23rd edition

Science on tourne !

scienceontourne.com

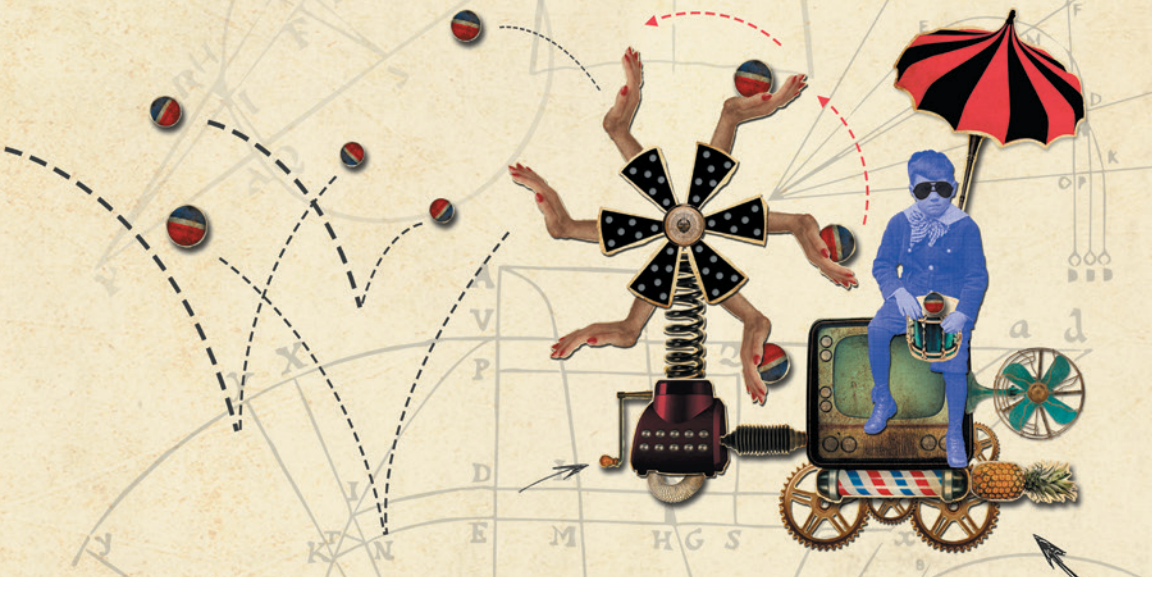
HURLER !

National final

MAY 2, 2015

CEC EN CHARLEVOIX

INTERCOLLEGIATE SCIENCE CONTEST



An event of

CENTRE DE DÉMONSTRATION EN SCIENCES PHYSIQUES

Partners

Québec

canal SAVOIR

The CHALLENGE

Create an autonomous machine that hurls a ball against a wall as many times as possible within 60 seconds.

PARTICIPATE IN SCIENCE, ON TOURNE!

Professional Category

Any student – youth or adult – enrolled at a public or private college in Québec in a full-time or part-time program in any discipline regardless of whether the program is offered through regular or continuing education.

Amateur Category

Any staff member employed at any public or private college in Québec.

How to sign up?

- Create your team (there may be no more than 3 participants per team). All members of your team must be enrolled at the same college since you will all represent your college if you move on to the national finals. An individual student cannot belong to more than one team nor submit more than one machine.
- The members of the team must be the same for the local and national finals.
- Contact your college's student services office to get the name of the person in charge of the contest at your college or your local organiser. Complete the registration form which that person gives you and return it to him or her. The same person will be responsible for sending your registration form to the *Science, on tourne!* team.
- Each participating team must give its machine an original name. The same name must be used for both the local and national finals. Trademarks and registered marks may not be used.

Local finals

FROM JANUARY 14 TO APRIL 10, 2015

Each institution organises its own local final during which teams compete in their respective categories (*Professional* or *Amateur*).

Each college is responsible for forming a jury which will evaluate the performance of the teams competing in the local contest.

Each participating college can award prizes to the winners of the local finals in the Professional and Amateur categories. It is up to the college to decide what those prizes will be.

The winning team from each college will be invited to participate in the national finals (one team per college per category).

The names of the winners of the local finals must be sent — no later than April 10, 2015 — to the SOT organisation.

National finals

MAY 2, 2015 AT LE DOMAINE FORGET LOCATED AT ST. IRÉNÉE, IN COLLABORATION WITH LE CENTRE D'ÉTUDES COLLÉGIALES EN CHARLEVOIX

The national finals bring together the winners in the *Professional* category from each college. The public is invited to attend the event. The *Amateur* category winners will get together at the same venue on the evening of Friday, May 1, 2015 for a friendly competition.

Canal Savoir will be on the spot at the national finals to broadcast the highlights of this edition. Stay connected to see the broadcasting schedule!

canal SAVOIR

The CHALLENGE

Create an autonomous machine that hurls a ball against a wall as many times as possible within 60 seconds.

The contest features two rounds, a qualifying round and a final round. The five teams with the best scores at the end of the qualifying round compete in the final round.

Safety first!

Before beginning your project, please be aware that the elements you will use in this contest to store your machine's energy might cause injury if they are not handled carefully. We strongly recommend that contestants wear protective equipment such as safety glasses and gloves. Thanks for taking care of yourself!

DEFINITIONS

The words defined below will appear in the following sections describing the contest. This is what they mean:

1.1. **Ball in play:** A ball is considered "in play" if after passing through the releasing mechanism, it:
- Is located in the playing area; and
- Has not been declared lost.

A ball in play serves for scoring.

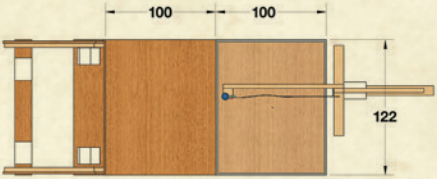
1.2. **Lost ball:** A ball may be declared lost by the team representative (at any time) or by the referee (if a rule has been broken).
- A lost ball can be replaced by a new ball that will be entered into play via the releasing mechanism; and
- A lost ball must be removed from the playing area and given to the referee before being replaced.

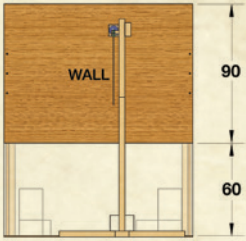
A ball that has been declared "lost" can no longer serve for scoring.

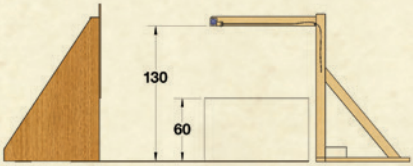
1.3. **Official attempt:** This is a 60-second timed period, included in the team's performance as described in 7.4, during which the machine must be autonomous and can score.

1.4. **Machine:** Everything located within the machine area at the beginning of the official attempt.

1.5. **Team representative:** This term designates the member named by the participating team who, during the official attempt, will have the following responsibilities:
- Announce to the referee that his or her team is ready to conduct its official attempt;
- Release (put into play) the first ball;
- Recover the lost ball (if necessary);
- Put the next ball into play if a ball has been lost; and
- Move the releasing mechanism (if necessary).







SCORING

$P = \sum [C_n*(10 - n)]$

- C_n corresponds to the number of times ball n hits the wall.
- **n** corresponds to the ball number (1 to 6). The numbers correspond to the chronological order in which the balls are used during an attempt.
- The symbol $\sum$ means that the scores attributed to each of the balls will be added together. See the calculation example provided in 2.3.

2.1. For its contact with the wall to be counted, a ball in play must be pitched by the machine. The ball must touch the machine between every two contacts with the wall.

2.2. Each team will have a maximum of two official attempts. The best score will be kept. For each official attempt, a team will have two boxes of three balls. The balls will be numbered from 1 to 6, in the chronological order of their entrance into play. If a ball is lost, the team can use the next ball to continue the official attempt (see 7.5.4.).

2.3. Scoring calculation example:

A team that manages to have its first three balls hit the wall during an official attempt will have its score calculated in the following manner:

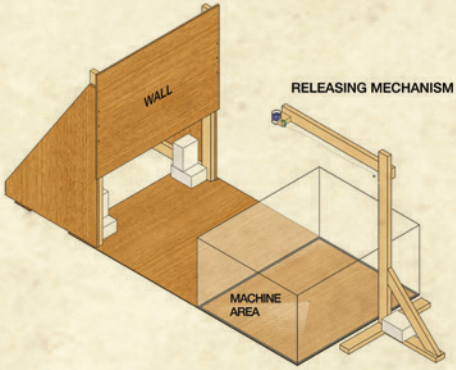
Ball 1 hits the wall five times:
So $C_1 = 5$ and $n = 1$; the score attributed to this ball is $C_1 * (10 - 1) = 5 * 9 = 45$

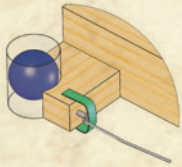
Ball 2 hits the wall three times:
So $C_2 = 3$ and $n = 2$; the score attributed to this ball is $C_2 * (10 - 2) = 3 * 8 = 24$

Ball 3 hits the wall twice:
So $C_3 = 2$ and $n = 3$; the score attributed to this ball is $C_3 * (10 - 3) = 2 * 7 = 14$

The remaining balls (4, 5 and 6) were not used and so $C_4 = C_5 = C_6 = 0$.
No points are attributed to these balls.

The total score for this attempt will be the sum ($\sum$) of the score obtained by each ball.
$P = 45 + 24 + 14 + 0 + 0 + 0 = 83$





PLAYING AREA

3.1. The playing area is the area containing the wall, the machine area and the track. There is a releasing mechanism to put the balls into play, but it is not considered part of the playing area.

3.2. The wall is a ½" thick MDF panel measuring 122 cm x 90 cm and attached to 2" x 4" supports measuring 130 cm in length. Its bottom edge stands 60 cm above the track.

3.3. The track is an MDF panel measuring 4' x 8' x ¼" placed flat on the floor.

3.4. The machine area is a volume whose dimensions are 122 cm x 100 cm x 60 cm; this is the area in which the team must place its machine. The area is located 100 cm from the wall; its edges are shown by a line drawn in marker on the panel that serves as the track.

RELEASING MECHANISM

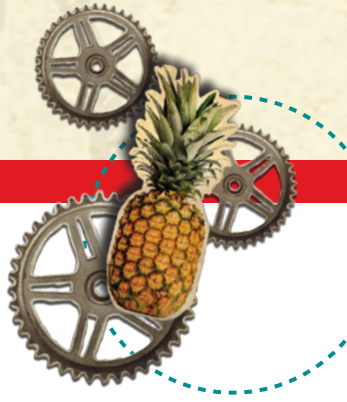
4.1. It consists of a stand, a tube (a racquetball ball box, with the ends cuts off) and a pin. The tube has a hole located 2 cm from its lower end into which the pin is inserted. The pin is horizontal and must hold the ball 130 cm above the track. See the website for construction details.

4.2. The team can place the releasing mechanism so that the ball falls onto the desired spot within the machine area.

4.3. The releasing mechanism can be moved at any time.

All the dimensions are indicated in the sketches (precise to ± 0.2 cm)

If there are any discrepancies between the English and the French versions of the flyer, the French version prevails.



OFFICIAL MATERIAL

Official balls: Six Penn brand racquetball balls (2 boxes).
See website for details.

RULES

A team can be barred from participation in the contest, disqualified, lose its official competition attempt, or have a "ball in play" declared "lost" if it fails to comply with one or more of the general rules.

6.1. Outside the official attempt, any form of energy – except combustion – may to used to store energy in the machine. Please take note that the use of human muscular energy is authorised.

6.2. During the official attempt, the energy stored in 6.1 can be used in any form, except in the form of electricity or combustion.

6.3. The moment the team informs the referee that it is ready to begin an official attempt, the machine must be autonomous. At this time, only interactions between the team's representative, the ball that is to be put into play and the releasing mechanism are permitted.

6.4. The machine must remain in its area at all times during an official attempt. If it moves outside the limits of this area, the attempt shall be considered over (even if the 60 seconds have not yet fully elapsed) and the score earned up to the moment when it left the area will be recorded.

6.5. The balls must be put into play via the releasing mechanism.

6.6. Once in play, a ball may interact only with the machine or the playing area, otherwise it will be declared lost.

6.7. Only one ball is authorised within the playing area at any time. A lost ball located in the playing area must be recovered and given to the referee before a new ball can be put into play (no more than 6 balls may be used for an official attempt).

6.8. If an interaction with the machine is required to dislodge a ball that has been declared lost, the official attempt is stopped. No additional points may be counted for this attempt after that. If the team's representative has to touch the machine (either directly or using a tool), this will be considered an interaction.

6.9. The playing area may not be soiled, damaged or modified.

6.10. The machine, the tools and the rest of the technical material must fit into no more than 2 separate boxes that would normally each hold 5,000 sheets of letter-sized paper (8.5” X 11”).

6.11. The machine must have been made by the members of the team participating in the national finals.

6.12. The machine’s operation must not pose any danger to people nor be likely to damage the competition premises.

6.13. Participants must abide by the times set for the various parts of their performance.

NATIONAL FINALS

Before the competition:

7.1. On the evening of Friday, May 1, each team – whether competing in the *Professional* or *Amateur* category – must have its machine inspected. It must show that its machine complies with all the rules, particularly Rule 6.12 which deals with safety.

During the competition:

7.2. Each team will have five minutes backstage to prepare its machine. A table will be provided for this purpose.

7.3. When invited to do so by the competition host, the team will place its material in the presentation area and will then have two minutes to give its oral presentation.

7.4. A whistle will signal the beginning of the team’s performance; it will then have four minutes to complete the following steps:

7.4.1. Place its machine in the machine area;

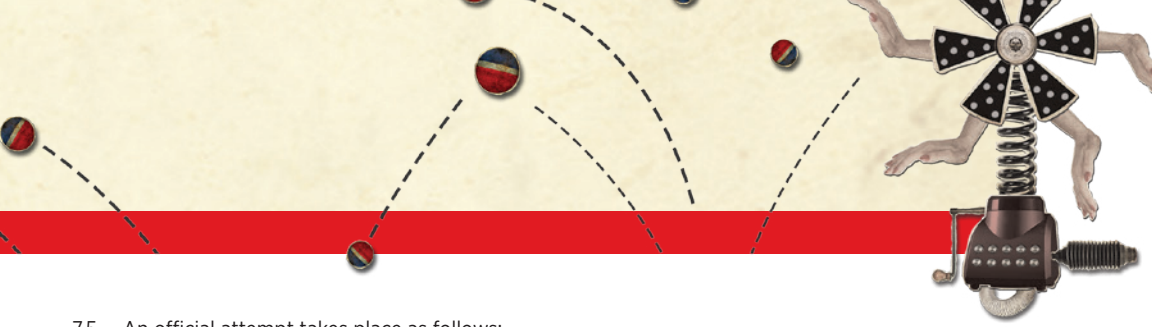
7.4.2. Position the releasing mechanism;

7.4.3. Perform one or more unofficial attempts, if necessary;

7.4.4. Get the machine completely ready for the official attempt;

7.4.5. Inform the referee that it is ready to begin its first official attempt. See 7.5 for information about how the official attempt is to take place.

7.4.6. If the team wishes and if there’s enough time left, it can perform a second official attempt after the referee blows the whistle, repeating steps 7.4.1. to 7.4.5.



7.5. An official attempt takes place as follows:

7.5.1. The team's representative, in charge of releasing the ball, remains near the machine while the other team members withdraw to behind the withdrawal line with the material not being used.

7.5.2. The referee blows the whistle and starts the 60-second count-down on the clock, signalling the beginning of an official attempt.

7.5.3. To put the first ball into play (and the other balls after that, if necessary), the team's representative must remove the pin to release the ball located in the holding tube.

7.5.4. If a ball is lost during an official attempt, the team's representative must follow rules 6.5., 6.7. and 6.8. to put another ball into play.

7.5.5. The official attempt is over at the end of the 60 seconds or when the participants, with the referee's approval, declare the attempt to be over before the 60 seconds have elapsed. The score is recorded.

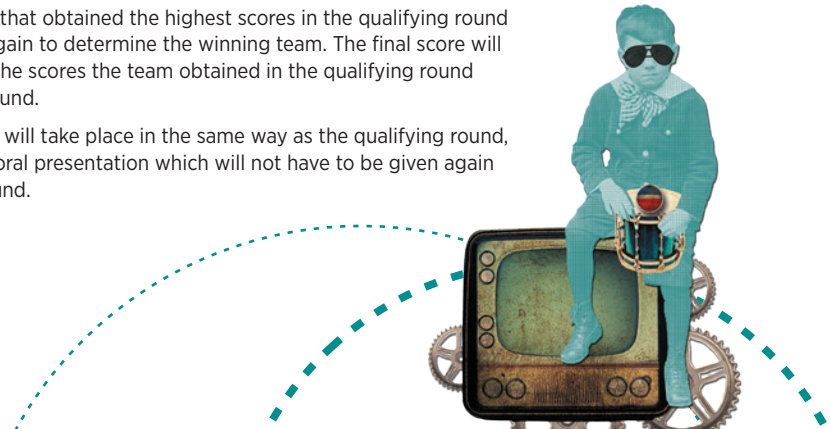
7.6. The best score obtained for a team's two official attempts will be used to establish the team's general ranking for the qualifying round.

FINAL ROUND

8.1. Only three balls will be available for the final round.

8.2. The five teams that obtained the highest scores in the qualifying round will compete again to determine the winning team. The final score will be the sum of the scores the team obtained in the qualifying round and the final round.

8.3. The final round will take place in the same way as the qualifying round, except for the oral presentation which will not have to be given again for the final round.



STEERING COMMITTEE

Hugo Beauséjour, Physics teacher, Cégep régional de Lanaudière à L'Assomption

Virginie Bertrand-Gaucher, Réseau intercollégial des activités socioculturelles du Québec representative, Sociocultural Officer, Cégep de Trois-Rivières

Michel Besner, Math teacher, Vanier College

Martin Carpentier, Lab tech, Collège Gérald-Godin

Olivier Dubé-Thériault, Junior Engineer, Festo Didactic

Gabriel Giguère, Chemistry teacher, Centre d'études collégiales en Charlevoix

Marcel Lafleur, Director, Centre de démonstration en sciences physiques

Michel Madore, Consulting analyst, Ministère de l'Économie, de l'Innovation et des Exportations

Hélène Nadeau, Physics teacher, Dawson College

Ludivine Ollive, Contest Coordinator, Centre de démonstration en sciences physiques

SCIENTIFIC COMMITTEE

Martin Carpentier, Lab tech, Collège Gérald-Godin

Viviane Lalande, Ph.D. student, École Polytechnique de Montréal

Alexandre Lebel, Engineer, Jalbert Automatisation

Simon Lupien, Mechanical engineering technology teacher, Cégep de Saint-Jérôme

Yannick Tremblay, Physics teacher, Collège Gérald-Godin

Good luck, everyone!

PARTICIPATE IN SCIENCE, ON TOURNE!
MANY VALUABLE PRIZES!

AWARDS

At the national finals, prizes will be awarded to the winners in the *Professional* category only.
The winning team in the *Amateur* category will receive a souvenir trophy.

Challenge Award
A **$1,000** award will be presented to each member of the team that gets the highest score.

Québec

Women's Participation Award
A **$500** award will be presented to a female student whose name is drawn randomly from amongst those of all female participants in the *Professional* category in the local finals.

Men's Participation Award
A **$500** award will be presented to a male student whose name is drawn randomly from amongst those of all male participants in the *Professional* category in the local finals.

Association francophone pour le savoir
Acfas

Free registration for the Science and Société Forum
Each member of the challenge's winning team will receive free registration for the International Science and Society Forum.

Ordre des Technologues Professionnels du Québec
www.otpq.qc.ca

Ingenuity Award
A **$1,000** award will be presented to the team whose assembly is outstanding for its innovative concept, assembly quality and ease of use and operation.

ROCHE

Design Award
A **$1,000** award will be presented to the team whose assembly is outstanding for its innovative appearance, originality and visually pleasing aspect.

Hydro Québec

Recycling Award
A **$1,000** award will be presented to the team that has made the best use of recycled materials.

Fédération des cégeps

Award of Merit
A **$1,000** award will be presented to the team that earned distinction in the following five categories: performance of their machine, oral and written communication, ingenuity, design and recycling.

Jury's Choice Award

A **$1,000** award will be presented to a team during the national finals.
The selection criteria for this prize are chosen by the members of the jury.

People's Choice Award

A **$1,000** award will be presented to the winning team chosen by public vote during the national finals.

Communication Award

This bursary will be awarded to a team for the quality of its communication. Each member of the team will receive a **$1,500 travel bursary** to participate in the *Sciences et Citoyens* event at the Futuroscope in Poitiers, France, in fall 2015.

To be eligible for this award, the teams must write a text in French presenting their machine.

For information about the evaluation criteria used to designate award winners, please visit, **www.scienceontourne.com**

BURSARIES

Only participants in the *Professional* category in the national finals are eligible for these bursaries; the winners will be chosen by means of a draw.
Visit the website for more details.

One $4,000 tuition fee bursary offered by Université Laval

One $1,000 enrolment bursary offered by the École Polytechnique de Montréal

One $1,500 tuition fee bursary offered by the École de technologie supérieure

PARTICIPATION PRIZES

Two trips for two people to James Bay in 2015 offered by Hydro-Québec

A day of discover with Roche ltée, Groupe-Conseil engineers and technicians – a unique opportunity to prepare your life plan!

3D scanning. Two teams will have their machines scanned in 3D, offered by Créaform.

Each participant in the *Professional* category at the national finals will receive a **one-year subscription to the magazine, *Québec Science*.**

And that's not all! Other participation prizes, offered by Hydro-Québec, Université Laval and ACFAS, will be awarded by random draw. All participants present at the national finals are eligible for this draw.

Science, on tourne! thanks its exceptional partners.