The problem:
To use pHelmIvP with behaviors implemented in the MRG repository. New behaviors need to be included and linked against libHelmIvP and pHelmIvP. Changing manually the files in the IVP repository is not a good solution since it would be desirable to keep it always up-to-date to the latest version of the IVP repository.

The goal:
To have a "minimally intrusive" mechanism to add new behaviors to pHelmIvP. The idea is that any number of behaviors could be added without modifying a single line in IvP (concretely, in the behavior populator).
With the proposal below, it would be something like:

- Get a fresh copy of / update the IVP repository.
- Run "ccmake ."
- Switch "ON" the flag "HELMIVP_HAS_OXFORD_BEHAVIORS".
- Press "configure". The user will be asked to locate the Cmake "package file" for the MRG repository.
- Press "configure", "generate".

Proposed changes:

IVP/ivp/src/CMakeLists.txt
REPLACE:

```
# *** REPLACE "../../MOOS" WITH WHATEVER VALUE IS REQUIRED.
THE DIRECTORY
# *** SHOULD HAVE CHILD DIRECTORIES SUCH AS "Core",
"Essentials", ETC.
SET(MOOS_BASE_DIR ../../MOOS)

# Using absolute pathnames seems to work better then relative, because you're
# never sure from which directory a relative path will be employed in commands
# such as LINK_DIRECTORIES() ...
GET_FILENAME_COMPONENT(MOOS_BASE_DIR_ABSOLUTE ../../
MOOS ABSOLUTE)
```

BY:

```
GET_FILENAME_COMPONENT(AUX_MOOS_BASE ../../MOOS ABSOLUTE)
SET(MOOS_BASE_DIR_ABSOLUTE ${AUX_MOOS_BASE} CACHE PATH "Root directory of MOOS")
```

REASON: By default, behaves like the current version, taking the MOOS library from the local copy within IVP repository, but if the user wants to, it can be changed to point to another local copy of the svn version of MOOS.

ADD:

```
SET(HELMIVP_HAS_OXFORD_BEHAVIORS OFF CACHE BOOL "Include
Oxford behaviors within pHelmIvP")
IF(HELMIVP_HAS_OXFORD_BEHAVIORS)
    # Define a symbol for the compiler:
    ADD_DEFINITIONS(-DHELMIVP_HAS_OXFORD_BEHAVIORS)
    # Include variables with MRG configuration & behaviors dependencies.
    FIND_PACKAGE(MRG REQUIRED)
    OXFORD_EXTRA_HELMIVP_CMAKE_SCRIPTS()
ENDIF(HELMIVP_HAS_OXFORD_BEHAVIORS)
```

REASON: It allows the insertion of arbitrary code & definitions via the MRG config file, only when the user of IVP switches on the "HELMIVP_HAS_OXFORD_BEHAVIORS" CMake variable.

IVP/ivp/src/lib_helmivp/CMakeLists.txt becomes:

```
#--------------------------------------------------------
# The CMakeLists.txt for:                  lib_helmivp
# Author(s):                          Mike Benjamin
#--------------------------------------------------------

FILE(GLOB SRC *.cpp *.c)

ADD_LIBRARY(helmivp ${SRC})

# Oxford behaviors, if defined.
INCLUDE_DIRECTORIES(${OXFORD_EXTRA_HELMIVP_INCLUDES})
TARGET_LINK_LIBRARIES(helmivp $
{OXFORD_EXTRA_HELMIVP_LIBS})
```

IVP/ivp/src/lib_helmivp/Populator_BehaviorSet.cpp

INSERT IN THE LIST OF #include's ON THE TOP:

```
#if defined(HELMIVP_HAS_OXFORD_BEHAVIORS)
// OXFORD behaviors
# include <oxford_behaviors_list.h>
#endif
```

REASON: The idea is to maintain a list of "#include's" in the origin repository, so the above code remains untouched no matter the number of new behaviors added.

INSERT IN THE CHAIN OF STRING COMPARISONS IN ::initializeBehavior():

```
...
#if 1
  // Andrew Shafer Behaviors --------------------------
  else if (bhv_name == "BHV_SearchArtifact")
    bhv = new BHV_SearchArtifact(domain);
#endif

#if defined(HELMIVP_HAS_OXFORD_BEHAVIORS)
// OXFORD behaviors
# include <oxford_behaviors_populate.h>
#endif

  return(bhv);
}
```

REASON: Idem. An example of "oxford_behaviors_populate.h" is:

```
  // THIS FILE IS INCLUDED BY Populator_BehaviorSet.cpp in IVP.
  // OXFORD Behaviors --------------------------
  else if (bhv_name == "BHV_ObstacleAvoidance_PTG")
    bhv = new BHV_ObstacleAvoidance_PTG(domain);
  else if (bhv_name == "BHV_MaximumSpeed")
    bhv = new BHV_MaximumSpeed(domain);
  else if (bhv_name == "BHV_SmoothVelocities")
    bhv = new BHV_SmoothVelocities(domain);
  else if (bhv_name == "BHV_MaximizeSMStability")
    bhv = new BHV_MaximizeSMStability(domain);
```

IVP/ivp/src/pHelmIvP/CMakeLists.txt becomes:

```
#--------------------------------------------------------
# The CMakeLists.txt for:                       pHelmIvP
# Author(s):                              Mike Benjamin
#--------------------------------------------------------

FILE(GLOB SRC *.cpp)

ADD_EXECUTABLE(pHelmIvP ${SRC})

TARGET_LINK_LIBRARIES(pHelmIvP
  MOOS
  MOOSGen
  ${OXFORD_EXTRA_HELMIVP_LIBS}
  helmivp
  behaviors-ajshafer
  behaviors-marine
  behaviors-sandbox
  behaviors-colregs
  bhvutil
  behaviors
  mbutil
  ivpbuild
  ivpcore
  geometry
  logic
  m
  pthread)
```