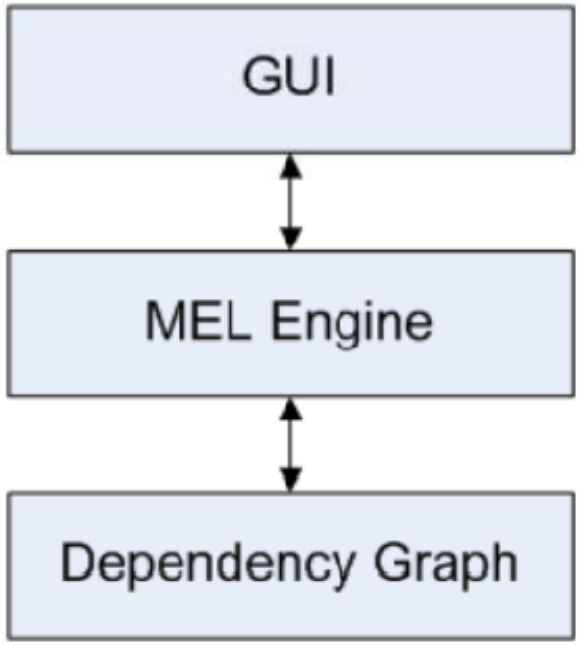
Animating Attributes

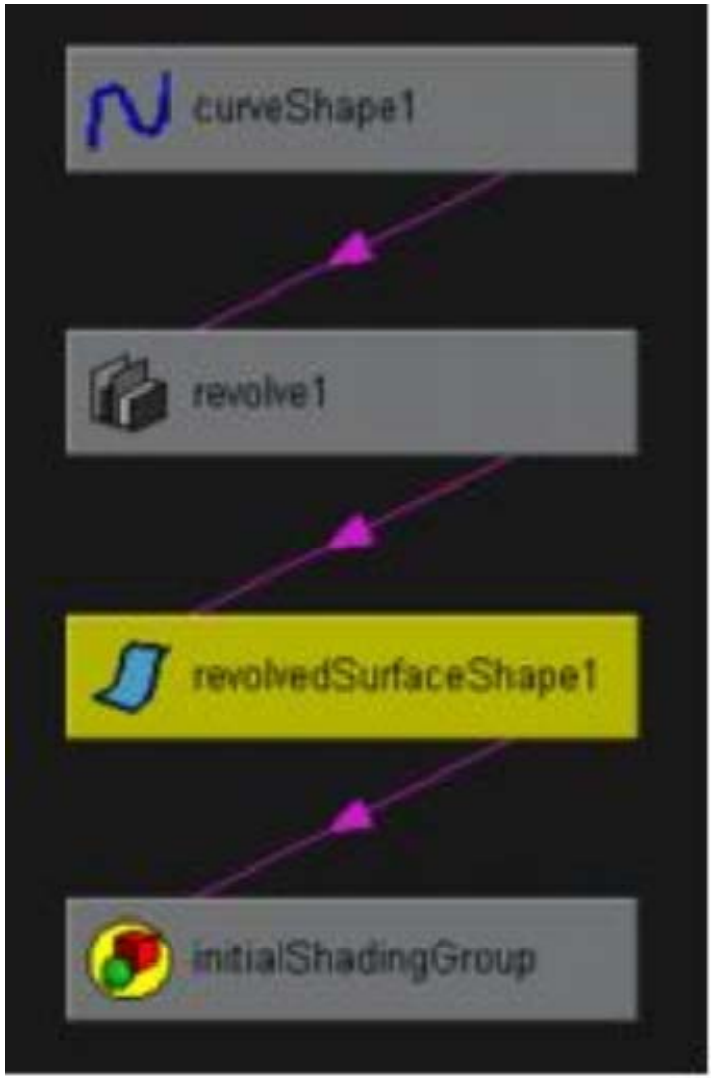
(in Maya 2008)

but first, understand
Maya internals



Maya's internal representation
- nodes
- with attributes
- connected to each other

Dependency Graph



Types of nodes

shape
transform
group
expression
shading
etc.

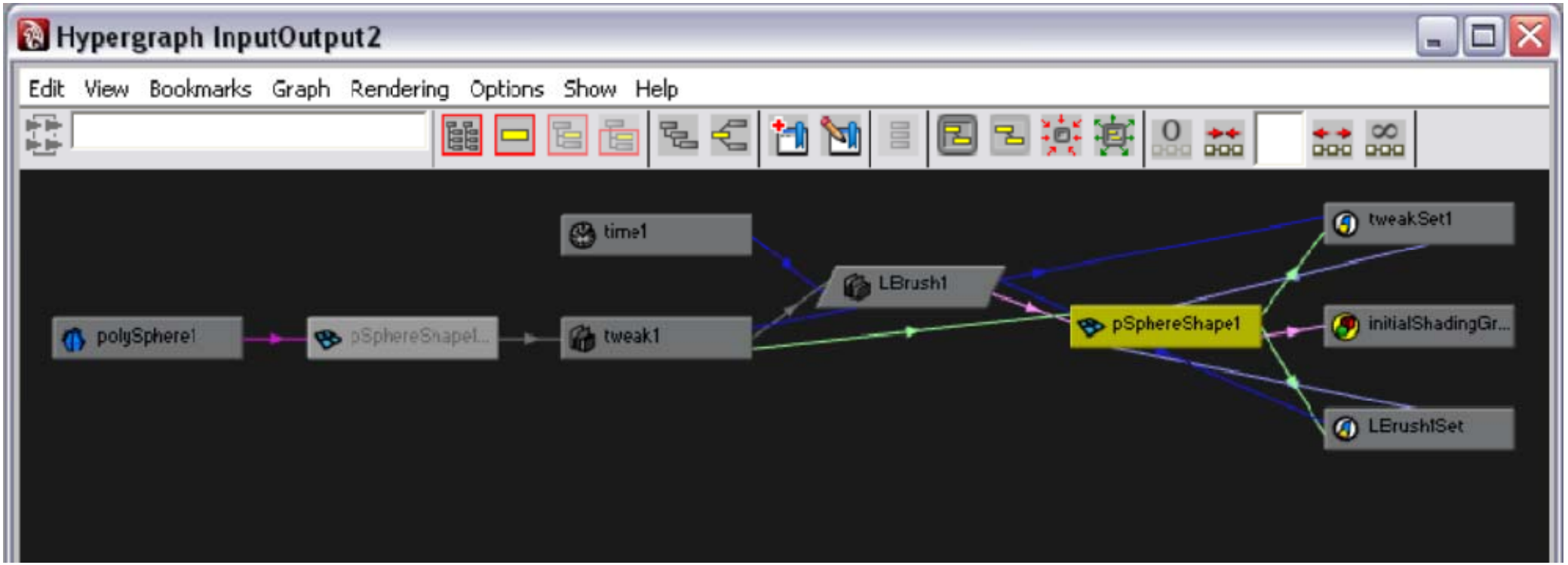
WIndows->Hypergraph:Connections

Attributes

types

- integers
- floating point
- enumerated
- vectors
- matrices
- arrays

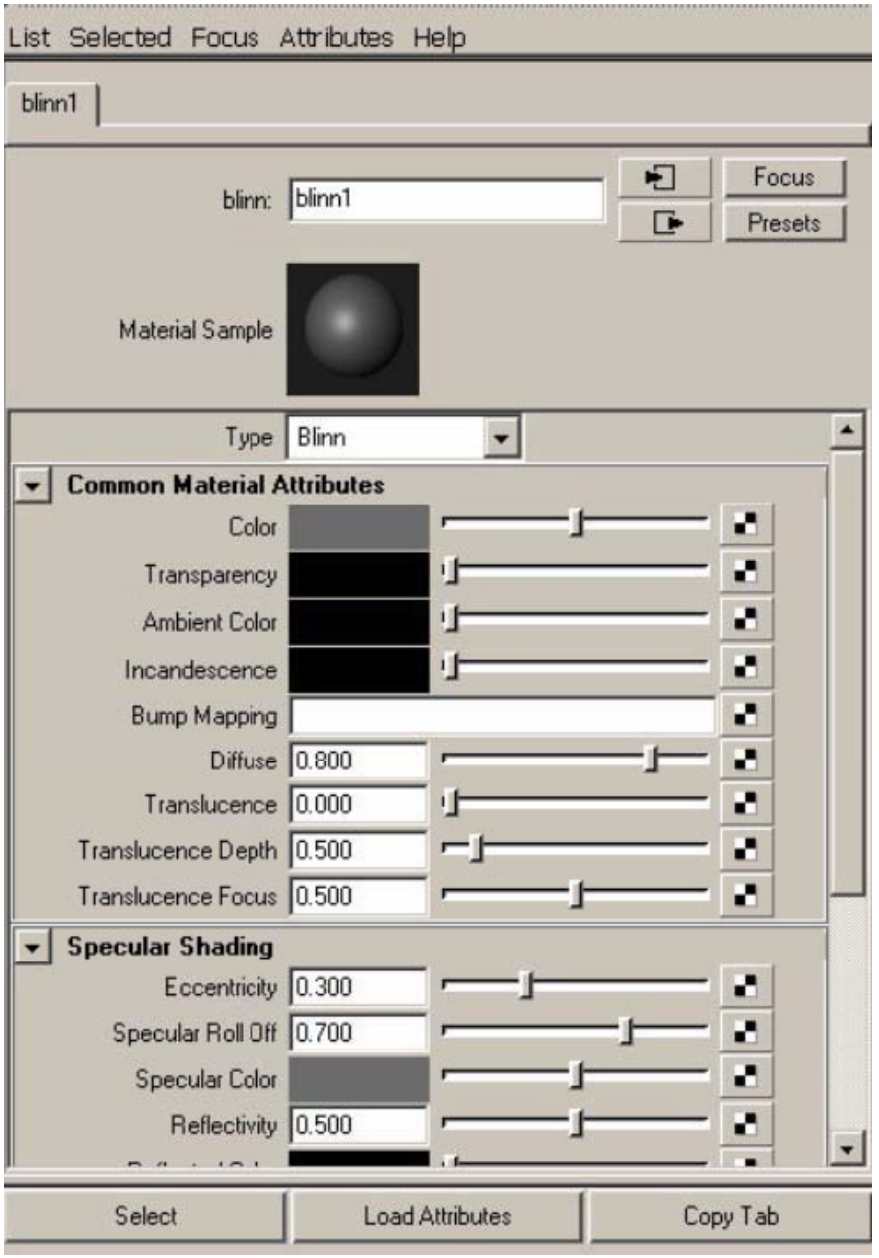
connections: links between attributes



Attribute Editor

1st of upper right icons

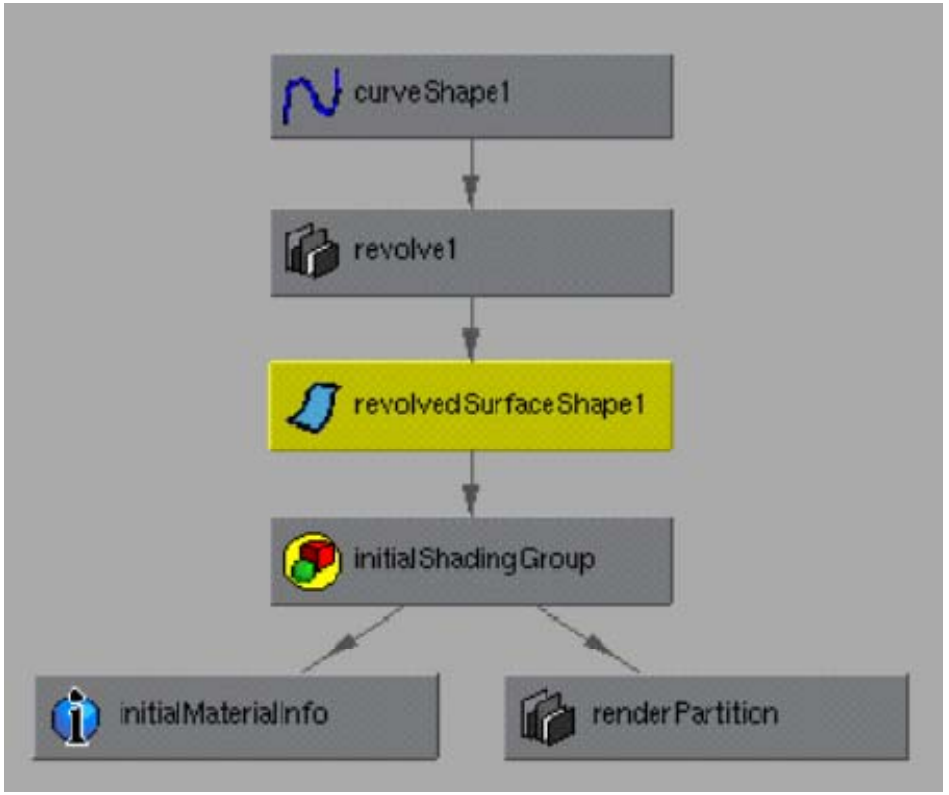
displays keyable attributes



Windows->General Editors ->Attribute Editor

Connections

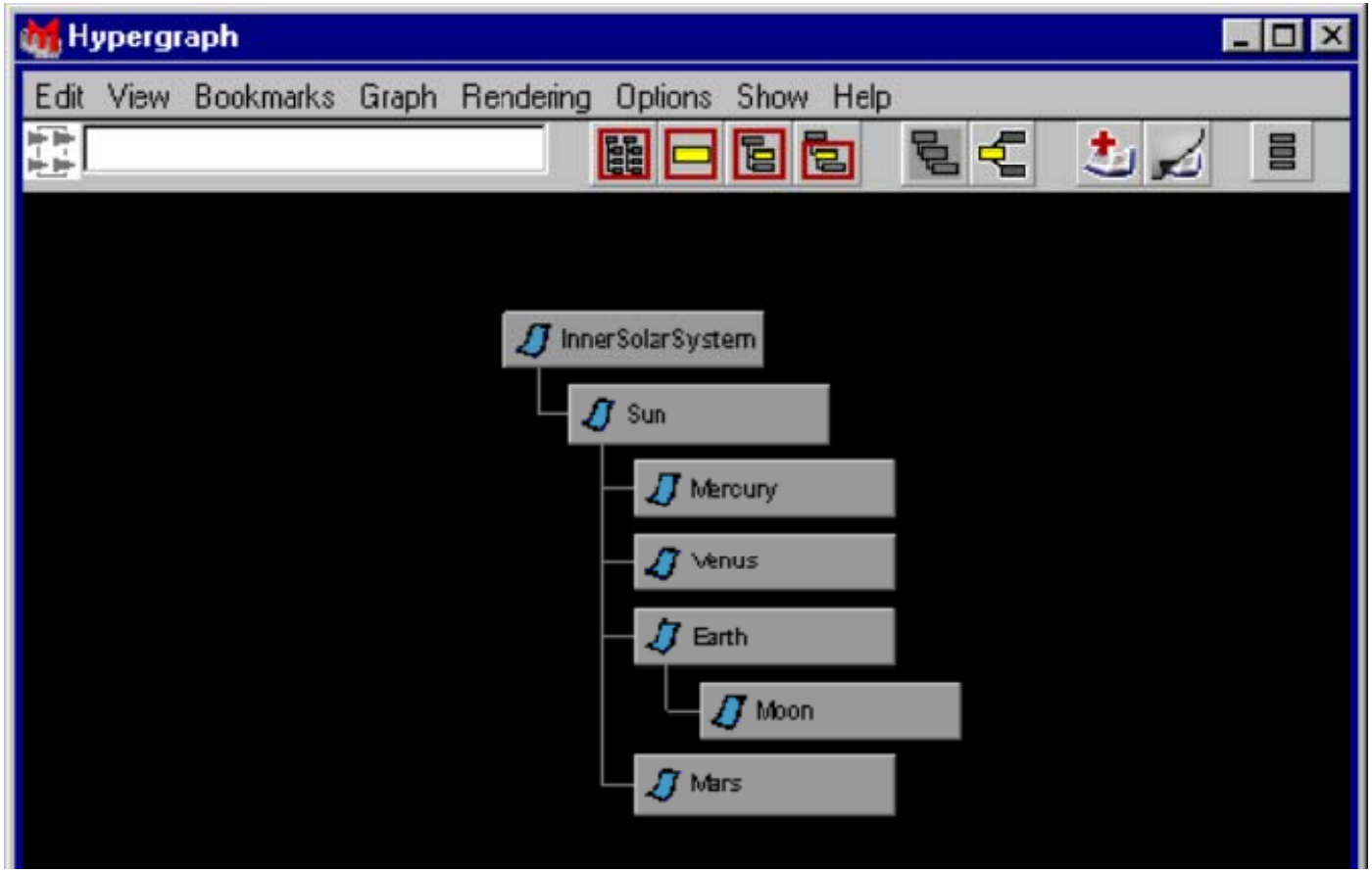
upstream v. downstrearm



Scene hierarchy

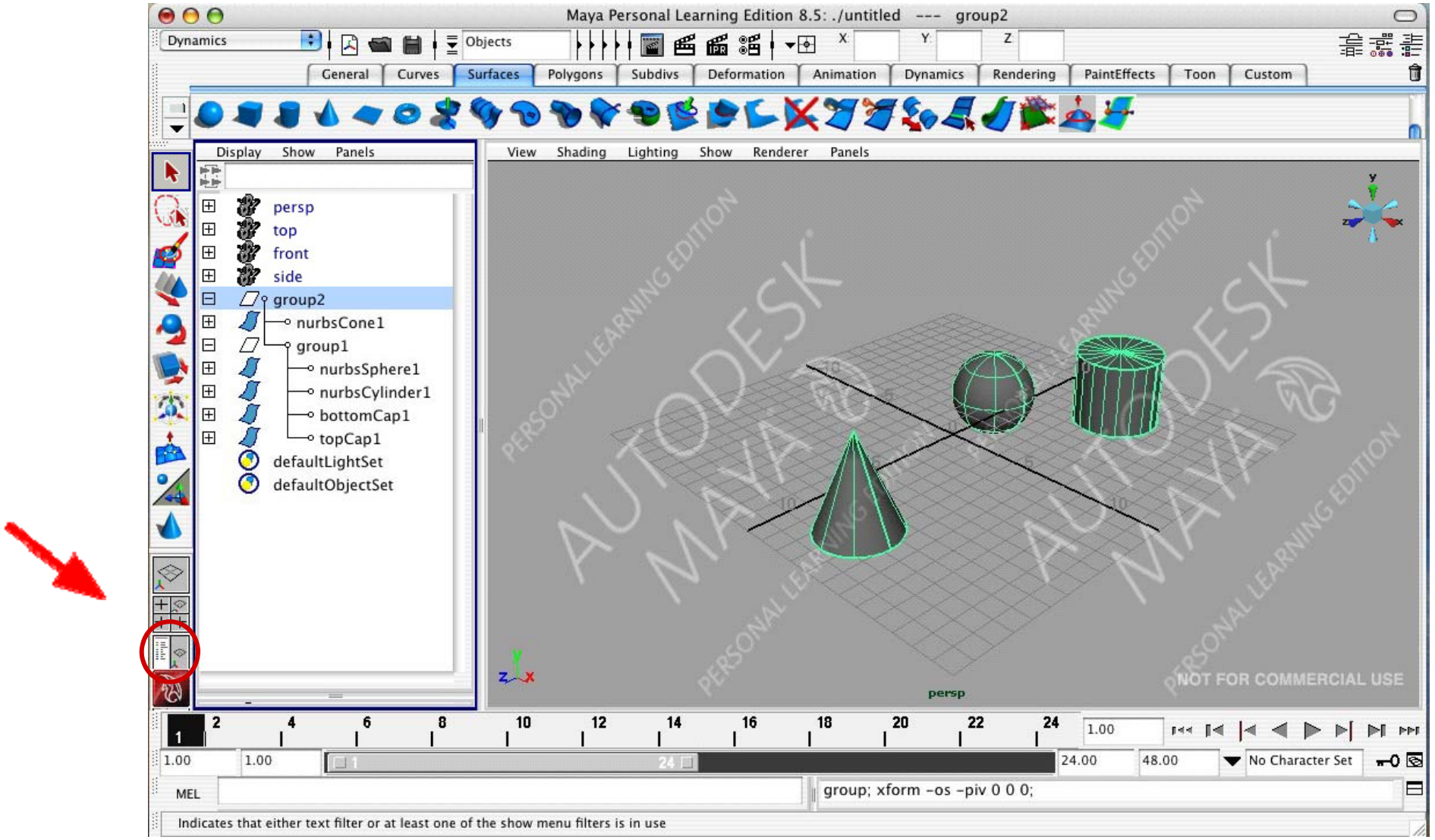
subset of DG

directed acyclic graph
DAG
transform hierarchy



WIndows->Hypergraph:Hierarchy

Outliner



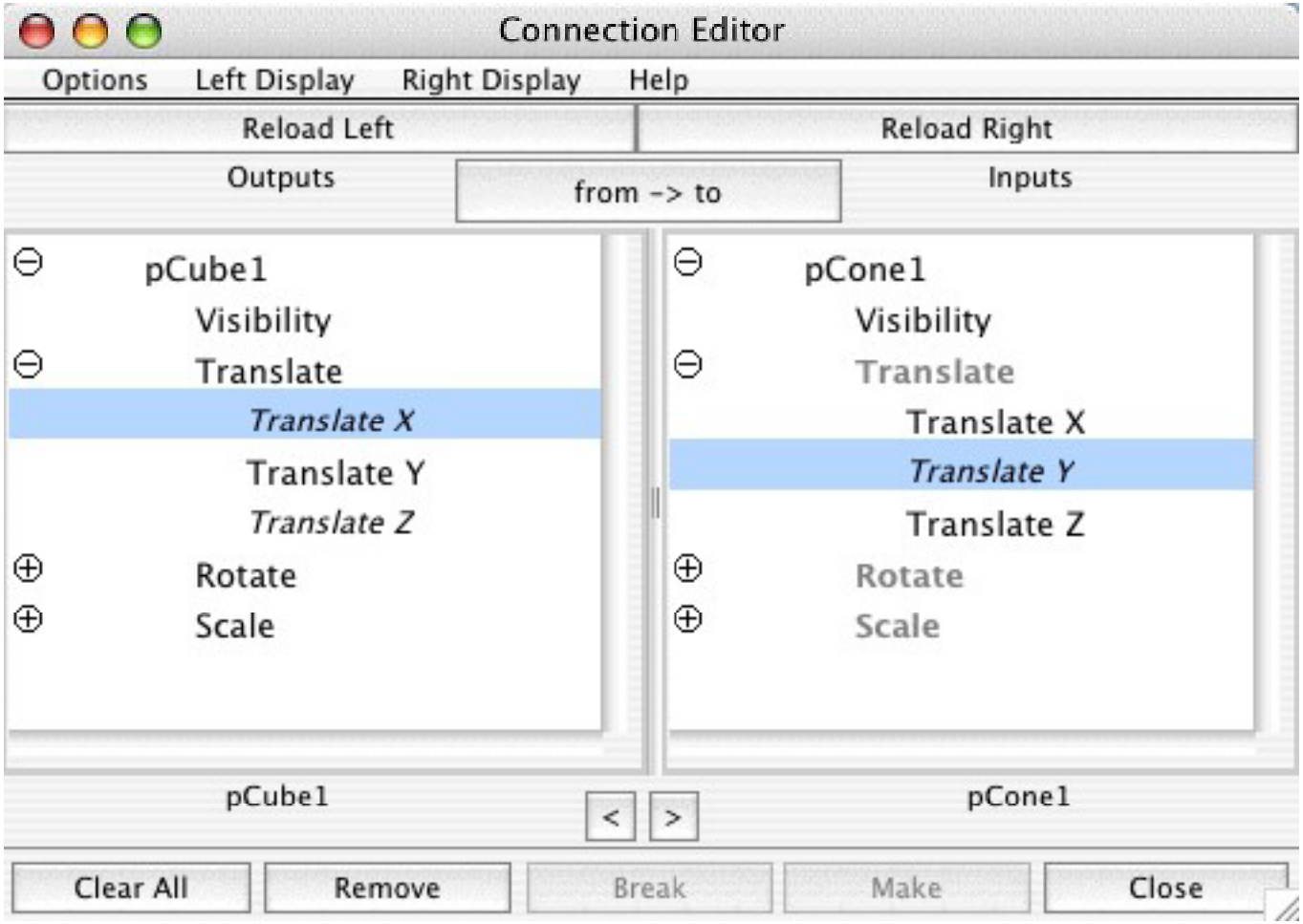
Windows->Outliner

Animating Attributes

Driven Keys

Expression Nodes

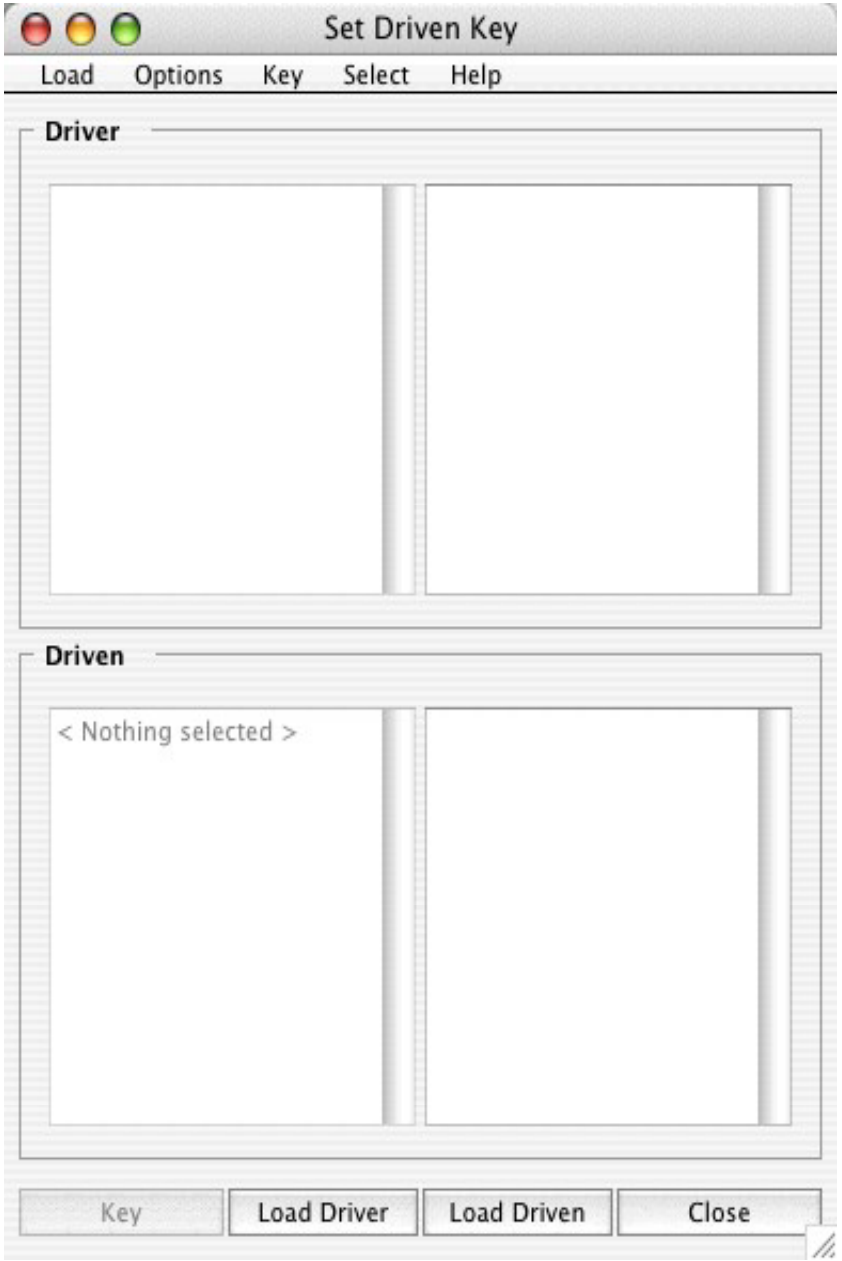
Direct Connections between attributes

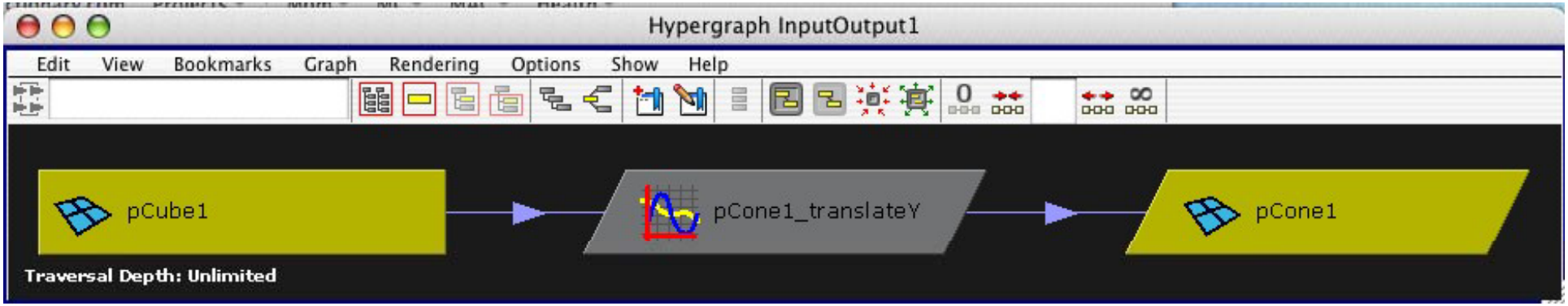


Window->General Editors->Connection Editor

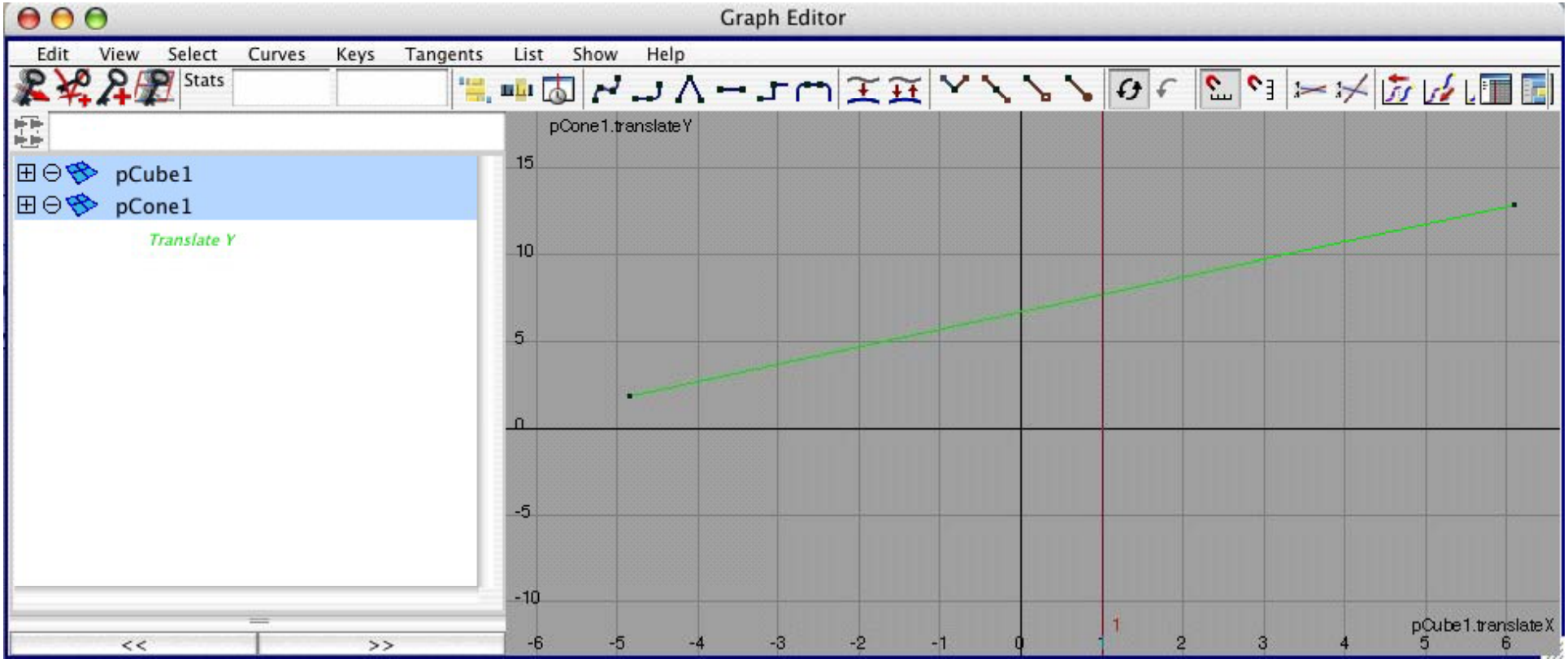
Driven Keys - set one attribute to 'drive' another

with the 'Animation' menu set: Animate-> Set Driven Keys -> Set ...





Window->Animation Editors->Graph Editor



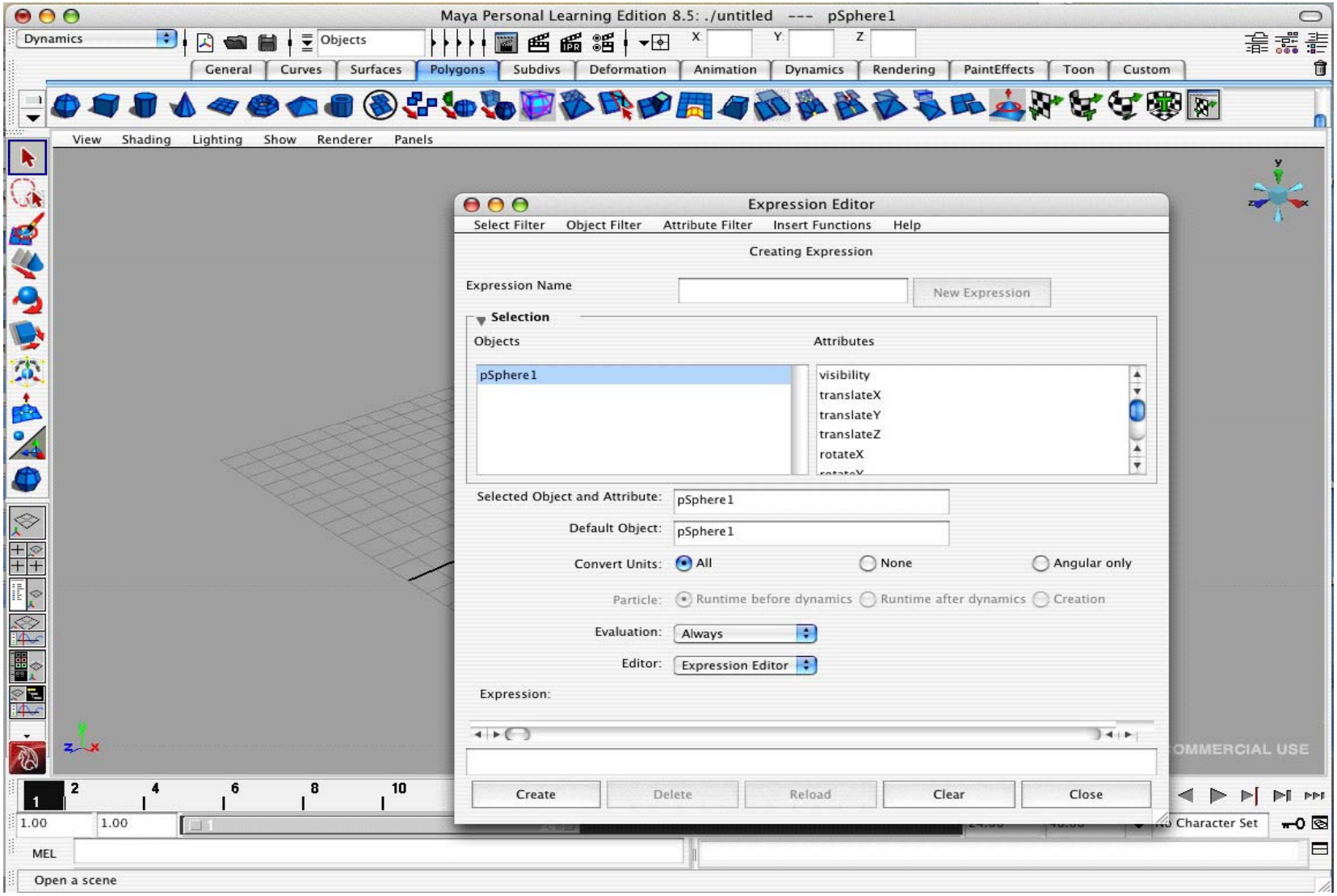
Expression Nodes

Create expressions to set attribute values from other attributes

Creates an *expression node* in the DG

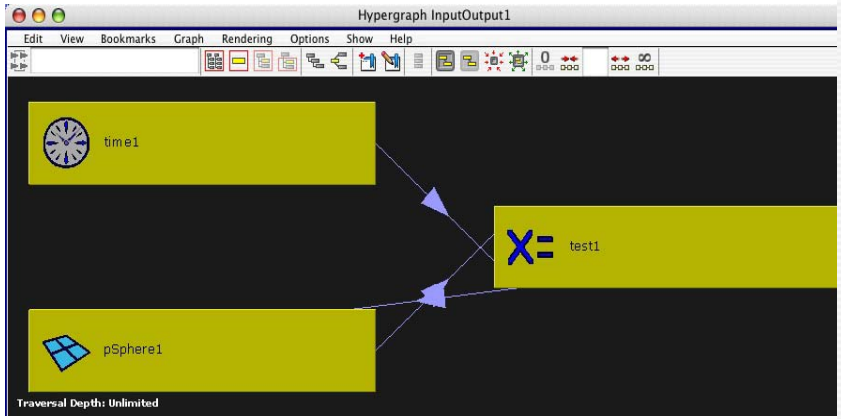
1. define variables
2. compute value
3. assign value to attribute

Expression Editor

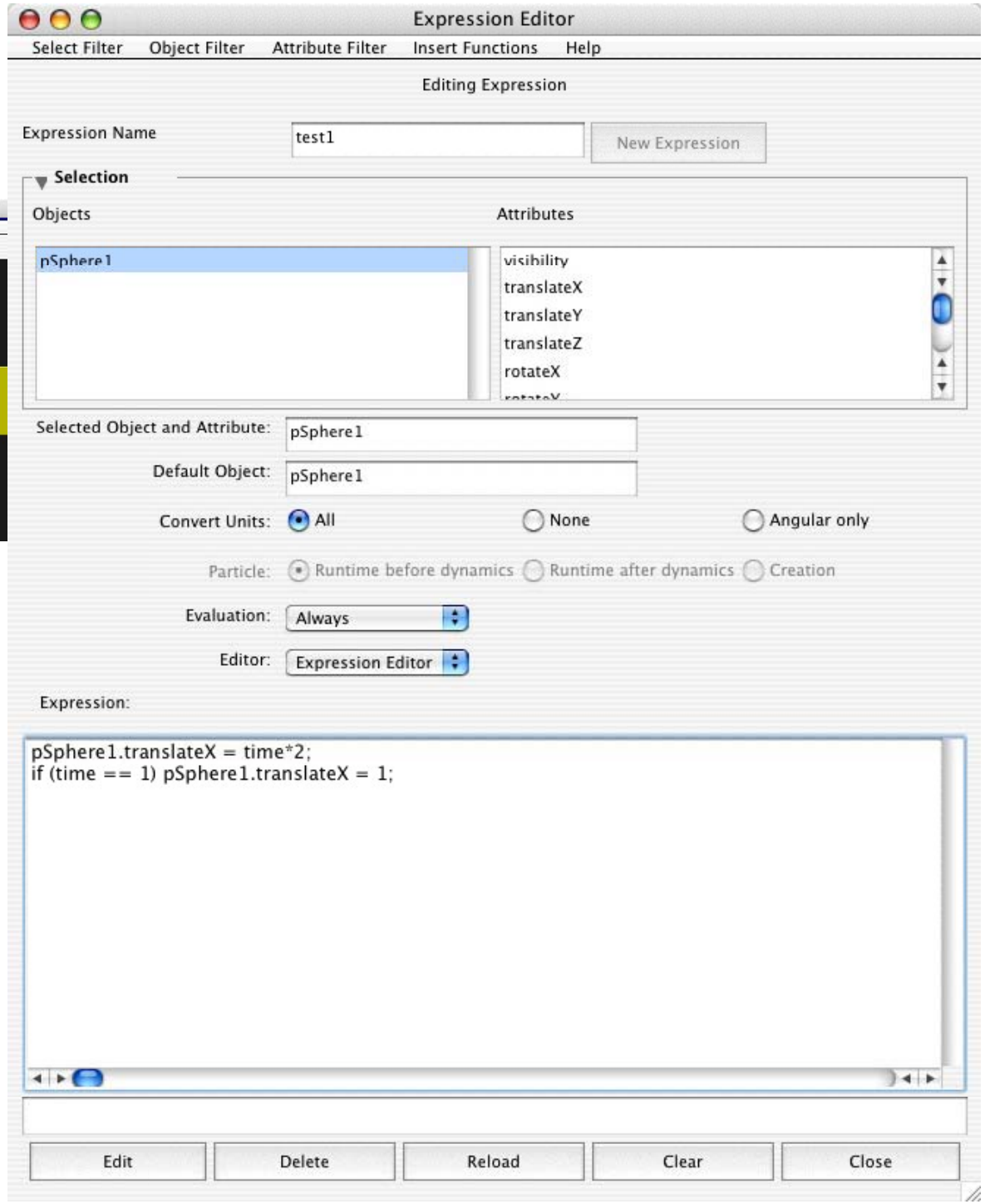


Window->Animation Editors->Expression Editors

Make a sphere



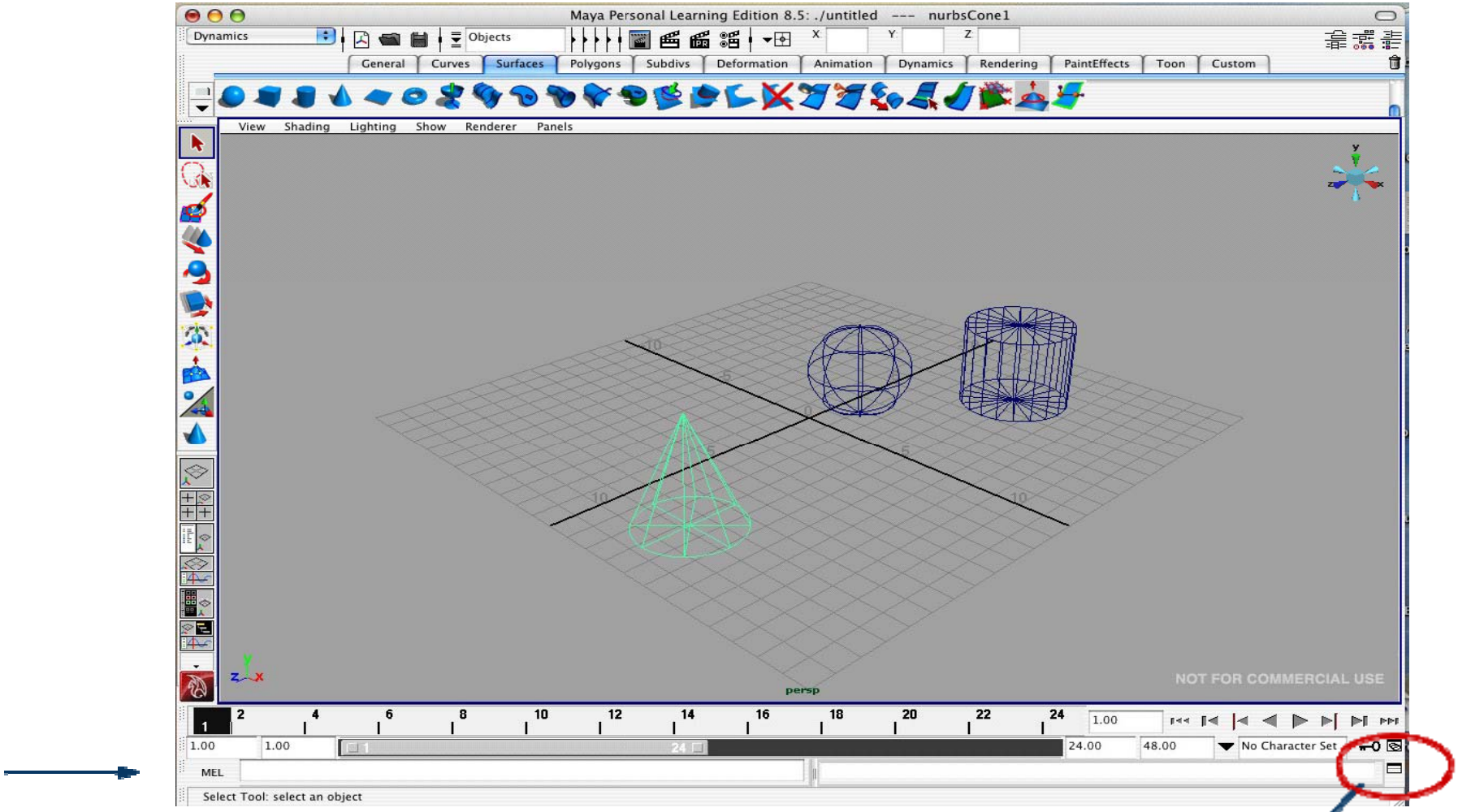
hypergraph



in Dynamics menu set, Particles->Particle Set attribute box

creation expression
per Object expression
per Particle expression

MEL/Python



command line

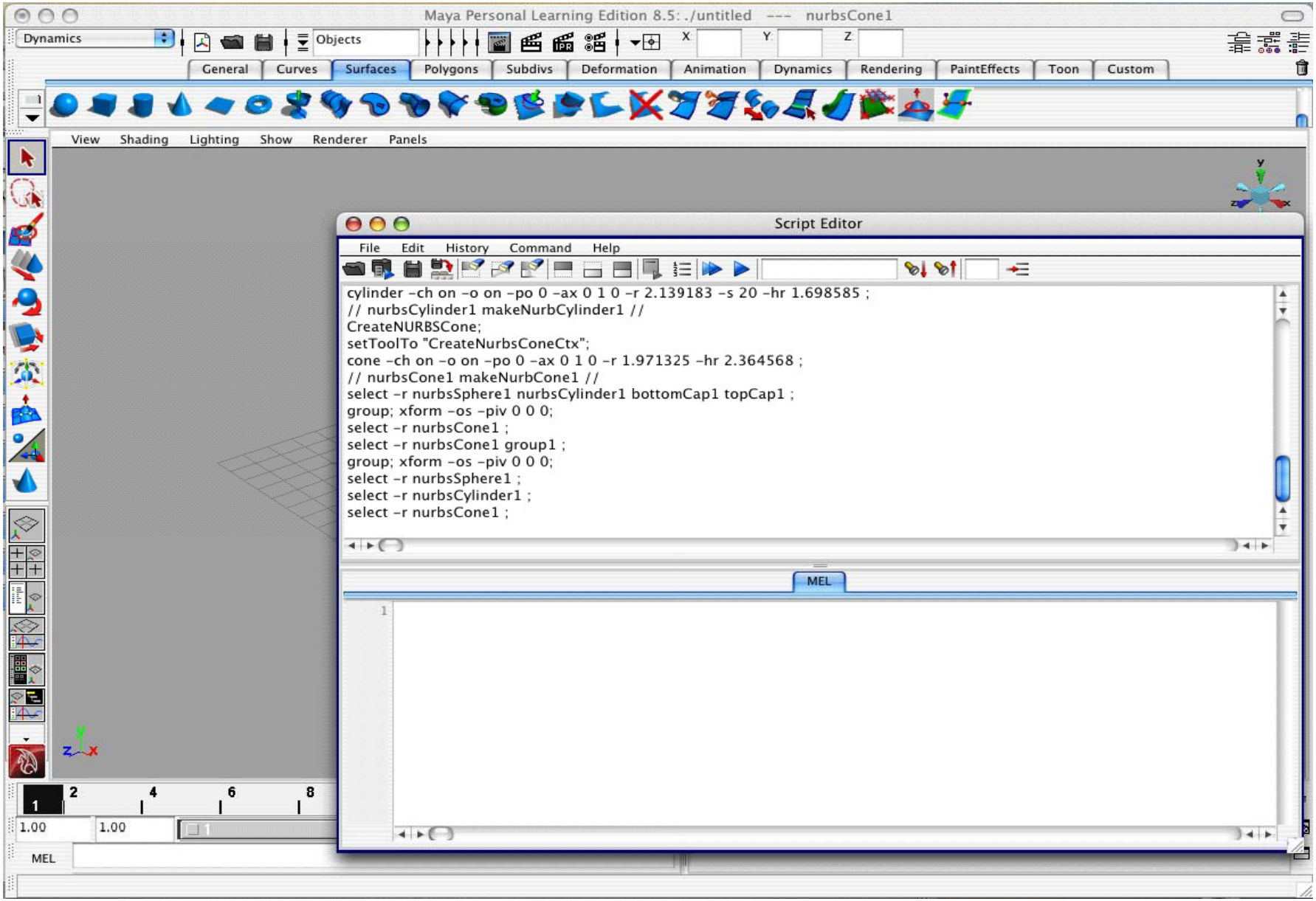
script editor

MEL

similar syntax to Expressions, but not same
MEL: setAttr(pSphere.translateX) = 10;
Expr: pSphere.translateX = 10;

write MEL script to define expression nodes

Script Editor



```
// MEL script
// sets keyframe
// from
// http://www.fundza.com/mel/quickref2/#keyframe1
string $sph[] = `sphere`;

currentTime 1;
setKeyframe ($sph[0] + ".translate");

currentTime 30;
move -r -moveY 2;
setKeyframe ($sph[0] + ".translate");

playbackOptions -min 1 -max 30;
play;
```

```
// simpleAnimation.mel
// shows use of setting an *Expression* in MEL
// an Expression gets executed each frame and is a way to set up
// procedural animation
// this script also sets the up and initiates playback
// from http://www.fundza.com/mel/quickref2/#expression1

string $exp = "";

for($i = 0; $i < 3; $i++) {
$obj = `sphere`;
move (rand(-3,3)) (rand(-3,3)) (rand(-3,3));
$exp += "select -r " + $obj[0] + ";\n" +
"move -moveY (rand(0,2));\n";
}
$exp += "select -clear;\n";

expression -s $exp -ae 1;
playbackOptions -min 1 -max 30;
// play;
```

Bouncing ball

v += a; p += v
where a = (0,-g)

script editor

create a sphere, name it b1
add attributes of velocity in x & y

expression editor

```
if first frame
    b1.velocityY = initVelocity
    b1.position = (0,0)
else
    add velocity to position
    add acceleration (gravity) to velocity
    if (positionY <= 0)
        K = 0.9*K
        b1.velocityY = initVelocity*K
```

Springy ball f 1= (Ks*|p1-p2| - Kd*(v1-v2).(p2-p1)/|p2-p1|) (p2-p1)/|p2-p1|

script editor

create two spheres, named b1 & b2
add attributes of velocity and acceleration in x & y

expression editor

for b1: if first frame, reinitialize position & velocity
else
compute f1, f2
compute a1 = f1/m1; a2 = f2/m2
update velocity += acceleration
[scale velocity down]
update position += velocity