# DMRSEF 2018-2019 Fair Season

Jennifer Hellier, PhD Fair Director

### **About the DMRSEF**

- Began in 1963 making this the 56<sup>th</sup> Annual Denver Metro Regional Science & Engineering Fair
- Serve eight counties in Denver metropolitan area: Adams, Arapahoe, Broomfield, Clear Creek, Denver, Douglas, Jefferson, and Summit



### About the DMRSEF

The DMRSEF is one of Colorado's 13 International Science and Engineering Fair Regions that feeds into the Colorado State Science and Engineering Fair.



### 2018 Awards

- Senior Best in Show:
  - First Place = \$750
  - Second Place = \$500
  - Third Place = \$250

- Junior Best in Show:
  - First Place = \$500
  - Second Place = \$250
  - Third Place = \$125
- Senior Division Best in Show winners (1<sup>st</sup> 3<sup>rd</sup>) receive all expense paid trip to compete at ISEF.
   Special awards: provided by sponsors of the fair.



# **2019 Categories**

- Animal Sciences (AS)
- Behavioral Science (BS)
- Biological Sciences -Biochemistry & Cellular and Molecular Biology (BIO)
- Engineering- Biomedical, Environmental Engineering & Engineering Mechanics (ENG)
- Chemistry (CH)

 Computer Sciences -Computational Biology, Bioinformatics, Embedded Systems, Mathematics, Robotics, Intelligent Machines & Systems Software (CMP)



# **2019 Categories**

- Earth and Environmental Sciences (EV)
- Energy- Chemical, Physical (EGY)
- Materials Science (MS)
- Medicine & Health Science -Biomedical, Health & Translational Medical Science (MED)
- Microbiology (MI)
- Physics and Astronomy (PA)
- Plant Sciences (PS)
- Social Sciences (SS)



# Successful Categories in the last five years at DMRSEF, CSEF, & ISEF

	DMRSEF		CSEF		ISEF	]	Overall
	Junior	Senior	Junior	Senior			
Materials Science (MS)	1	2	0	0	0		3
Medicine & Health Science -Biomedical, Health &	1	5	0	4	2		12
Translational Medical Science (MED)							
Physics and Astronomy (PA)	2	1	1	2	1		7
Animal Sciences (AS)	0	0	2	0	0		2
Behavioral Science (BS)	1	0	2	0	0		3
Chemistry (CH)	2	0	2	0	3		7
Computer Sciences -Computational Biology,	4	2	0	2	1		9
Bioinformatics, Embedded Systems, Mathematics,							
Robotics, Intelligent Machines & Systems Software							
(CMP)							
Earth and Environmental Sciences (EV)	2	2	5	0	1		10
Energy: Chemical & Physical (EGY)	0	0	2	1	1		4
Engineering- Biomedical, Environmental	1	2	0	6	5		14
Engineering & Engineering Mechanics (ENG)							
Biological Sciences -Biochemistry, Cellular &	3	3	1	3	1		11
Molecular Biology (BIO)							
Plant Sciences (PS)	0	0	0	2	0		2
Social Sciences (SS)	1	0	0	0	0		1

REGIONAL SCIENCE AND ENGINEERING FAIR

### **2018** Deadlines

### Online registration opens Nov. 30, 2018.

• Last day to register is January 15, 2019.

**NO EXCEPTIONS** 

Paperwork corrections due February 5, 2019.



### **2019** Tentative Schedule

### Friday, February 15, 2019: Day of the Fair

Registration **Display & Safety/Photos Tours/Activities/Lunch** Judges Preview without students Interviews with Judges Students dismissed with projects TBD, February 16 or 17, 2019: Awards 6:30-8:30PM Ceremony

8:30-9:30 a.m.

9:30-11:30 a.m.

11:30 a.m.-1:00 p.m.

Noon-1:00 p.m.

1:00-5:00 p.m.

5:00 p.m.



# **Display and Safety**

Zach Richards Display and Safety Chair

# **Display and Safety**

- No food (candy included), no water, nothing that contains chemicals in vials
- No syringes, knives, or ammunition
- No mechanical devices that have pinch points
- No animals or animal parts
- No glass
- No plants, no dirt, no rocks
- See pages 24-26 of the 2019 Rules and Guidelines



### Information on Judging

Meredith Tennis, PhD Category Judges Chair JoJo Law Special Awards Judges Chair

# Judging

- Over 200 volunteer category judges are recruited from academic institutions, industry, retired professionals, and interested community members
- Category judging is based on a 100 point rubric from the INTEL ISEF
- Rubric can be found at

https://student.societyforscience.org/judging-criteria-intel-isef



# Judging

 Special awards judges are recruited to judge for specific awards based on criteria from award sponsors

### Judging goals:

- Identify category places, best in fair, and special awards
- Give some feedback to each student for future presentations or revision

 Provide positive interactions with scientists for students



# Rule Changes and Common Paperwork Errors

Jennifer Hellier, PhD Jesse Hinckley, MD, PhD Scientific Review Committee Co-Chairs

# Rule Changes for 2018-2019

### General

- Minor changes in wording (spelling, grammar, formatting)
- P. 4 New section on digital paperwork and signatures
- All sections (human participant, vertebrate animals, PHBAs, hazardous substances) have been realigned to state general rules first and put exemptions at the end of the section.

### Human Participants

- <u>*Removed expedited review.*</u> Any project that requires IRB approval requires full approval.
- Clarification of Regulated Research Institution IRB and School IRB
- New section on human participant involvement in student-designed invention, prototype, computer application and engineering/design projects



# Rule Changes for 2018-2019

### Vertebrate Animals:

 P. 10 Rule 6 - 15% is the maximum permissible weight loss for experimental animals compared to control group.

#### **PHBAs:**

• P. 14 B - Describes conditions under which various rDNA technologies may be conducted.

### Hazardous Chemicals, Activities, or Devices:

• Clarifies sections on regulated drones and radiation



# Rule Changes for 2018-2019

### **Engineering Projects Guide:**

• P. 20 - New Section. Provides checklist for hazardous chemicals, substances, devices; human participants; vertebrate animals; PHBAs.

#### Forms:

- 1C Now two pages
- 7 Only current and previous project details are on the form. Additional forms may be used for all prior projects.



### **Adult Roles**

- Adult Sponsor
- Qualified Scientist
- Designated Supervisor
- Institutional Review Board (IRB)
- Scientific Review Committee (SRC)



### **Incomplete Paperwork & Common Errors**

- Check boxes NOT marked on forms
- Required forms missing (particularly Form 3)
  - Each project should have a Form 3 to identify potential risks and how they will be reduced
  - Form 3: N/A only allowed on Question 4
- BSL2 work in BSL1 lab setting



### **Incomplete Paperwork & Common Errors**

- Research Plan: Procedures not complete or missing information to understand how the experiment was completed
- Dates on forms are incorrect:
  Must be dated PRIOR to experimentation
- Copies not clear or easy to read



### Please WATCH our videos about how to fillout and complete paperwork

### clas.ucdenver.edu/denversciencefair/



### Human Subjects

- Exempt Projects/Studies: READ CAREFULLY!
   No IRB Review, no Form 4
- Full IRB Review Projects/Studies
  - IRB Review by at least 3 adults, Form 4 with correct boxes checked, dated PRIOR to experimentation
  - School IRB or Regulated Research Institution IRB



### Human Subjects: Exempt Projects

- Student-designed Invention, Prototype, Computer Applications or Engineering/Design project when no health/safety hazard & the student researcher is the only human testing the invention. → Form 3 is required.
- Data/record review studies (publically available data)
- 3. Behavioral Observations in public setting
- 4. Pre-existing, de-identified/anonymous data set



### **Research Plan**

- Read page 31 of 2019 Rules and Guidelines:
- All projects must have a Research Plan and/or Project Summary
  - Written prior to experimentation detailing research question(s), methodology, and risk assessment.
  - Addendums required if changes are made during the research. Any additional approvals must be obtained and documented. This document can serve as Project Summary.
  - If no changes are made from the original research plan, no project summary is required.



#### Research plan

Many people in the Archery society debate constantly about which bow is more accurate and consistent; the Compound, Recurve, or Long bow. With my research and my hypothesis, that the Compound bow will be the most accurate and consistent, I hope to shed a light in the debate for the Compound Bow. I am using a professional Bowhunter that has used this varity of different bows in his hunting career.

To conduct my experiment, we will travel to Barr Lake in Brighton Colorado where we will use their Archery Range. We will be shooting at 10 and 20 yards with three identical, carbon arrows and the Compound, Recurve, and Long Bows. We will shoot for consistency by doing the same thing every time then measuring the distance between the farthest left and right arrow. We will also shoot for accuracy by aiming at the same point in the target every time then measuring the group for each bow. As always, safety first......That is why we have the guidance of a Professional Bowhunter, a qualified archery range, and using common sense for safety.

My sources: Jim Titchenell, www.Bowhunters Paradise.com, <u>www.Bowtecharchery.com</u>, Colorado Bowhunters Association, Gamelines Archery club, Muzzy Archery Potential SRC Interview



**Question:** If we use the solvent extraction method with Decanoic acid in different ratios of water to simulated saltwater, will we able to desalinate water at an effective rate?

**Ratios (Acid to water):** 25:1 20:1 15:1 10: 5:1 1:1

**Hypothesis:** If we use the solvent extraction method with Decanoic Acid to remove salt from water, then we will find that the Decanoic acid at the 20:1 and 15:1 ratios will work because those ratios are the closest to the original test.

#### Materials:

- 1 litre >98% Decanoic Acid
- 1 litre of distilled water
- 35g of table salt
- Hot plate with magnetic stirring capabilities
- 100mL Beaker
- 100mL Separation Funnel
- Electric Meter

#### Procedures

- Mix 1L of water with 35g of salt. Stir until fully dissolved.
- Take 2mL of the solution and mix with 50 mL of Decanoic acid in the 100 mL beaker. Put onto a hot plate and heat to 70°C with continual stirring for 1 hour.
- After stirring is finished, turn the heat off and remove from hot plate. Let it cool and gravitationally separate. Using the glass pipet, carefully remove the transparent liquid from the solution.
- Add the liquid into a small graduated cylinder. Use the electric meter to record the electrical resistance of the liquid. Record Data.
- Repeat step 3-5 9 more times, then another 10 for each of the given ratios until the test stops to work. From that point, test each ratio 1 part of acid up until the ratio with the highest efficiency is found.
- Observe and record data.
- Make a conclusion based on data and observations.

#### **Safety Precautions**

Take great care with the Decanoic acid solutions because they are corrosive and hazardous. The Decanoic acid is flammable. Nitrile gloves will be worn and an experienced chemist will be over watching.

Hot plates provide a hazard because of their hot temperatures in this experiment for an extended period of time. Great care will be taken to avoid making direct contact with a hot plate and there will be an experienced supervisor over watching.

#### Bibliography

- 1 "Solvent Extraction" Britannica School. N.p., n.d., Web., 08 Oct 2014
- 2 Bajpayee Anurag, Tengei Luo, Andrew J. Muto, and Gang Chen. "Very Low Temperature Membrane Free Desalination by Directional Solvent Extraction." *Supplementary Material (ESI) for Energy & Environmental Science (2011)*: n. pag Printhttp://www.rsc.org/suppdata/ee/c1/c1ee01027a/c1ee01027a.pdf
- 3 "Capric Acid." Wikipedia. Wikimedia Foundation, 10 July 2014. Web. 08 Oct. 2014.
- 4 "Seawater." Britannica School. N.p., n.d. Web. 08 Oct. 2014.
- 5 "Taking the Salt out of Water with Oil." *Taking the Salt out of Water with Oil.* N.p., n.d, Web. 08 Oct. 2014 <u>http://mpc-www.mit.edu/agenda/item/140-taking-the-salt-out-of-water-with-oil</u>
- 6 Gregory, Michael J. "Organic Chemistry, Biochemistry" Organic Chemistry. Clinton Community College, Web. 08 Dec. 2014<u>http://faculty.clintoncc.suny.edu/faculty/michael.gregory/files/bio%20101/bio%20101%20lectures/biochemistry/biochemi.htm</u>



