Genetic dissection of Natural Dry-On-Vine trait in grapevine

Jonathan Fresnedo Ramírez

Department of Horticulture and Crop Science

July 2018

XII International Conference On Grapevine Breeding And Genetics

CFAES

THE OHIO STATE UNIVERSITY

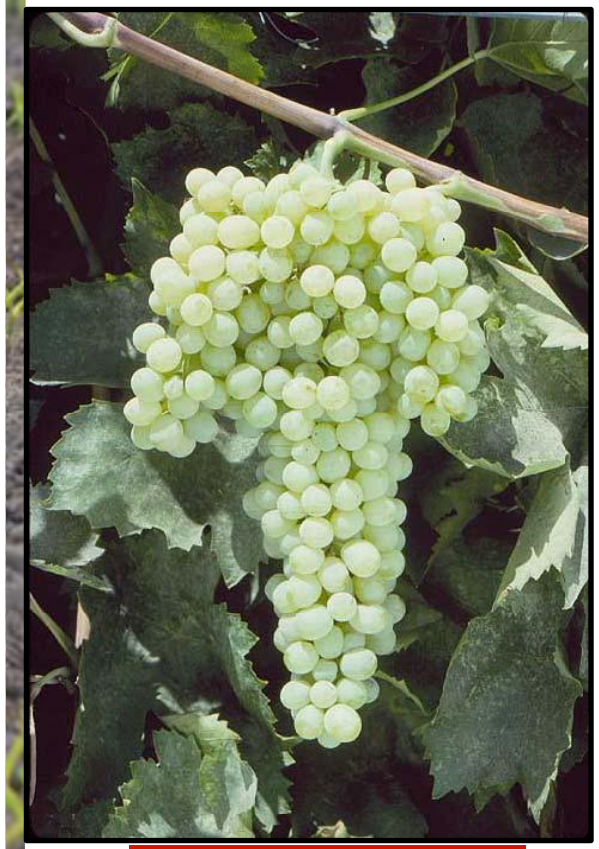
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

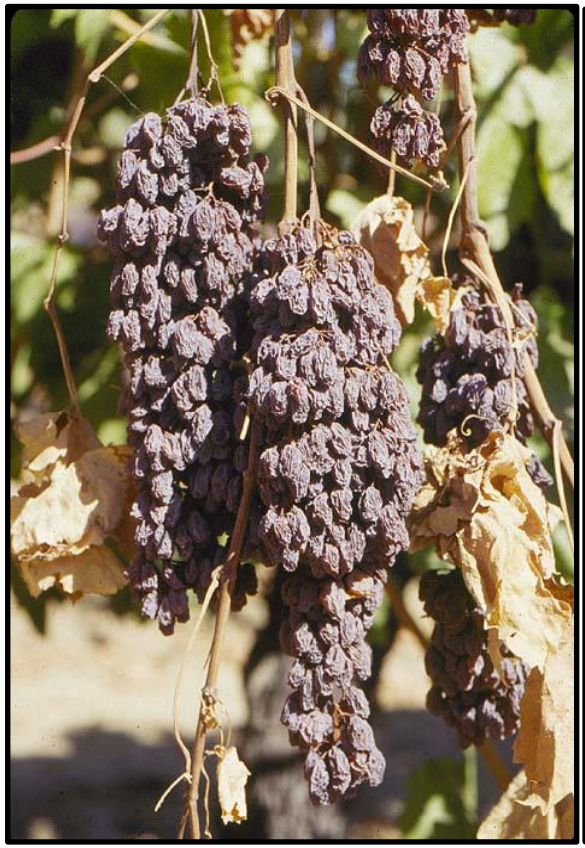
Raisins, a little of context

- Dried grapes
- Industry of more than 100 years in California
  - Multiple uses: raw, cooking, baking, brewing
- Trend to mechanization
  - Labor up to 35% of production costs
- Specialized germplasm

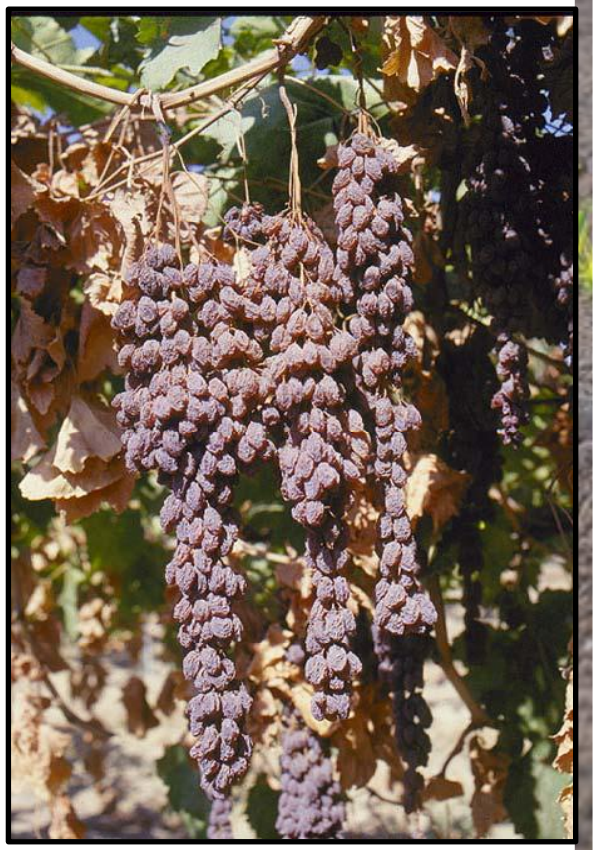
CFAES

Germplasm: traditional





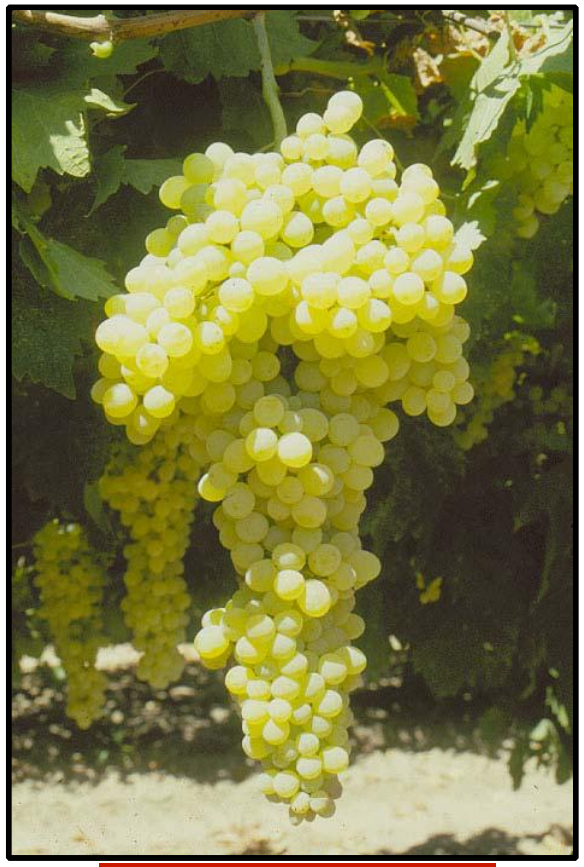
Sultanina

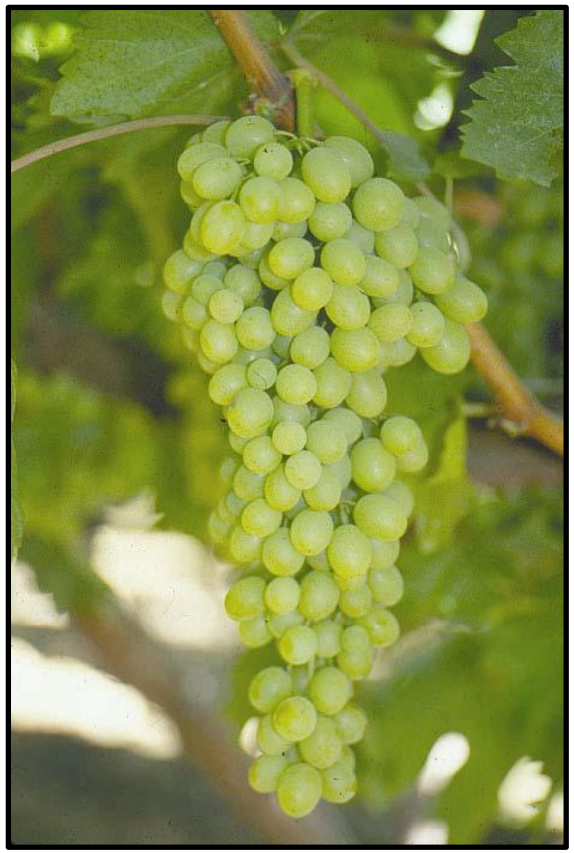


Fiesta

CFAES

Germplasm: DOV





DOVine

Selma Pete

CFAES

Germplasm: Natural Dry-On-Vine (NDOV)

Sunpreme
(B82-43)

CFAES

Traditional vs NDOV

CFAES

How to breed for NDOV raisins?

- *Sunpreme* solely source at the moment
- *Vitis*Gen
- Mapping of the trait
  - *C87-41* × *Sunpreme*, using presence/absence = No hits!
  - *A95-27* × *Sunpreme*, using % dry at three date = No hits!

CFAES

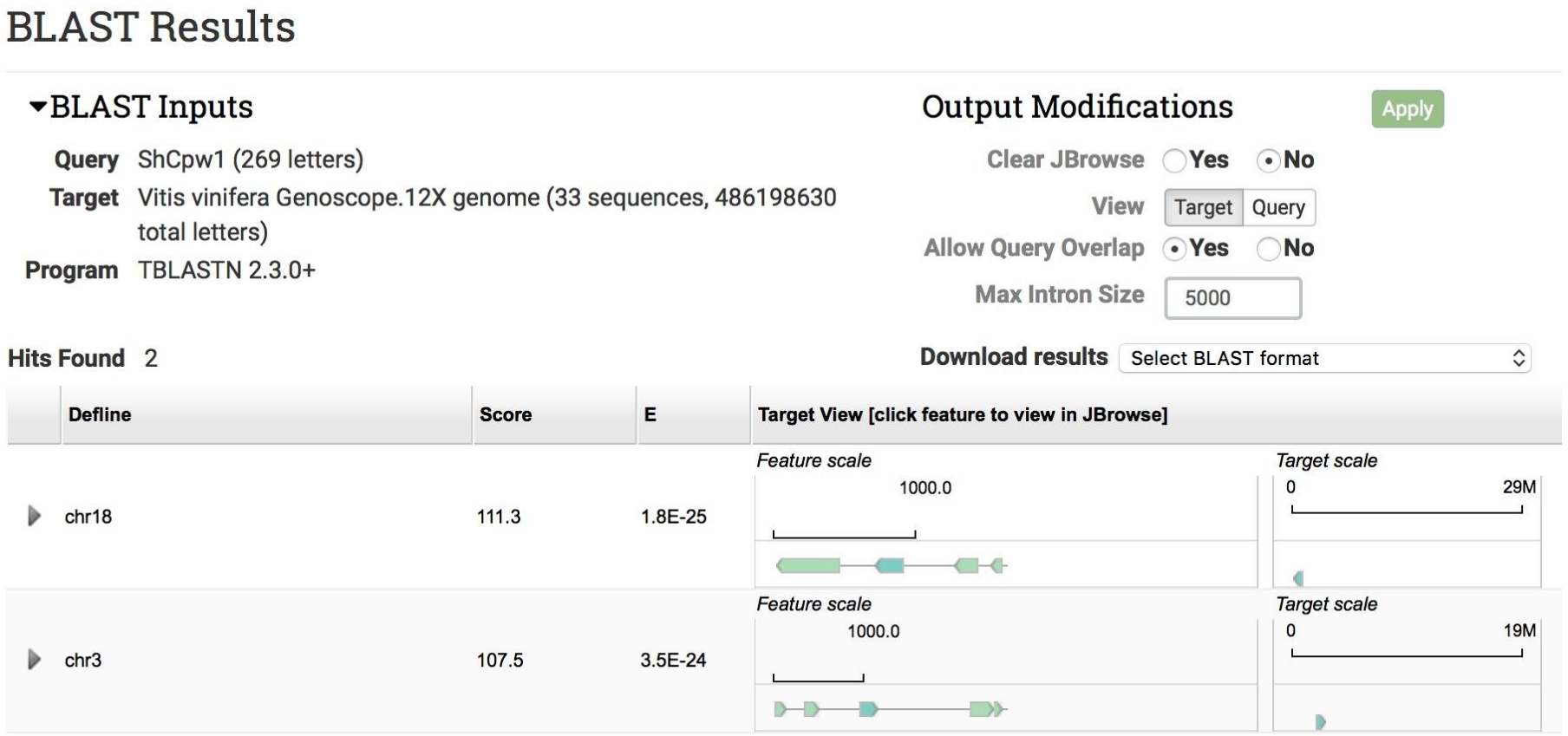
Using a different approach: candidate gene

- Did we have a well constructed linkage map?
- Are we phenotyping the correct trait?
- Fruit drying: a reason or a consequence?
- Thinking in Vavilov: trait parallel series
  - Which other fruits dry on a vine? → wild tomatoes
- Cuticular Water Permeability 1 (*CWP1*) gene (Hovav, 2007
  - cuticle microcracking in fruits of primitive green-fruited wild tomato species, *Solanum habrochaites, S. cheesmaniae* and *S. pimpinellifolium*

CFAES

Is *Cwp1* present in grapevine?

- tblastn query of *S. habrochaites Cpw1* on PN40024



CFAES

Collaboration with the USDA ARS San Joaquin Valley Agricultural Sciences Center

- Craig Ledbetter
  - Research Geneticist
  - Segregating populations (Tray-dry × NDOV) and phenotypic evaluation

- Steven Lee
  - Molecular Biologist
  - Gene cloning and transgenic preparation/evaluation

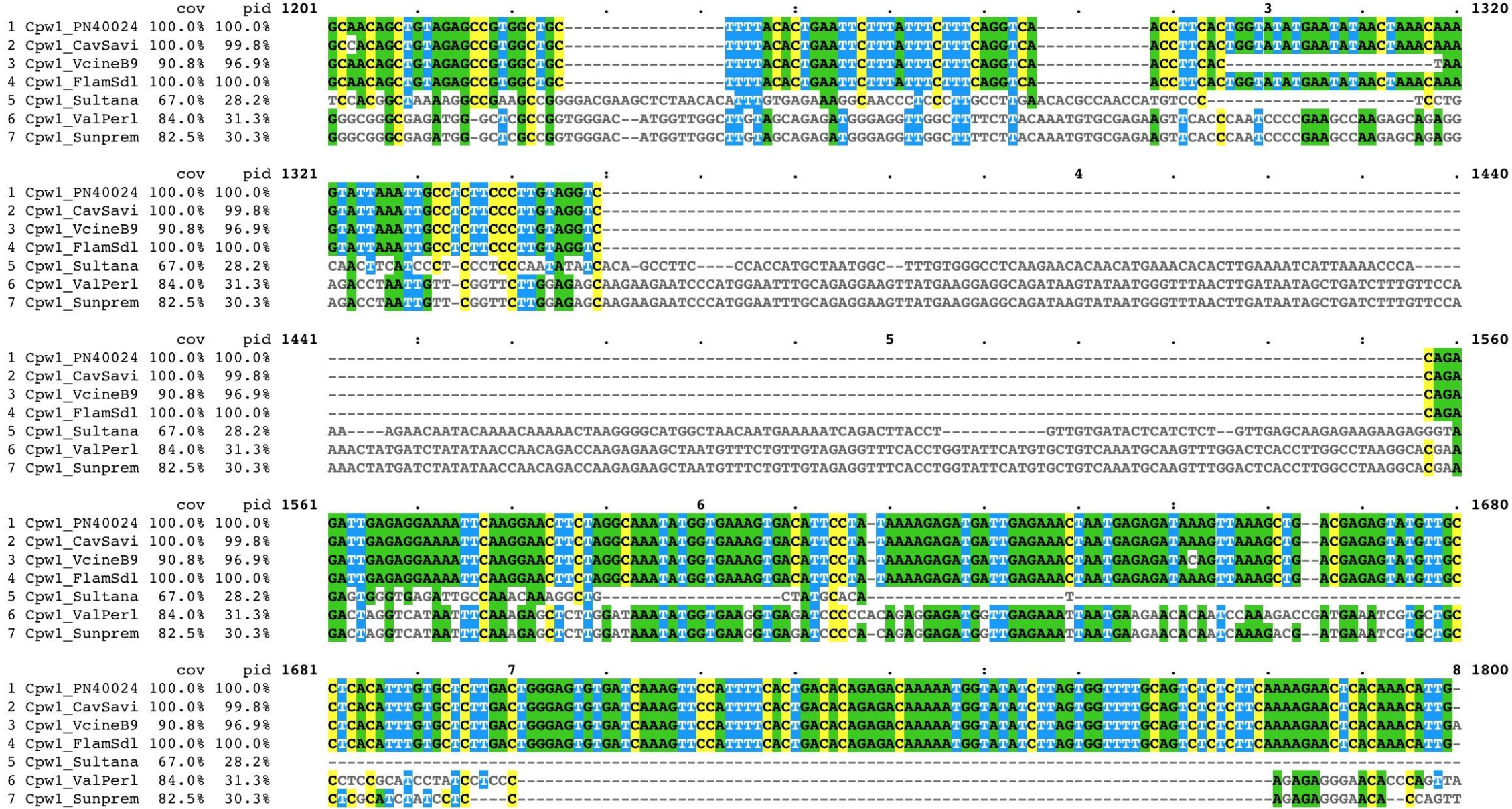
CFAES

Gene cloning and (simple) functional evaluation

- Generate primer sequences based on PN40024
- *Sunpreme*, *Valley Perl* and *Y308-344* (NDOV + REN4)
- Transferring into tomato (ongoing)
  - Phenotypic evaluation on microfissure density

CFAES

What about *Cpw1* in other genotypes?



Expectations

- **Test the hypothesis whether or not *VviCpw1* is responsible for NDOV trait**
  - Provide a tool for the early identification of NDOV genotypes
  - Link NDOV with studies of cuticle characteristics (epidermis) in grape fruits (drying)
  - Collaborate in the selection of NDOV genotypes in a more comprehensive view
- Genotyping of available pedigree and derived germplasm from *Sunpreme*
- Design of transcriptomic and phenotypic evaluations with additional functional tests

Taken from Hovav *et al.* 2007, The Plant Journal, 52(4) 627-639

CFAES

NDOV is a minute part but relevant

Agronomic

Sensory

CFAES

Thanks for your attention!

CFAES

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES