Helper Classes

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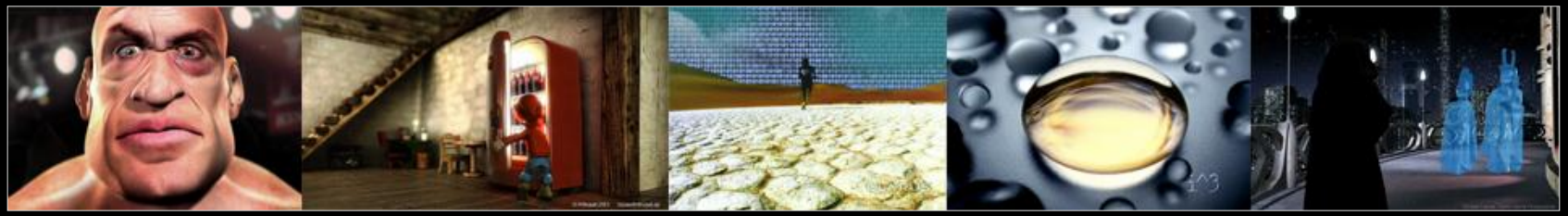
Agenda

- API Command Utilities
- Error Handling and Debugging
- DAG Hierarchy



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API Command Utilities

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Utilities API: MGlobal

- Query and set global settings (time, z-up, selection masks, etc..)
- Query what is selected or highlighted
- Display command warnings and errors
- Interaction with script languages

Utilities API: MGlobal

- Query and set global settings (time, z-up, selection masks, etc..)
    - MGlobal::mayaState(MStatus * returnStatus)
    - MGlobal::viewFrame (const MTime & time)
    - MGlobal::setSelectionMode (MGlobal::MSelectionMode mode)
    - MGlobal::setYAxisUp (bool rotateView)
    - Etc…

MGlobal & Selection List

- MSelectionList: class representing a list of MObjects
  - Used for more than just what is selected, e.g.
    - Highlight list
    - Query / Modify list membership

- MItSelectionList:class for iterating over the items in an MSelectionList. A filter can be specified so that only those items of interest on a selection list can be obtained.

```
MGlobal::getActiveSelectionList(MSelectionList &dest);
MGlobal::getSelectionListByName ( const MString &  name, MSelectionList &  list   )
MGlobal::setActiveSelectionList( const MSelectionList &  src,
    MGlobal::ListAdjustment )
```

MGlobal Selection

- MGlobal::select (const MDagPath & object, MGlobal::ListAdjustment listAdjustment)
  add an object to the active selection list without creating an MSelectionList first

- MGlobal::selectByName(const MString & name, MGlobal::ListAdjustment listAdjustment)
  finds all objects matching a pattern and adds them to the active selection list

- MGlobal::setActiveSelectionList (const MSelectionList & src, MGlobal::ListAdjustment)
  Set the active selection list. The selection items on the given list will update the contents of the active selection list as indicated by the listAdjustment parameter.

- MGlobal::selectCommand (const MSelectionList & src, MGlobal::ListAdjustment)
  Set the active selection list, by calling the built in Maya select command

- MStatus MGlobal::selectFromScreen (const short & x_pos, const short & y_pos, MGlobal::ListAdjustment, MGlobal::SelectionMethod)
  Perform click-pick type selection. If an object intersects the click point then it is selected according to listAdjustment.

Utilities API: MGlobal

- Display error/warning messages or general information to the user for custom command

```
void MGlobal::displayInfo ( const MString &  theMessage  )

void MGlobal::displayWarning ( const MString &  theWarning  )

void MGlobal::displayError ( const MString &  theError  )
```

Utilities API: MGlobal

- Execute MEL script:

  MGlobal::executeCommand(const MString &command)

  MGlobal::sourceFile

- Execute Python Command:

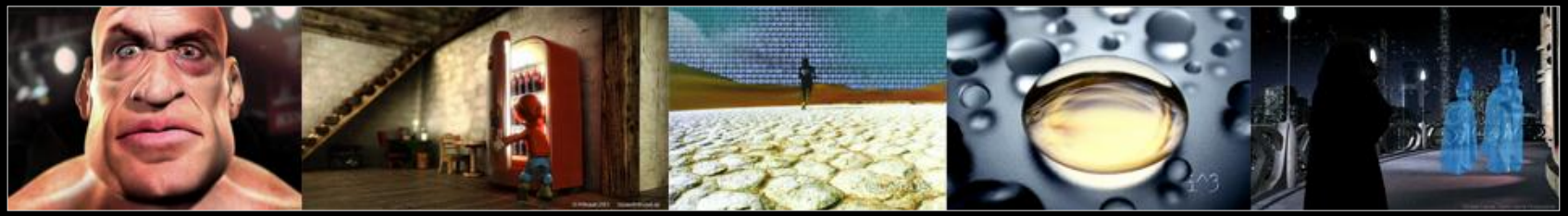
  MGlobal::executePythonCommand (const MString &command)

```
# execute MEL command to create a nurbs sphere
OpenMaya.Mglobal.executeCommand( "sphere" );

# execute the specified mel script
OpenMaya.MGlobal.sourceFile( "C:\\MyScripts\\testScript.mel" );

#execute python command to create a poly cube
OpenMaya.MGlobal.executePythonCommand (“polyCube( sx=10, sy=15, sz=5, h=20 )”)
```

Error Handling and Debugging



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Error checking: MStatus

- We have removed the MStatus class.
- Python exceptions (try and except) must be used instead of MStatus.

- 3 Special cases:
  - Hardcoded Maya API class for status codes:

OpenMaya.MStatus.kSuccess - The operation was successful

OpenMaya.MStatus.kFailure - The operation failed

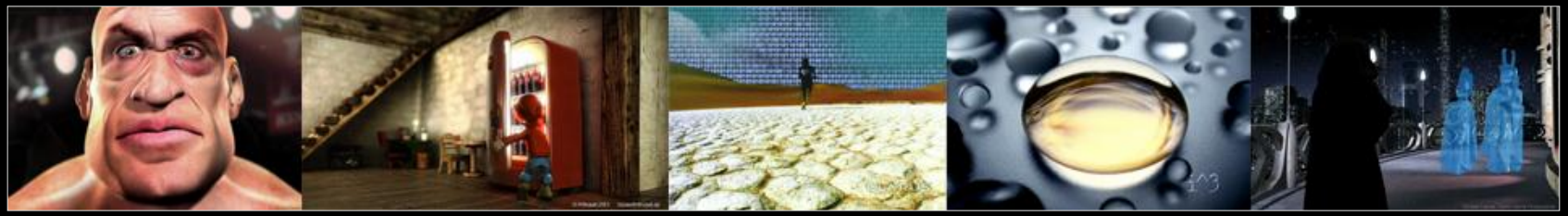
OpenMaya.MStatus.kUnknownParameter - Returned by MPxNode::compute for unrecognized plugs

OpenMaya Status Codes

- Python API does not contain MStatus
- Any method that would have returned a non-success
- MStatus will raise an exception instead
- Provides error checking that is more natural in Python

```
try:
        mplugin.registerNode( kPluginNodeTypeName, sineNodeId,
                nodeCreator, nodeInitializer )
except:
        sys.stderr.write( "Failed to register node: %s" %
        kPluginNodeTypeName )
        raise
```

DAG Hierarchy



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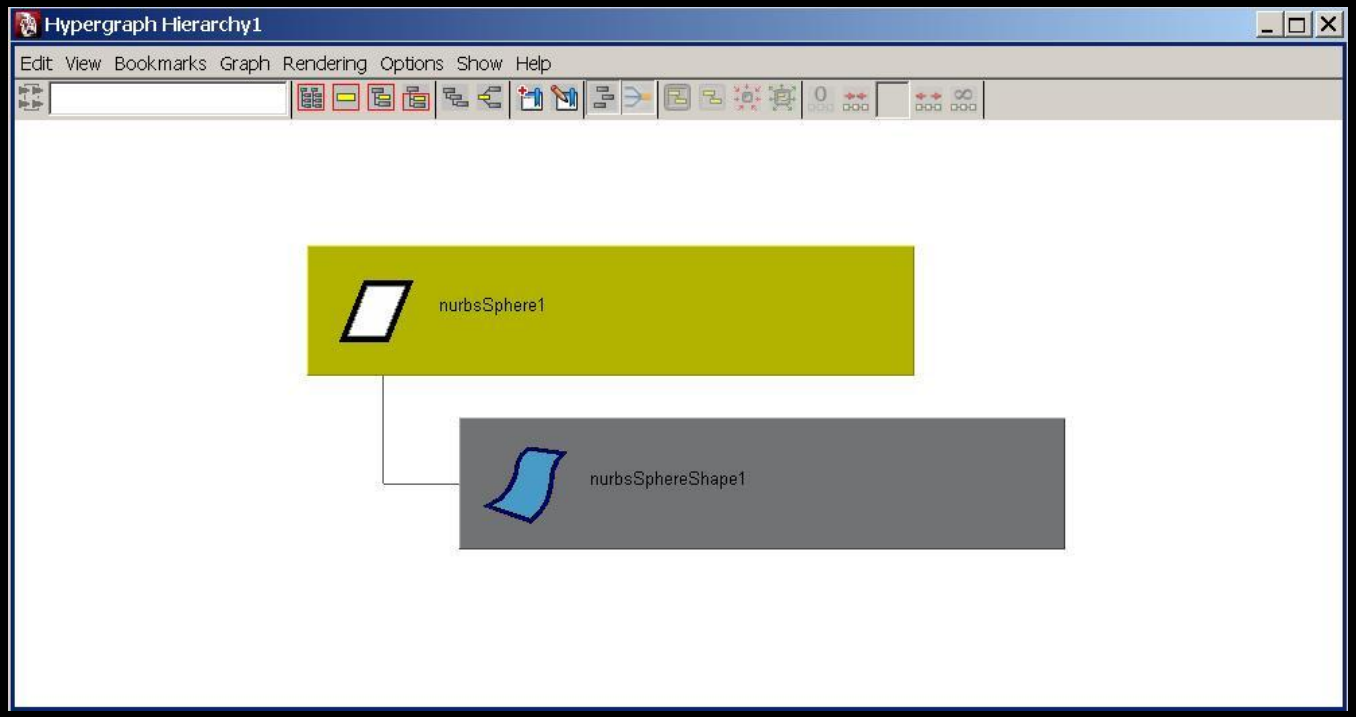
DAG (Directed Acyclic Graph)

- DAG Nodes are just DG Nodes!
- Parenting are not dependency graph connections
- DAG hierarchy
  - Node types containing transformation info:
    - joints (MFn::kJoint)
    - transforms (MFn::kTransform)
  - Other typical node types in a skeletal hierarchy:
    - shapes (nurbs, polys, …)
    - locators (MFn::kLocator)
    - Ik (MFn::ikHandle, MFn::ikEffector)

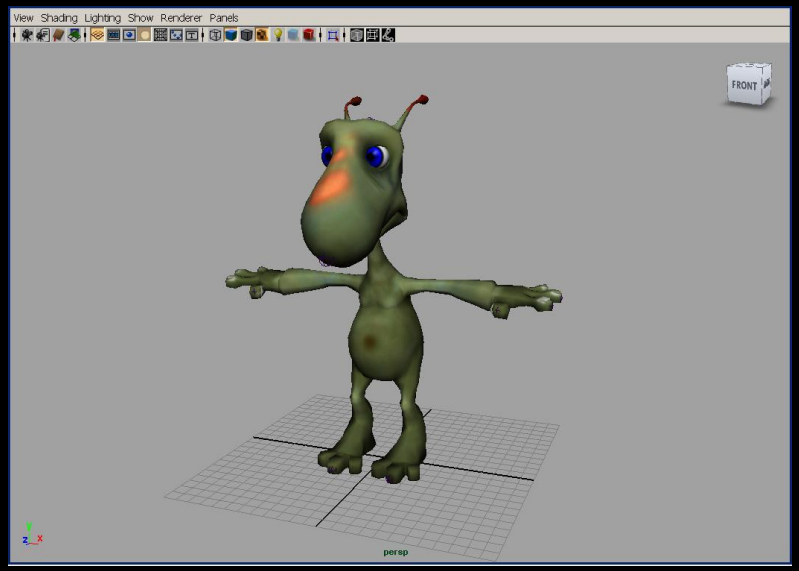
DAG Hierarchy

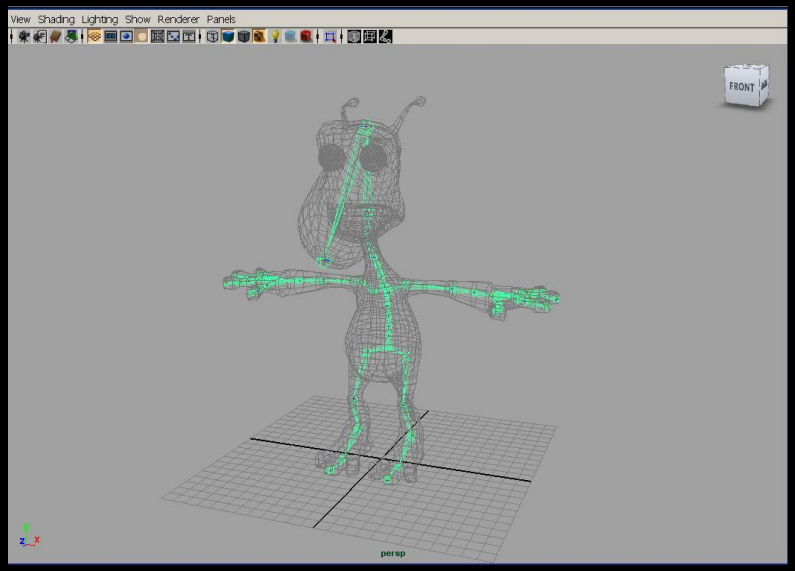
- An Example: sphere



DAG Hierarchy

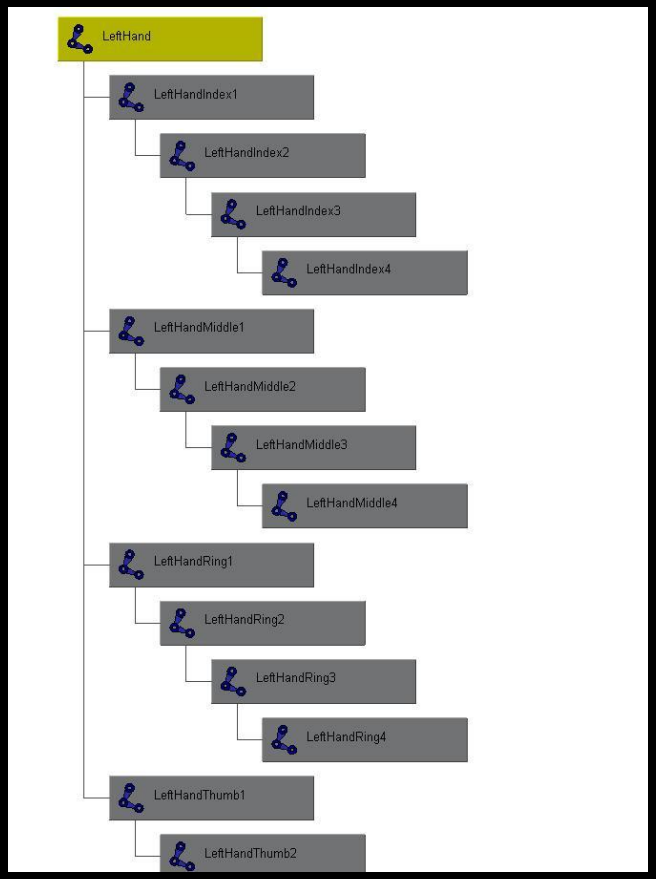
- A more complex example: skeleton hierarchy





DAG Hierarchy

- A more complex example: skeleton hierarchy



hip

spine

shoulder

arm

hand

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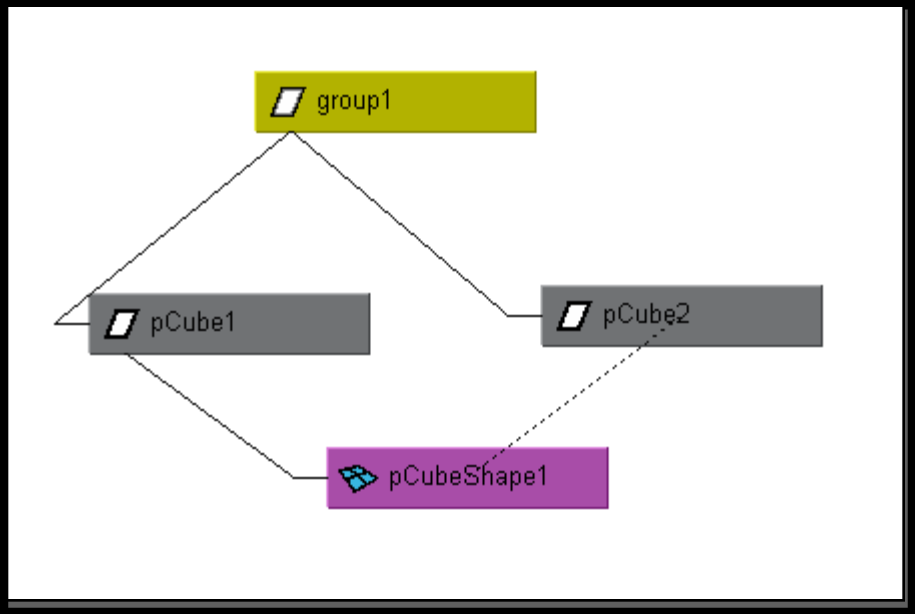
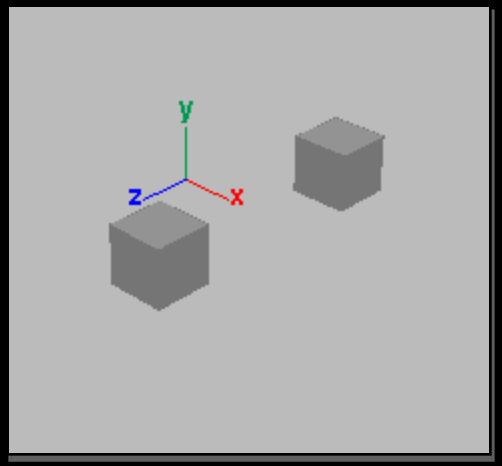
Instancing

- A node may have more than one parent
- A dagPath is used to identify instances

  group1|pCube1|pCubeShape1

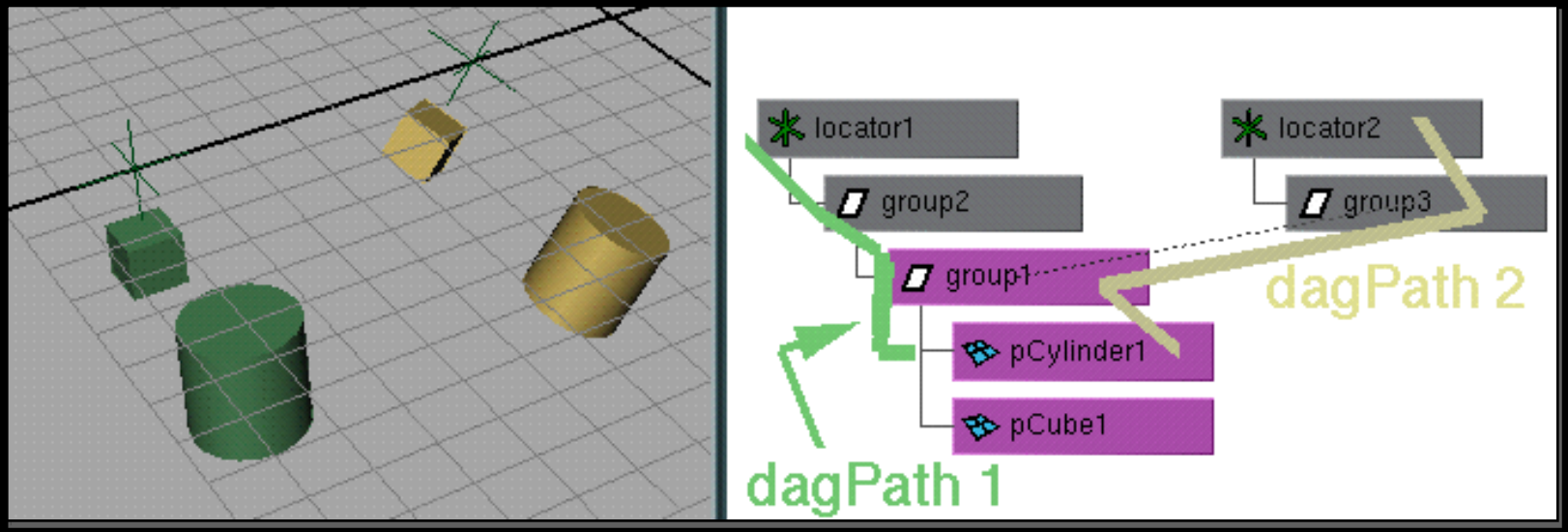
  group1|pCube2|pCubeShape1





Dag Paths

- used to find world space transformations
- used to traverse up and down hierarchy
- node names need not be unique if dagPaths are different
  (MDagPath fullPathName, partialPathName)



MObject VS. MDagPath

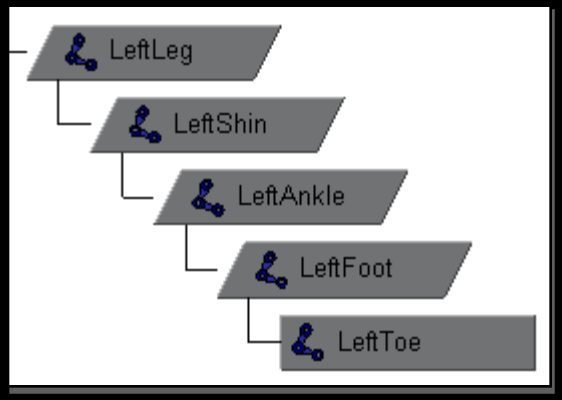
Many of the Maya API accept/return a MObject or a MDagPath

- A MDagPath is a handle describing a path to a node

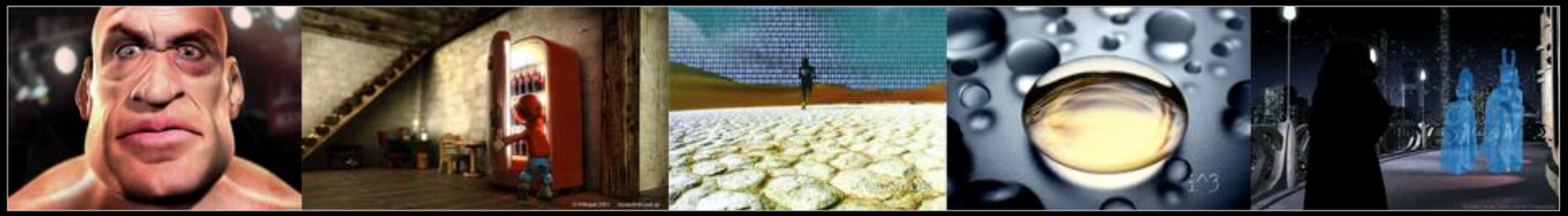
- A MObject is a wrapper around a pointer to the internal Maya object
  - Generic class (represents all node / attribute)
  - Use apiType() / hasFn() to determine what it is or what you can do with it
  - Use isNull() to determine if it is a valid MObject
  - Do not store MObject

Important API methods

- Traversal : MItDag iterator class
- Depth in hierarchy: MDagPath::length, MItDag::depth
- Getting the parent: MDagPath::pop
- Local matrix: MFnTransform::transformation
- World matrix: MDagPath::inclusiveMatrix, MDagPath::exclusiveMatrix …



Workshop Session



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Example: dagInfo

- In this exercise, we will implement a custom command dagInfo. For all the selected DAG nodes in the scene, it will print out the instance information, dag path and also inclusive and exclusive matrix.
- Important Classes: MFnDagNode, MDagPath MMatrix, MGlobal, MItSelectionList

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