random” background combinations

ROOT tutorial:

what else can we do to clean up our mass distribution?

* you will learn that the best resolution in CMS is achieved in the barrel region:
— apply also an $|\eta|$ cut of 1.0

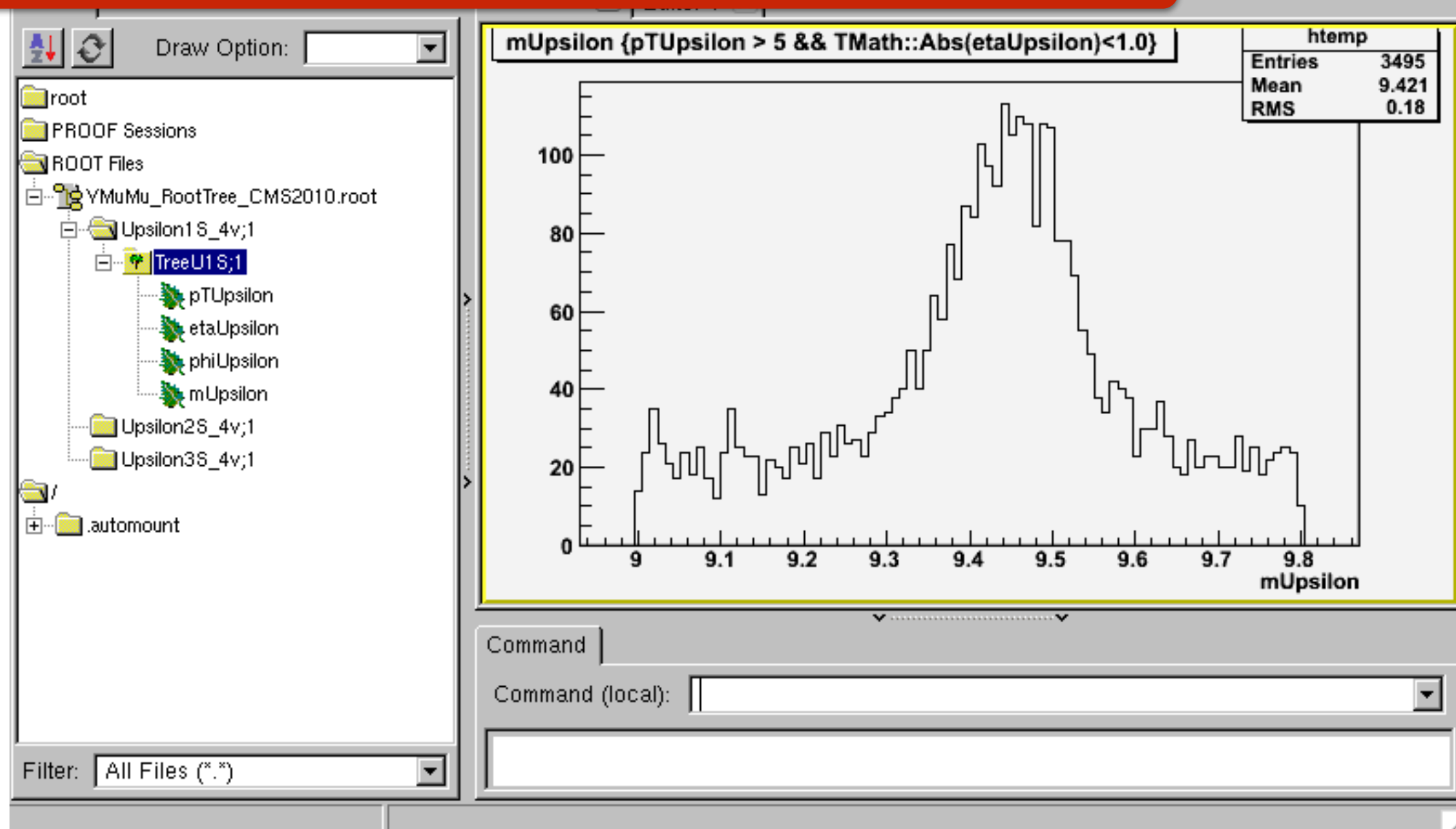


ROOT tutorial: the effect on the mass

% again double click on “mUpsilon”

% **notice:**

- the number of entries in the histograms: 3495 (before 5046, long time ago 6200)
- background level ~ 20 (before ~ 30 , long time ago ~ 40) entries
- signal & background (peak) level ~ 110 (before ~ 150 , long time ago ~ 190) entries
- signal width ~ 0.2 GeV



summary: interactive analysis

- * use the “StartViewer” to visualise the tree variables
- * you can apply cuts on one or more variables
(a-priory you have the variables saved in the tree 😊)
- * with the interactive analysis you can see in a reasonable fast way which variables can help you to improve your analysis sensitivity

time for a break and (a lot of) questions

*play interactively with data is nice,
playing remote with data is cool*