What to Do with the Default Hadronic Cross Sections ?

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Hadronic Models vs Cross Sections

For Geant4 hadronic processes:

- No default models
- Yes default cross sections : typically the Gheisha ones
  - G4Hadron**Elastic**Process : **G4HadronElasticDataSet**
  - G4Hadron**Inelastic**Process : **G4HadronInelasticDataSet**
  - G4Hadron**Capture**Process : **G4HadronCaptureDataSet**
  - G4Hadron**Fission**Process : **G4HadronFissionDataSet**
  - G4**PhotoNuclear**Process : **G4PhotoNuclearCrossSection**
  - G4**ElectronNuclear**Process : **G4ElectroNuclearCrossSection**
  - G4**PositronNuclear**Process : **G4ElectroNuclearCrossSection**
  - G4**MuonNuclear**Process : **G4KokoulinMuonNuclearXS**

Pros & Cons

- Pros : no need to care, and if you want to use something else, then simply *AddDataSet(new Xxx)* ;
  quick also to change the default cross sections

- Cons : in the case that the alternative cross section is not applicable, i.e. the method *IsApplicable()* returns false, then it silently uses the default cross section
  - Found recently a bug in *G4ChipsNeutronElasticXS*

```
G4ChipsNeutronElasticXS::IsIsoApplicable(...) {
  if (particle == G4Proton::Proton() ) return true;
  return false;
}
```

  -> We were thinking of using Chips neutron elastic cross section, instead we were using Gheisha !
  Without default cross section, the application would have crashed immediately

What can we do?

1. Nothing, but inspect visually all *IsApplicable()* methods

2. Leave the default cross sections, but write out a warning when one or more alternative cross sections exist but the default one is used
   - Be careful of not writing too many warnings

3. Remove the default cross sections
   - Easy, but many, many files (processes, physics lists builders and constructors, examples, and tests) need to be changed
   - Moreover, if we decide to replace one cross section with another (e.g. BGG elastic cross section instead of Gheisha), we need to edit many files