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PRESS RELEASE

THE 2022-2023 ARC STUDENT PRIZES:
SPOTLIGHT ON THREE SOCIALLY IMPACTFUL PROJECTS

Montreal, May 19, 2023 – On May 8, 2023, the Association pour la recherche au collégial (ARC) announced the winners of its Student Prizes competition. In the first phase, a jury selected the portfolios of three finalists. In the second phase, it heard the finalists' oral presentations at the ARC colloquium, *Durable, la recherche collégiale?*, held during the 90th Acfas convention, and awarded the prizes after exhaustive deliberations.

The first prize went to Yu Ran Wang, an Honours Pure and Applied Sciences student at Marianopolis College, for her project *It's Going TiBia Ok*: *Prosthetic Design Using Freedom and Constraint Topology (FACT)***.** The evaluation committee commended her poised and professional presentation and mastery of the subject matter, the confidence with which she answered questions, and her ability to explain a complex topic in simple terms. The committee also acknowledged the challenge of giving a presentation in a language other than your mother tongue, noting this had no impact on the candidate finishing first. The project was supervised by Chemistry professor Angela Keane.

The second prize was awarded to Émile Raymond, an Engineering Physics Technology student at Cégep de La Pocatière, for his project *Clinical trial design and validation of an incontinence detection system.* The committee commended the scale of his project, which integrates several disciplines, his collaboration with partners from various backgrounds—an essential component of research—and how coherently he presented the difficulties encountered, the respective solutions, and each stage of his project. The project was supervised by Jonathan Bélisle, Engineering Physics Technology teacher. In addition to this prize, Émile Raymond received the *Relève étoile* designation in the Nature and Technologies sector.

The third prize was awarded to Danick Bonnette, a Food Processing and Quality Assurance Technology student at the Institut de technologie agroalimentaire du Québec, for his project *Effect of salmon co-product hydrolysates in inhibiting microbial growth. Objective: waste reduction and food development*. The committee admired the student's dynamic energy and communication skills, his ability to use vivid metaphorical language to capture the attendees' attention, and the clarity of his visual aids. This project was supervised by Food Science professor Véronique Fournier. In addition to this prize, Danick Bonnette received the *Relève étoile* designation in the Health sector.

The scientific posters that ARC produced for each project can be downloaded from the ARC website and EDUQ.Info. The ARC Student Prizes are supported by the Fonds de recherche du Québec – Nature et technologies, Santé, Société et culture, the Secrétariat du Québec aux relations canadiennes, Acfas, and COOPSCO. "For the first time since the creation of these awards in 1996, the prizewinners are from the three different types of college institutions—a private subsidized college, a CEGEP, and a government school. A clear sign that research is indeed present in all sub-networks," said Lynn Lapostolle, the Director General of ARC.

About Association pour la recherche au collégial
The mission of the Association pour la recherche au collégial, founded in 1988, is to promote college research by representing the interests of individuals and groups engaged with such research, by organizing activities to recognize excellence in college research, and by providing services to the college research community.

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Abstracts of the award-winning research projects in the 2022-2023 ARC Student Prizes

Effect of salmon co-product hydrolysates in inhibiting microbial growth. Objective: waste reduction and food development

Danick Bonnette, Food Processing and Quality Assurance Technology student at the Institut de technologie agroalimentaire du Québec

In Quebec alone, the fishing and food processing industry generates about 15,970 tons of co-products every year, of which 730 tons are from pelagic fish, mainly destined for animal feed. Co-products include bones, viscera, heads and skins—outputs of manufacturing processes for human consumption. This project proposes a co-product recovery solution with the aim of reducing the environmental footprint while finding an innovative use for human consumption. The solution advocated is the use of fish skin protein hydrolysates, known for their antimicrobial activity in a raw ground chicken matrix. The commercial enzyme Flavourzyme*TM* was used to produce a mixture of peptides that was then centrifuged and dehydrated. A shelf-life study was conducted, incorporating the hydrolysate into a 0%, 1% and 3% w/w raw chicken meatball recipe. The growth of aerobic mesophilic bacteria, yeasts and molds was observed over a period of 14 days. Hydrolysate inhibited microbial growth in the raw chicken matrix. In comparison, the 0% w/w formulation followed a normal microbial growth curve. Therefore, hydrolysate retains its antimicrobial activity when added to food that is susceptible to bacterial growth, such as raw ground chicken.

Clinical trial design and validation of an incontinence detection system

Émile Raymond, Engineering Physics Technology student at Cégep de La Pocatière

Hospital staff mostly rely on their sense of smell to determine whether a patient's diaper is soiled. Having reliable technology to automatically detect feces and urine would help to reduce the length of time patients spend in discomfort. The Artificial Nose project focuses on developing a measuring device that uses several gas sensors to detect incontinence odours. We will present the test bench, the acquisition software, the final prototype, and its embedded software. The prototype successfully detects molecules present in urine and feces: hydrogen sulfide, volatile organic compounds (VOCs), methanethiol, and sulfur dioxide. We will also disclose the results of a three-week clinical trial in CHSLDs which helped identify the best sensors for effectively detecting urine or feces.

It's Going TiBia Ok: Prosthetic Design Using Freedom and Constraint Topology (FACT)

Yu Ran Wang, Honours Pure and Applied Sciences student at Marianopolis College.

Prosthetics are currently made using expensive technologies and materials. They are also heavy and susceptible to damage, making them financially inaccessible, difficult to adapt, and uncomfortable. Despite the absence of wires and hydraulic pistons, prosthetics using compliant mechanisms mimic human muscles and joints. Production costs are reduced, product durability is improved, and user comfort is enhanced. Moreover, this prototype can be fully 3D printed, which lowers costs and assembly time. The prosthetic was designed using the *Freedom and Constraint Topology* (*FACT*) method, with flexible elements analyzed using stiffness and twist-wrench matrices. As expected, the final product is flexible along the axis of the joints while retaining its rigidity in all other directions. The flexibility of the bendable elements also confirms the theoretical calculations. Although simple in design, the prosthetic can be customized based on the individual's height, weight, etc. Flexible prosthetics (such as the one in question here) are, among other things, affordable for people in low-income communities and can considerably improve their quality of life.