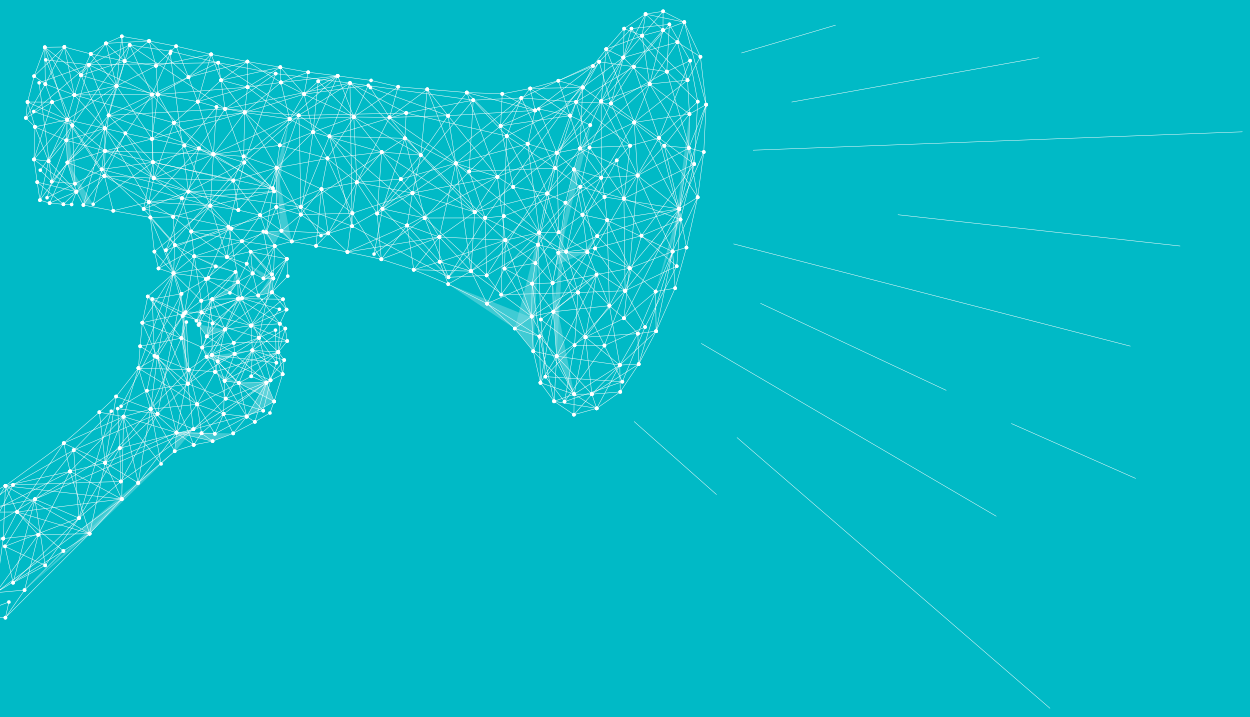
SCIENCE AND EXPERIENCE WORKING TOGETHER

2017 ACTIVITY REPORT

irsst Institut de recherche Robert-Sauvé en santé et en sécurité du travail



DECLARATION OF DATA RELIABILITY

I declare that I have every reason to believe that the observable facts and measurable data presented in this activity report accurately reflect the situation as at December 31, 2017. This information falls under my responsibility as president and CEO of the Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST). I hereby attest to its accuracy and the reliability of the controls relating thereto.

The indicators retained are developed using reliable and accurate data and allow us to assess the IRSST's production over the course of the year.

Recommended by the members of the Institute's Scientific Advisory Board and approved by the Board of Directors, this 2017 activity report faithfully describes the Institute's mission, vision, and principal achievements.

Marie Larue
President and CEO

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MESSAGE FROM THE PRESIDENT AND CEO

Marie Larue

I firmly believe that the year 2017 left everyone at the IRSST with a feeling of satisfaction about the work accomplished. The most noteworthy accomplishment – one that required time, thought, and many consultations – was undoubtedly the preparation of the new five-year scientific and technical production plan. Our partners will recognize themselves in this plan as they contributed to its design by, among other things, participating actively in focus groups. This time, the focus groups were organized by activity sector and around the theme of the return to work of individuals with occupational injuries. Representatives of the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST); joint sector-based associations; the Réseau de santé publique en santé du travail (RSPST); as well as employer, union, and professional associations; government-owned corporations; and privately owned companies all joined in the dialogue to share their needs regarding expertise and the advancement of knowledge. I wish to underscore the significant contribution made by our partners and personnel, and by the Scientific Advisory Board, whose input further enhanced the new plan. In fact, the plan has already elicited a positive response for its relevance and the priority nature of its content. Adopted by the Institute's Board of Directors, the new scientific and technical production plan provides a roadmap for the 2018 to 2022 period, defining the objectives we will pursue and the direction we will take to achieve them. In addition, for the first time, the production plan comes with a five-year capital plan to ensure that the physical and IT resources needed to carry out the 2018-2022 plan are available, sufficient, and appropriate.

The year 2017 was marked by considerable staff movement, mainly in the form of retirements, which resulted in major changes. The most notable included the following: the appointment of a new scientific director after the retirement of Paul-Émile Boileau, whom I would like to salute and thank on behalf of his colleagues for his steadfast dedication; the appointment of a new director of communications and knowledge transfer; and the recruitment of a director of information technologies. I also wish to express my great appreciation to Louis Lazure, who served as interim scientific director before being promoted to the position of executive director of the Institute. These changes remind us that the forward-looking planning of our workforce remains a pressing issue, as a number of employees, including a large proportion of management, are approaching retirement age.

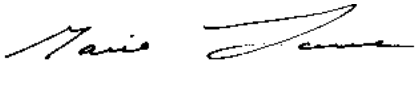
With these departures, we lose part of the Institute's collective and institutional memory, as well as unique expertise in some cases.

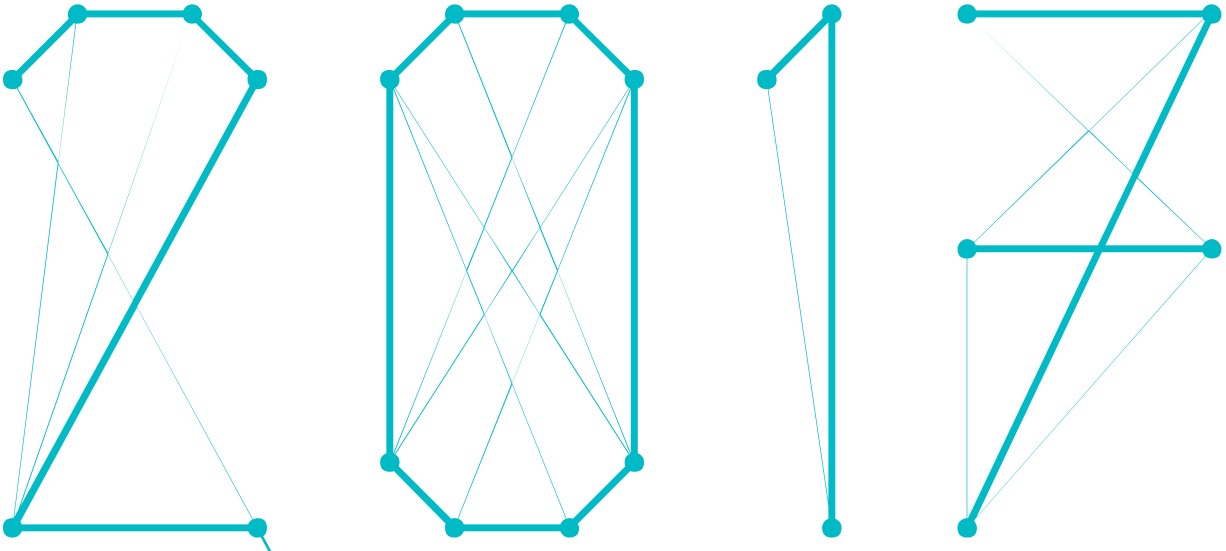
The expertise we offer is undoubtedly a little-known aspect of the Institute's mission. The 2017 activity report therefore casts the spotlight on a few examples of initiatives taken and their often-underestimated impacts. Our personnel take great pride in putting their expertise to work for our partners and for occupational health and safety in general. Their contribution, particularly to standardization initiatives and regulatory developments, is often blurred or eclipsed by advances in knowledge.

WITH THESE DEPARTURES, WE LOSE PART OF THE INSTITUTE'S COLLECTIVE AND INSTITUTIONAL MEMORY, AS WELL AS UNIQUE EXPERTISE IN SOME CASES.

This important aspect deserves to be promoted and recognized on par with the crux of our mission, which remains to "contribute, through research, to the prevention of industrial accidents and occupational diseases and to the rehabilitation of affected workers."

One thing is certain, and that is this: endowed with highly qualified staff and this new five-year production plan, we are intent on fulfilling our mission by putting both science and experience to work on behalf of Québec's workers and employers.





2017 IN NUMBERS

PRODUCTION

OUR LABORATORIES

SCHOLARSHIPS AND FELLOWSHIPS

DISSEMINATION

PRODUCTION

ACTIVE PROJECTS AND ACTIVITIES

42 projects being developed
23 projects began (**11** joint, **7** external, and **5** internal)
27 projects completed
72 projects in progress

PARTNER ORGANIZATIONS INVOLVED IN FOLLOW-UP COMMITTEES

REQUESTS FOR EXPERTISE

EXTERNAL RESEARCHERS

from **19** universities, **19** research centres, and **4** other organizations formed part of the IRSST's network of scientific collaborators.

EXTERNAL COMMITTEES INCLUDED AT LEAST ONE IRSST REPRESENTATIVE

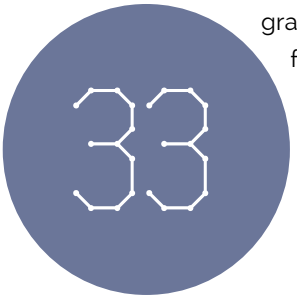
9 committees (including regulatory committees) of the CNESST and its network
12 national and international standards committees
14 other local, national, and international committees

OUR LABORATORIES

environmental, toxicological, and microbiological **ANALYSES** were performed, including **77%** for partners in the prevention-inspection network: CNESST, integrated health and social services centres, and joint sector-based associations. This figure represents a drop in production attributable to a redistribution of resources effected to meet partners' requests for the development of new analytical methods.

HOURS were devoted to calibrating, maintaining, and repairing direct-reading and sampling instruments, including **83%** for the OHS and inspection-prevention network. This number of hours represents an output similar to that of the previous year.

SCHOLARSHIPS AND FELLOWSHIPS



graduate studies scholarships and postdoctoral fellowships were awarded to master's, doctoral, and post-doctoral candidates whose research programs dealt specifically with the prevention of industrial accidents and occupational diseases or the rehabilitation of affected workers.

was the budget allocated for the Scholarship and Fellowship Program. In 2017, half of the master's and doctoral scholarship and fellowship recipients received a supplement, as they were also awarded financial aid by another funding organization.

PUBLICATIONS

42 research reports, including **27** in French and **15**[1] in English
11 guides and technical awareness-raising tools, including
6 in French and **5** in English

SCIENTIFIC PUBLICATIONS

related to projects carried out or funded by the IRSST
42 peer-reviewed journal articles
13 peer-reviewed articles published in conference proceedings
10 other publications, including books, book chapters, master's and doctoral theses, etc.

PRESENTATIONS

given by IRSST personnel or IRSST-funded researchers
at scientific conferences or events organized by partners

SIMPLIFIED ARTICLES

+ 28 news briefs published in the *Actualités* column of *Prévention au travail*, the magazine issued jointly by the CNESST and the IRSST

VIDEOS POSTED ONLINE

56,559 viewings of IRSST-produced videos
423,481 sessions on the IRSST's Web sites
771,926 unique downloads of publications posted on the IRSST's Web sites
5,651 subscribers to *InfoIRSST*, the IRSST's electronic newsletter

[1] This refers to translations of reports that were already published in French in 2016 or 2017.

FIVE-YEAR PLAN

In 2016, the IRSST began broad consultation with its partners as the groundwork for developing its *Five-Year Scientific and Technical Production Plan 2018-2022*. Vital in terms of strategic planning, these consultations are part of an ongoing process of identifying and updating priority research needs. Priorities emerge from the worlds of work and research, analysis of databases, and scientific monitoring and surveillance activities. This major operation allows the IRSST to focus its knowledge advancement efforts on the most promising OHS niches, over a period of five years.

The Institute innovated again, this time, by organizing consultations by activity sector and around a theme. As privileged interlocutors, our partners were also invited to express their research needs by participating in focus groups.

The first meeting brought together individuals associated with the **return-to-work** theme, and comprised 13 participants from a variety of organizations, including the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST), the Confédération des syndicats nationaux (CSN), the Canadian Union of Public Employees (CUPE), a private insurance company, the Fédération des cliniques privées de physiothérapie du Québec, a major government-owned corporation, a human resources services and technology firm, and four professional associations or orders.

THE INSTITUTE INNOVATED AGAIN, THIS TIME, BY ORGANIZING CONSULTATIONS BY ACTIVITY SECTOR AND AROUND A THEME.

The second meeting generated discussions on the needs of the **agriculture, fishing, and green jobs** sectors. The 10 participants came from the Comité sectoriel de main-d'œuvre des pêches maritimes, EnviroCompétences, the Conseil des entreprises en technologies environnementales du Québec, the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec, the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, and the Union des producteurs agricoles, among other groups.

The knowledge needs of the **mining sector** were the focus of the third meeting. It was attended by five partners representing the Association minière du Québec, the Association paritaire pour la santé et la sécurité du travail du secteur minier, a major Canadian gold-mining company, the Fédération de l'industrie manufacturière (CSN), and the Syndicat des Métallos (FTQ).

The fourth meeting brought together 16 participants from the **transportation, manufacturing, and industry** sectors. These partners came from Prévibois (a new entity formed by the merger of the Association de santé et sécurité des pâtes et papiers du Québec and the Association de santé et sécurité des industries de la forêt du Québec), five joint sector-based associations, the Centre patronal de santé et sécurité du travail du Québec, the Confédération des syndicats nationaux, the Canadian Federation of Independent Business (CFIB), and the Direction de santé publique de Montréal.

The fifth meeting was devoted to the **provincial** and **public administration** sectors. Fifteen participants voiced their research needs. They came from groups such as the Fédération des policiers et policières municipaux du Québec, the Regroupement de réseaux en santé des personnes au travail, Québec's Treasury Board, the Canadian Union of Public Employees (CUPE), Ville de Montréal, and the Association paritaire pour la santé et la sécurité du travail du secteur des affaires municipales (APSAM).

The **health, social services, and education** sectors were the focus of the sixth meeting, where 12 participants fuelled the discussions. They spoke on behalf of various organizations, including the Fédération des commissions scolaires du Québec, the Centrale des syndicats du Québec, the Fédération des employées et employés de services publics (CSN), the Fédération interprofessionnelle de la santé du Québec, the Ministère de la Santé et des Services sociaux, and the Association paritaire pour la santé et la sécurité du travail du secteur des affaires sociales (ASSTSAS).

The seventh meeting assembled 12 participants from the **construction** sector. They represented primarily the Association québécoise des entrepreneurs en infrastructure, the Association de la construction du Québec, the Association des constructeurs de routes

THE SECOND MEETING GENERATED DISCUSSIONS ON THE NEEDS OF THE AGRICULTURE, FISHING, AND GREEN JOBS SECTORS

et grands travaux du Québec, the Association des entrepreneurs en construction du Québec, the Conseil provincial du Québec des métiers de la construction (International), and FTQ-Construction.

Supplementing the information compiled during these sector-based consultations was information from other sources, such as the CNESST's 2017-2019 strategic plan, its multi-year 2017-2019 prevention-inspection plan, a consultation held with external researchers, the IRSST's research field leaders, scientific monitoring and statistical surveillance activities, as well as comments raised in the 2017 institutional evaluation report.

This long, iterative process served to improve the 2018-2022 plan, which was then submitted to the Scientific Advisory Board for assessment. Its members in turn enhanced the content and recommended that the plan be adopted. In November 2017, the Board of Directors gave the green light for this five-year plan to be broken down into annual action plans, effective from its first year of application.

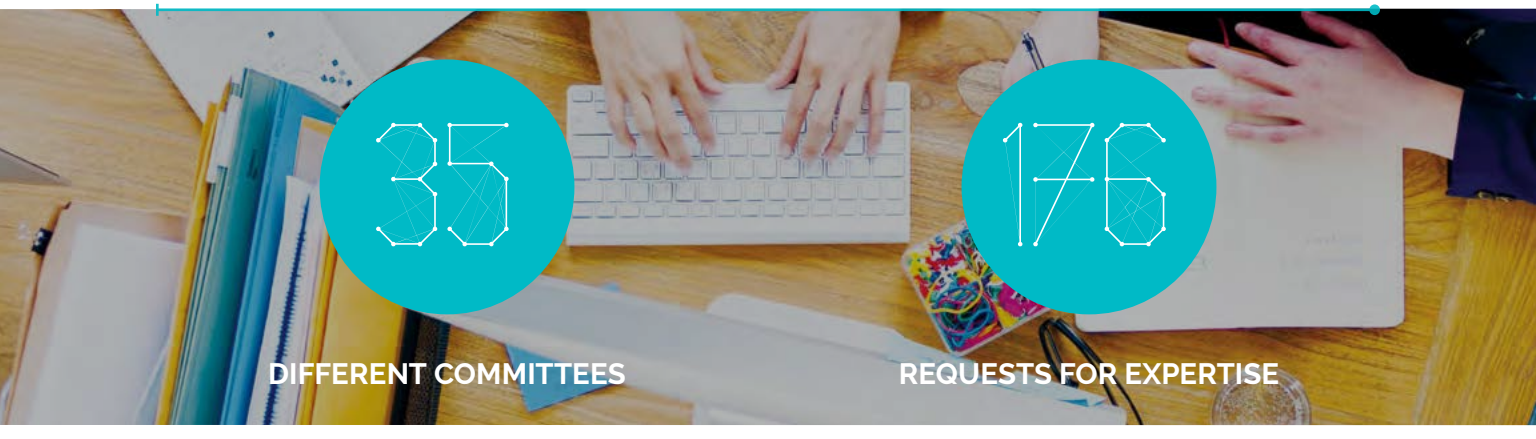
By conducting such a demanding consultative process, the Institute ensures that the research needs (including emerging problems) of its partners and clients are addressed.

SCIENCE AND EXPERIENCE WORKING TOGETHER

The advancement of knowledge is not the only factor promoting the IRSST's influence and reputation far and wide. The Institute also pursues another component of its mission, that of "serving as a scientific reference centre and expert" by putting **science, knowledge,** and its personnel's **experience** to work for its partners and various OHS practitioners. While little is said about this role, it warrants mention and is fulfilled in several different ways. For example, the Institute supports the CNESST and its network by playing an essential reference role in their operations and strategies. In addition, in 2017, members of our personnel were invited to sit as experts on 35 different committees, including nine CNESST committees.

Thus each year, the IRSST endeavours to meet the requirements of its partners when it comes to providing expertise. In 2017, **176 requests for its expertise** were recorded as active in the Research and Expertise Division's logbook, including **121 new requests** received during the year. These requests took various forms such as courses or training sessions for trainers, the formulation of expert opinions, expert appraisal activities in the field, participation in standardization or regulatory committees, methodological or statistical support, and the scientific evaluation of a doctoral thesis and of articles to be published in academic journals.

IN 2017



For example, the Institute sat as an expert on the round-table for the improvement of OHS among immigrant workers. It helped train physicians in Québec's public health system on the application of the *Guide de surveillance biologique de l'exposition* [Guide to the biological monitoring of exposure] with regard to the sampling and results interpretation strategy. It also collaborated in the *Low-dose chlorine inhalation-related changes in healthy humans* pilot project as an aerosol science expert.

If the Institute receives these types of requests, it is thanks to its ability to respond to them by drawing on the expertise of its own scientific and technical personnel, or by recruiting and mobilizing specialized external resources to do so. Some requests are met within a few days, while others can take several weeks of work. In 2017, the IRSST spent 706 days (which equates to three full-time workers) to resolve issues requiring expertise, and 195 days (which equates to one full-time worker) sitting on various committees.

During its 38 years of existence, the IRSST has built a well-established reputation for its role as a scientific reference centre and provider of expertise, which ensures it a respected voice in the worlds of science and work, and among its partners. This influence is exercised not only through its responses to requests for expert appraisals, but in various ways and numerous fields. Here are some examples.

CONTRIBUTING TO THE DEVELOPMENT OF STANDARDS

Since 2017, in both Europe and North America, the only recognized test method for the cut resistance of materials has used a **machine designed by the IRSST** or an equivalent. This method is at the heart of European Union Standard EN 388 and U.S. Standard ANSI/ISEA 105, clearly illustrating the influence and expertise of the Institute's personnel in terms of the development of a normative framework in this regard. The source of this influence was the design of the **tomodynamometer TDM-100** in 1995. **A first prototype** was created in the IRSST's laboratories before a final form was adopted. Following a number of refinements, the machine was then marketed by the **Québec company RGI**. The TDM-100 led to the development of an **avant-garde test method** for evaluating the cut resistance of materials used in the manufacture of protective work gloves and in their classification based on their effectiveness. This represented an important **scientific breakthrough** in this field, and its effects are still being felt today. The IRSST's significant contribution to this development of standardized test methods is the result of a laudable collective accomplishment. The initial studies were conducted by the researcher **Jaime Lara**, who was supported by professional colleagues and technicians. They aligned perfectly with one of the current research orientations in the Mechanical and Physical Risk Prevention field, specifically, producing methodological and metrological tools, simulations, and test and evaluation methods to help those responsible in the workplace diagnose and assess risks more effectively. These studies also focus on developing support tools for selecting, enhancing, and designing prevention solutions, taking the human factor into account.

TDM
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Today, IRSST engineer **Chantal Gauvin** et al. have taken up the cause and are continually working to improve the test method. This involves, for example, participating in the ASTM standardization committee (F23.20), which promoted the integration of a standardized test method for resistance to needle puncture (ASTM F2878-10) into the American standard. The IRSST's expertise and its contribution to the development of standards mean that Québec employers and workers today have at their disposal protective work gloves that are better at preventing occupational injuries.

SERVING AS A CONSULTANT

To respond to the CNESST's requests, the IRSST made particular efforts in 2017 to support the CNESST in its process of evaluating and revising legislation. For example, the Institute provided it with evidence-based data to strengthen decision making.

THE MAIN SUBJECTS INVOLVED WERE:

- the emission of asbestos-containing fibres into the air during engineering and public works projects on asbestos-contaminated sites, and measurement of their concentrations, if needed;
- recent scientific advances in terms of toxicity and exposure to contaminants regulated in Schedule 1 of the *Regulation respecting occupational health and safety* (ROHS);
- the advancement of knowledge on noise exposure; and
- carcinogenic substances.

AIDING THE PRIVATE SECTOR

In the United States, the company Martin Engineering published *The Global Best Practices Resource for Safer Bulk Material Handling*, which it describes as the **first compilation of global best practices** aimed at reducing the risks and occupational injuries related to conveyor use. This American document of over 500 pages contains numerous references to the IRSST's activities, including **16 mentions** of the Institute's name and its work. These references concern mainly the documents titled *A User's Guide to Conveyor Belt Safety: Protection from Danger Zones*, co-produced by the IRSST and the CNESST, and *Estimating the Costs of Occupational Injuries – A Feasibility Study in the Mining Industry*. A PDF version of the Martin Engineering document can be downloaded free of charge.

SETTING THE COURSE FOR SAFETY

PREVENTING FALLS OVERBOARD

TRANSFERRING KNOWLEDGE

The IRSST's expertise in terms of leveraging research and transferring knowledge is unequivocal. This time, it earned **recognition from the Americans**. In a letter from the Center for Maritime Safety and Health Studies of the National Institute for Occupational Safety and Health **(NIOSH)**, its director, Jennifer Lincoln, expressed her organization's interest in the IRSST's studies and achievements regarding the risks faced by lobster fishers from the Gaspé region and the Magdalen Islands. Ms. Lincoln, who is known herself for having instigated the NIOSH Commercial Fishing Safety Research and Design program, underscored the **quality of the video** *Setting the Course for Safety: Preventing Falls Overboard*, produced by the Institute. She regarded the study and the video as **a first** in terms of primary prevention of falls overboard, and wrote that she had therefore forwarded the URL link to the IRSST's video to members of the advisory committee associated with a current NIOSH project on American lobster fishers. In addition, the Massachusetts Institute of Technology Sea Grant College Program and the Harvard T.H. Chan School of Public Health published a document also presenting the IRSST video. Titled *Rescues: Maine and New Hampshire Responding to Emergencies at Sea and to Communities Under Extreme Stress*, this document is now in its second print run. Appendix E, under the heading *Preventing Falls Overboard in the Lobster Industry*, reiterates the prevention strategies proposed in the Institute's video and the accompanying reference document.

PROVIDING A SOURCE OF INSPIRATION

The IRSST's influence is felt worldwide. For example, Japan's National Institute of Occupational Safety and Health (JNIOSH) translated our document titled *Best Practices Guidance for Nanomaterial Risk Management in the Workplace* into Japanese to promote management of nanomaterial-related risks in workplaces. Subsequently, the former Department of Mines and Petroleum (now Department of Mines, Industry Regulation and Safety) of **Western Australia** adopted what it dubbed the "Québec model." Given the failure to reach a consensus on the best method for adjusting exposure standards for workers who spend more than 8 hours a day or 40 hours a week in mining operations, Western Australia opted to apply the 4th edition of the IRSST's *Guide for the adjustment of permissible exposure values (PEVs) for unusual work schedules*. Its adoption was recommended by the Australian Institute of Industrial Hygienists, which adapted it to the current exposure standards of Safe Work Australia.

All this is reported in *Adjustment of atmospheric contaminant exposure standards – guide*, a document published by the government of Western Australia.

ACTIVELY NETWORKING

The IRSST's presence and active participation in the annual meeting of the Sheffield Group, which brings together the heads of the world's **leading OHS research centres,** also increase recognition of the Institute's expertise and credibility in this community. These meetings promote exchanges and networking, while paving the way to research partnerships. They also keep participants informed of emerging problems in industrialized countries and provide a venue for sharing ways of doing things and best practices.

Japan's National Institute of Occupational Safety and Health (JNIOSH) hosted the meeting of the Sheffield Group in 2017. It was held in Tokyo and focussed on the theme of psychological health in the workplace. IRSST president and CEO **Marie Larue** took part.

ENHANCING EVALUATION

Over the past 12 years, the performance and relevance of the IRSST's scientific activities have undergone three **evaluations** by an independent committee of international experts. Drawing on this experience, the Institute's president and CEO, as vice-president of the International Section of the ISSA for Research on Prevention of Occupational Risks of the International Social Security Association (ISSA), helped develop a reference document for research centres wishing to assess their own activities. The document was presented at ISSA's 21st World Congress, held in Singapore in September 2017.

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FORMING PARTNERSHIPS

The quality of an organization's expertise is also judged by the partnerships it is able to form with renowned institutions. In 2017, the IRSST was a party to **some 40 partnership agreements**. They are designed mainly to strengthen research capabilities and to share expertise, as well as human, physical, and financial resources.

The IRSST is linked to credible OHS-research partners all-around the world, such as the Institut national de recherche et de sécurité (INRS-France), the National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention (United States), the Health and Safety Executive (HSE-United Kingdom), the Institute for German Social Accident Insurance (IFA-Germany), JNIOSH (Japan), and the Workplace Safety and Health Institute (WSHI-Singapore). Several universities, located mainly in Québec, were also signatories to partnerships with the Institute. In 2017, six new agreements, or agreements whose terms were updated or amended, were also ratified. These included:

1. the signing of a framework agreement specifically on the exchange of information pertaining to occupational cancers, with the **Occupational Cancer Research Center in Toronto;**
2. the renewal of the framework agreement between the **HSE of the United Kingdom** and the IRSST; and
3. the signing of a specific agreement with the **Palais des congrès de Montréal,** which paved the way to creating the IRSST/Ambassadors' Club Joint Award and to coordinating actions aimed at hosting major national and international conferences in Montréal.

2011-2015 INSTITUTIONAL EVALUATION

Chaired by Claude Bédard, the director general of the Bureau de coopération interuniversitaire (BCI), an independent committee comprised of five national and international experts assessed the relevance of the IRSST's activities and the Institute's efficiency during the 2011-2015 period to help guide the Institute's management team in their improvement, development, and future-orientation strategies.

THIS IS THE THIRD TIME THAT THE IRSST HAS UNDERGONE THIS TYPE OF FIVE-YEAR EVALUATION EXERCISE.

The committee analyzed the situation from **five perspectives:**

1) governance;
2) the mission pursued;
3) the "analytical laboratories" mission;
4) the "research leveraging and knowledge transfer" mission; and
5) institutional affairs and stewardship.

To support the committee's work, the IRSST gave the members a copy of the institutional assessment it had prepared. This document of approximately 150 pages, written in the context of the evaluation, talked about subjects such as the Institute's positioning in the OHS field, its external environment, organizational capacity, personnel's motivation, and productivity.

The evaluation looked at the strengths, weaknesses, challenges or threats, and opportunities related to each of these aspects. The committee filed its report during the course of the year. The Institute took note of its content and will apply the recommendations over the next five years.

OUR LABORATORIES

In addition to responding to requests for analyses from the CNESST and its network, the Institute's laboratory personnel are involved every year in research projects that could not be carried out without their support and solid expertise in industrial hygiene. In 2017, the laboratories took part in **approximately 10** research projects and scientific activities requiring the implementation or development of new analytical methods.

THESE PROJECTS AND ACTIVITIES CONCERNED THE FOLLOWING TOPICS, AMONG OTHERS:

- Characterization of emissions from high-resistance bitumen made with polyamine additives
- Design and development of a new calibration platform for noise measurement instruments
- Development of a molecular analysis method for determining the ERMI (Environmental Relative Moldiness Index) to allow for assessment of the mycotoxin risk of indoor air in workplaces
- Evaluation of chemical contaminant exposure among workers in the primary electronic-waste recycling sector in Québec and assessment of health risks
- Implementation of a method for measuring 4,4'-methylene dianiline (MDA) in the air by LC/MS
- Evaluation of the capture efficiency of the CIP-10 sampler for isocyanate vapours
- Implementation of a method for measuring 4,4'-methylene dianiline (MDA) in worker urine

THE IRSST PROVIDES THE LABORATORY SERVICES AND EXPERTISE REQUIRED TO SUPPORT THE PUBLIC OCCUPATIONAL HEALTH AND SAFETY NETWORK.

Jacinthe Boisvert /

THE LABORATORIES ALSO EMBARKED ON SEVERAL OTHER SPECIFIC OPERATIONAL ACTIVITIES DURING THE YEAR. THESE INCLUDED:

Upgrading the GC/MSD ChemStation software by the solvent analysis team to facilitate the transition from Windows XP to Windows 7

Launching the Thermal Desorber Sampling System (TDSS) for analyzing thermal desorption tubes in order to identify unknown contaminants in indoor air

Implementing two methods for analyzing metals (beryllium/12 metals + arsenic) on Solu-Sert™ sampling substrates, using ICP-MS

Interfacing the GC/MS equipment to allow the automatic transfer of analytical data to the Laboratory Information Management System (LIMS)

Optimizing a new instrument (HPLC-UV-QDa) with a view to the technological transfer of Method 376 (isocyanates double filter)

Conducting an exploratory study of a method for analyzing aldehydes by LC-MS in preparation for a lowering of permissible exposure values

Drafting and validating the instructions needed for measuring asbestos content in vinyl floor tiles by means of transmission electron microscopy (TEM)

Organizing the re-evaluation visit of the American Industrial Hygiene Association (AIHA) with a view to renewing accreditation for the industrial hygiene program

Characterizing the reference materials of Germany's Institute for Occupational Safety and Health of the German Social Accident Insurance (DGUV-IFA)

Implementing analyses of inorganic acids on cassettes

Measuring urinary arsenic levels for biological monitoring of worker exposure

Performing analytical validations in order to adjust methods to the permissible exposure values (PEVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) for benzene, cyclohexane, ethylbenzene, isopropyl alcohol, n-propyl alcohol, toluene, trichloroethylene and xylene for passive dosimeters and activated charcoal tubes

Performing analytical validations in order to adjust methods to the PEVs of the ACHIG for 1-bromopropane on activated charcoal tubes

Adjusting analytical methods for measuring metals on Solu-Sert™ sampling substrates by ICP-MS in preparation for the revamping of the standards in Québec's *Regulation respecting occupational health and safety* and adoption of the PEVs set by the ACGIH

Sampling and characterizing asbestos on a dismantling site in order to obtain essential real samples and ultimately ensure the sustainability of the Fibre Counting Quality Control program (CQ Fibres)

Improving the new LabPlus LIMS (interfacing instruments, solving problems, etc.) and the ClicLab portal to offer better service to the laboratories' clients and collaborators

Using microbial organic volatile compounds (MVOCs) as a biomarker of exposure to mould in the workplace

Developing a method for adjusting the flow rate of cyclones used to sample the respirable fraction of airborne dusts

Improving methods for detecting *Legionella pneumophila* and *Legionella spp.* using cultures and molecular biology methods in different matrices coming from workplaces

Validating the BBHD module to improve the sensitivity of the crystalline silica monitor (DRX).

ACCREDITATIONS

The IRSST's laboratories also put energy into preparing for the renewal of **two of their accreditations,** specifically, Industrial Hygiene (IHLAP) and Environmental Microbiology (EMLAP), under the American Industrial Hygiene Association – **Laboratory Accreditation Programs** (AIHA-LAP). Our lab personnel completed an application to renew their enrolment in the **Asbestos Analysts Testing** (AAT) Proficiency Program of the AIHA Registry Programs™ concerning quality control of fibre counting using samples from a variety of Québec workplaces.

ACCESSIBILITY

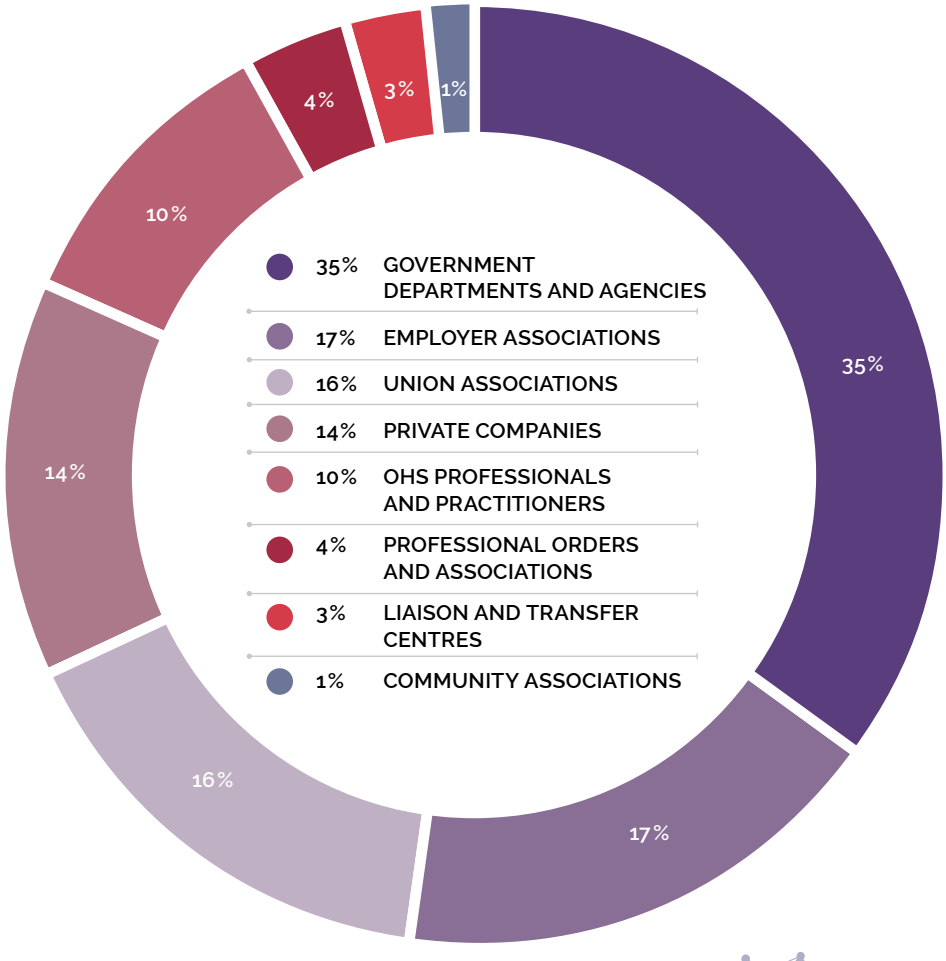
Additional time and energy were spent on the ClicLab portal to improve the entry of requests for material sampling and for instrument loans and servicing in order to simplify access for the laboratories' entire clientele.

PROPOSED FEDERAL REGULATIONS ON **ASBESTOS**

The Laboratory Division participated in Canadian government consultations regarding the proposed approach to regulating asbestos and asbestos-containing products. This participation resembled the analytical support role it plays with the CNESST, the Réseau de santé publique en santé au travail, and Labour Canada. Thus, in the last three years, it has performed no fewer than 200,000 tests on various contaminants, including 827 samples of bulk materials and sedimented dusts, in order to determine the percentage of asbestos they contained. During the same period, the laboratories also quantified the potentially asbestos-containing fibres in 1,231 air samples collected in workers' breathing zones. In addition, to maintain its ISO/CEI 17025 accreditation from the American Industrial Hygiene Association (AIHA), the IRSST participated in a blinded analysis of asbestos samples. The Laboratory Division manages two recognition programs for the analysis of this substance, obliging it to maintain a collection of approximately 650 standard reference materials containing various concentrations of asbestos. These materials represent a total mass of roughly 4,000 grams and are essential to continuing these programs.

TESTS PERFORMED IN THE LAST THREE YEARS

PARTNER ORGANIZATIONS INVOLVED IN FOLLOW-UP COMMITTEES



LEVERAGING RESEARCH AND TRANSFERRING KNOWLEDGE

FOLLOW-UP COMMITTEES

No fewer than **100 research projects** active during 2017 had a follow-up committee to ensure ongoing interaction between researchers and users at all stages of the project. Thus, **379 individuals** from **191 organizations** sat on these committees, which play a crucial role in the successful transfer of knowledge to workplaces. Representatives of government departments and agencies (67) accounted for most of the committee members, followed by representatives of employer associations (33) and union associations (30), private companies (26), OHS professionals and practitioners (20), professional orders and associations (7), liaison and transfer centres (5), and community associations (3).

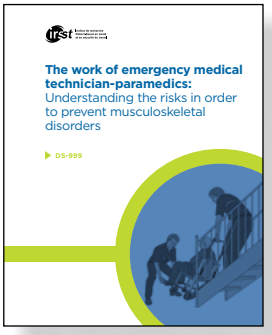
THE COMMUNICATIONS AND KNOWLEDGE TRANSFER DIVISION (CKTD) LOGGED 14 KNOWLEDGE TRANSFER ACTIVITIES IN 2017.

EXPANDED FOLLOW-UP COMMITTEE FOR THE CONSTRUCTION SECTOR

In terms of ways of doing things, the IRSST innovated by forming an **expanded follow-up committee** in the Mechanical and Physical Risk Prevention research field to bring together its partners in the construction sector. Traditionally, a specific follow-up committee is struck for each study involving this sector, meaning that the same participants often find themselves around the same table. The CKTD therefore proposed grouping all these committees into one. Rather than tackling one activity at a time, the expanded committee meets twice a year to discuss **all projects.**

Two meetings were held in 2017, with around 10 projects on the agenda. This new arrangement met with a very positive response from participants, as it gives them an **overview** of all projects, ensures better follow-up, and optimizes the **efficiency** of this type of meeting.

EMERGENCY MEDICAL TECHNICIAN-PARAMEDICS



An awareness-raising document titled *The work of emergency medical technician-paramedics: Understanding the risks in order to prevent musculoskeletal disorders* was produced in light of the results of a major study that profiled this occupation, which is characterized by high staff turnover. The document encourages such actions as the development and application of various means of protection in order to reduce the frequency and severity of MSDs and to enhance training and professional development activities. It is based on observation of the actions of 101 technicians in the Montréal and Québec City areas during 175 work shifts. Close attention was paid to individual factors.

RESILIENT-FLOOR COVERING INSTALLERS

The job of resilient-floor covering installer is physically demanding, It consists mainly of handling heavy loads, kneeling for long periods of time, spreading glue over large surfaces, and performing precision work. Also, new products and materials are always coming onto the market, requiring workers to learn new techniques for properly installing the floor coverings while protecting their health and safety.

Based on the results of an IRSST **study**, the Institute produced **a video that gives a voice** to installers of this type of floor covering and to a teacher who explains the occupational risks. It also **proposes solutions** and stresses the importance of job training.

CONFINED SPACE WORK

A **new tool** for managing risks associated with confined space work and intended for qualified personnel (prevention officers, managers, clients/work providers, principal contractors, designer-integrators, and rescuers) was developed and posted online. This e-tool (named CLOSE), which is applicable to **all types of confined space** and adapted to Québec regulations and standards, examines the main, but often little-known, potential hazards. It proposes a five-module approach: (1) describe the confined space; (2) describe the work; (3) determine the potential hazards; (4) choose preventive measures, and (5) estimate risk before and after implementing preventive measures.

Designed to take into account the complexity of the work and to help users structure their analysis of the situation, CLOSE can be used for design purposes or to evaluate an existing confined space. The tool can even **generate reports** and provide information pertinent to the preparation of an entry permit, an audit, or a call for tenders for subcontractors.

THE SAFE INTEGRATION OF NEW WORKERS IN QUÉBEC'S MINING SECTOR POSES SPECIFIC CHALLENGES, ESPECIALLY GIVEN THE NATURE OF ITS ACTIVITIES.

THE MINING SECTOR

Based on a study conducted at the request of the Association paritaire pour la santé et la sécurité du travail du secteur minier (APSM), a **self-diagnostic tool** was created to give employers and preventionists food for thought on ways to safely integrate new workers in this sector, which is known for its inherent risks.

The tool uses questions about the goals, process, and actors involved in the integration process to enable users to:

1. **take stock** of the conditions facilitating the safe integration of new workers; and
2. **target priorities for action** with a view to making continuous improvements.

A **practical pamphlet,** designed to optimize use of the self-diagnostic tool, illustrates the various steps in the integration of a new worker hired to operate an oversized dump truck.

English and French versions of the tool and pamphlet are available free of charge.

HYPOTHENAR HAMMER SYNDROME

A frequent injury among workers who use vibrating power tools or the palms of their hands to pound, crush, or twist objects, **hypothenar hammer syndrome** is insidious and easily confused with other conditions that also cause the fingers to blanch.

Tools were designed by the IRSST to help workers, employers, preventionists, and members of occupational health and safety committees **recognize this condition more readily and prevent it.**

The IRSST worked in collaboration with the Institut national de santé publique du Québec (INSPQ) to produce English and French versions of a **plain-language pamphlet**, including a **small poster** designed to improve understanding and promote effective prevention of this syndrome.

SUPPORTING OCCUPATIONAL THERAPISTS

The IRSST hosted two training activities organized by the **Ordre des ergothérapeutes du Québec** (OEQ). The first passed on knowledge about the effectiveness of **occupational rehabilitation** programs to ensure their integration into best practices. No fewer than 200 occupational therapists participated in this activity, either via a webcast or in person. The results of the study titled *Return-to-work coordination practices of large organizations in Québec* were the focus of the exchanges.

The second activity presented a tool for improving interventions with workers suffering from a mental or physical health problem. Around 40 occupational therapists took part in this training activity on how to use the Return-to-Work Obstacles and Self-Efficacy Scale (ROSES) **questionnaire** with workers suffering from a common mental disorder or a musculoskeletal disorder.

COMMUNICATION

The theme of the Institute's annual colloquium in 2017 was *Révolution 4.0 – À l'aube d'une nouvelle SST?* [Revolution 4.0 – the dawn of a new OHS era?]. A dozen or so speakers and experts shared their knowledge of this new revolution in the world of work with a full house of more than **200 people**. This revolution is characterized by trends such as the application of artificial intelligence to industrial production.

The speakers touched on various aspects and answered numerous questions concerning, for example, the degree of preparation of Québec companies (**Geneviève Lefebvre,** CEFRIO), the impact of work in the digital era (**Gregor Murray** and **Matthieu Pelard**, Université de Montréal), the OHS issues (**Agnès Aublet-Cuvelier**, INRS-France), the virtual sound environment and how to better evaluate and rehabilitate workers with hearing loss (**François Bergeron**, Université Laval), the use of "big data" (**Guillaume Chicoisne**, Institut de valorisation des données), industrial hygiene data and data banks of occupational exposure measures (**Jérôme Lavoué**, Université de Montréal), collaborative robots (**Damien Burlet-Vienney**, IRSST), the impacts and benefits of 4.0 initiatives for organizations (**Yuvin Chinniah**, Polytechnique Montréal), the use of avatars to prevent MSDs (**Denys Denis** and **Christian Larue**, IRSST), and smart textiles serving workers (**Justine Decaens**, CTT Group).

Exhibitors were also invited to present their innovations. Participants were thus able to attend virtual reality demonstrations of a wheelchair driving simulator, of a virtual sound environment (*Immersion 360*), and of two mobile robots designed to provide home assistance.

Yuvin Chinniah, Polytechnique Montréal /

HOST OF THE MONTRÉAL SYMPOSIUM ON OCCUPATIONAL CARCINOGENS

After two knowledge transfer meetings, the first in Toronto and the second in Vancouver, arising from the study titled *The Human and Economic Burden of Occupational Cancer in Canada*, the Montréal Symposium on Occupational Carcinogens welcomed **90 partners** from the CNESST, the Réseau de santé publique en santé du travail (RSPSAT), joint sector-based associations, and employer and worker associations. The IRSST both organized and **hosted** this event. Its main objective was to mobilize these stakeholders and raise their awareness of the human and economic burden of occupational cancers by promoting research results but, above all, by presenting current or potential prevention strategies with regard to four carcinogens: **asbestos, silica, diesel engine exhaust, and welding fumes.**

The workshop discussions focussed on two questions: *Which preventive interventions should be given priority?* and *How should the results of the Burden of Occupational Cancer in Canada study* (a study in which **France Labrèche and Martin Lebeau from the IRSST** collaborated) *be used to promote prevention?*

PRESENCE IN THE FIELD

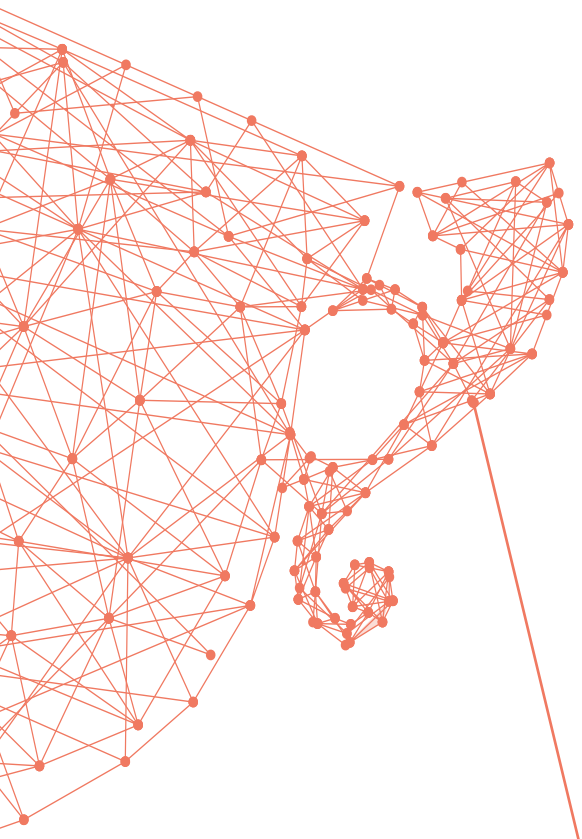
Every year, the Communications and Knowledge Transfer Division (CKTD) ensures the IRSST's **presence** at major events, which provide ideal opportunities for promoting the results of the Institute's research and showcasing the expertise of its scientific and technical personnel.

IN 2017, THE CKTD SET UP ITS INFORMATION BOOTH AT THE FOLLOWING EVENTS:

1. 39th Congress of the Association québécoise d'hygiène, de santé et de sécurité du travail (AQHSST), in Victoriaville
2. Grand Rendez-vous en santé et sécurité du travail, in Québec City
3. Slips, Trips and Falls International Conference, in Toronto
4. Grand Rendez-vous en santé et sécurité du travail, at the Palais des congrès de Montréal
5. Prévibois Congress Ensemble, in Québec City

At the Grand Rendez-vous event in Montréal, the chair of the CNESST's board of directors, **Manuelle Oudar,** dropped by the IRSST booth to greet the personnel.

From left to right: Maura Tomi, Louis Lazure, Manuelle Oudar, Charles Gagné, Chantal Gauvin, François Ouellet. /



THE **HONOUR** ROLL

Every year, the IRSST is proud to officially recognize the excellence of the members of its governing bodies, personnel, and external collaborators who have excelled in their work.

At its annual colloquium, the IRSST paid tribute to the contribution made by **Andrée Bouchard** (of the Confédération des syndicats nationaux) to OHS research. It handed her a commemorative plaque and an enlargement of a photo taken by **Chantal Bellefeuille**, an IRSST staff member. Ms. Bouchard sat on the Institute's board of directors for more than 30 years, among other things.

The Andrée Bouchard scholarship on gender, work, and health was created in her honour.

PRIX ACFAS-IRSST MAÎTRISE

Every year, the Institute partners with the Association francophone pour le savoir (Acfas) to hand out two prizes as an incentive to the next generation of OHS researchers and underscore the excellent university results obtained by selected master's and doctoral students.

In 2017, the *Prix Acfas-IRSST – Maîtrise* was awarded to **Marie-Christine Richard**, a health sciences student at Université de Sherbrooke. A trained ergonomist with clinical experience as a physiotherapist, this award-winner collected data on workers aged 55 and over to gain insight into the factors facilitating their sustainable job retention and helping them to continue leading active, healthy lives.

PRIX ACFAS-IRSST DOCTORAT

A psychology student at Université du Québec à Montréal, **Maxime Fortin,** was awarded the *Prix Acfas-IRSST – Doctorat* for his innovative project aimed at optimizing cognitive behavioural therapy for workers suffering from post-traumatic stress syndrome. The therapy includes weekly 90-minute sessions over a period of 8 to 32 weeks, depending on the worker's needs. The project was funded by the Canadian Institutes of Health Research.

WINNER OF AN ÉTUDIANTS-CHERCHEURS ÉTOILES AWARD

An IRSST **fellowship recipient** was honoured with the *Étudiants-chercheurs étoiles Award* from the Fonds de recherche du Québec. **Alexandra Lecours,** a doctoral student in biomedical sciences at Université du Québec à Trois-Rivières, won the award for a scientific article she authored. Published in the *Scandinavian Journal of Occupational Therapy*, the article was titled *Preventive behaviour at work — A concept analysis*. It concerned preventive behaviours and the actions to be promoted among workers. Ms. Lecours' research, which was associated with her IRSST fellowship, involved studying the development of preventive behaviours related to musculoskeletal upper-limb injuries and disorders when learning a trade in a vocational program. Alexandra Lecours was also the recipient of the *Prix Acfas-IRSST – Doctorat* in the **Prix Relève** category in 2016.

CSA GROUP AND FALLS FROM HEIGHTS

The expertise of our researcher **Bertrand Galy** was officially recognized by CSA Group, a Canadian certification and standardization organization. It awarded him the title of associate member of the CSA Z259 Technical Committee for Fall Protection. He thus joins his colleague **André Lan,** who has represented the IRSST on this committee since 2005.

Moreover, in 2017, the **IRSST hosted** the meeting of this technical committee, which brought together some 40 researchers and experts from various countries.

SIAS SCIENTIFIC COMMITTEE

IRSST engineer **Laurent Giraud** was named a member of the scientific committee of the 9th International Conference on Safety of Industrial Automated Systems, which will be held in Nancy in 2018.

Launched in Montréal in 1999 at the IRSST's initiative, this conference assembles experts to take stock of advancements in knowledge on machine safety and methods of risk analysis, while providing better understanding of human-machine interactions.

CSA GROUP AND PROTECTIVE FOOTWEAR

The expertise of engineer **Chantal Gauvin** was solicited by one of CSA Group's technical committees. An IRSST scientist, she was named a member of the CSA Z195 and CSA Z334 committees, which are developing standards for protective footwear.

These standards encompass numerous aspects such as the design and performance requirements of safety footwear and over-the-shoe toe protectors, their general stability requirements, and sole resistance to slips, perforation, and electric shock.

PUBLICATION SELECTED BY THE ILO

In the context of the 2017 World Day for Safety and Health at Work, the International Labour Organization (ILO) selected a publication by IRSST researcher **Philippe Sarazin** to form part of its collection of articles that "focus on the critical need for countries to improve their capacity to collect and utilize reliable occupational safety and health (OSH) data."

Published in the journal *Annals of Work Exposures and Health* under the title *Trends in OSHA Compliance Monitoring Data 1979–2011: Statistical Modeling of Ancillary Information across 77 Chemicals*, this article assesses whether the air contamination data compiled by the Occupational Safety and Health Administration (OSHA-USA) can be used to estimate occupational exposure in North America.

AWARD-WINNING PRESENTATION

At a colloquium celebrating its 30 years of research and innovation, the Centre de recherche interdisciplinaire sur le bien-être, la santé, la société et l'environnement (CINBIOSE) of Université du Québec à Montréal awarded the *Prix Pechakucha* for the best presentation to IRSST kinanthropologist **Caroline Jolly**.

The award honours an oral presentation synchronized with a slideshow of 20 slides that must scroll along every 20 seconds, for a total time of exactly 6 minutes and 40 seconds. The *Prix Pechakucha* officially recognizes the eloquence, narrative sense, conciseness, and graphic expression of the presentation.

BEST PRESENTATION

A chemistry trainee in the Laboratory Division, **Mélodie Bonin** won the first prize for the **best student presentation** at the annual congress of the Association québécoise pour l'hygiène, la santé et la sécurité du travail (AQHSST) in 2017.

She co-authored a presentation titled *Caractérisation des émissions de bitume haute résistance au désenrobage (HRD) avec dope d'adhésivité* [characterization of emissions from high-resistance bitumen containing anti-stripping agents].

TWO BOARDS OF DIRECTORS

Two Canadian prevention organizations working in the agricultural sector, **Agrivita Canada inc.** and the **Canadian Centre for Health and Safety in Agriculture** (CCHSA) of the University of Saskatchewan, invited IRSST president and CEO, **Marie Larue,** to sit on their respective boards of directors.

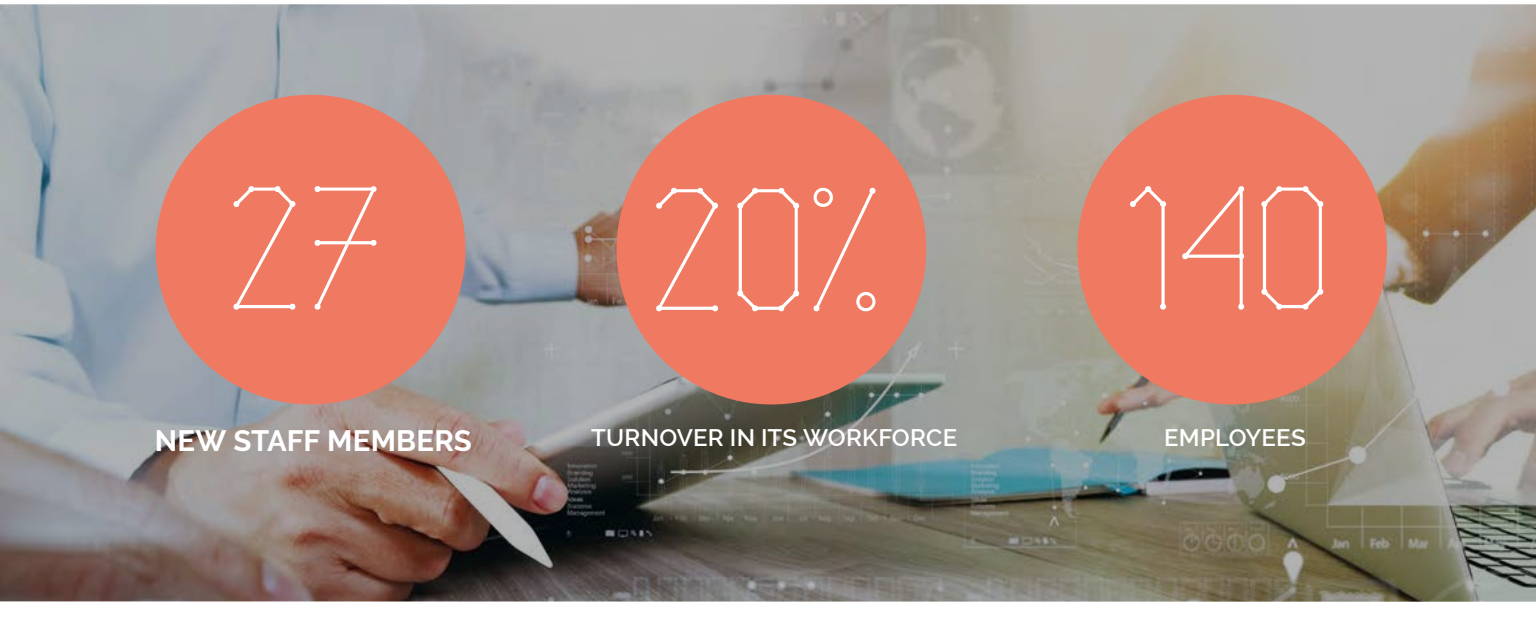
These non-profit organizations dedicate their efforts to promoting and ensuring the application of industrial hygiene, and to leveraging research and transferring results applicable to the agricultural sector.

The IRSST has been collaborating with Agrivita Canada and the CCHSA for a number of years.

HUMAN RESOURCES

The Finance and Administration Division is having to put more time and energy than ever into filling the gaps left by the many retirements, as well as meeting current needs. In 2017, it recruited, hired, and welcomed **27 new staff members**, representing a **20% turnover in its workforce**. Twenty-one of these new employees hold full-time permanent positions, while the six others are temporary employees.

As at December 31, 2017, the Institute had **140 employees**, including 22 researchers, 48 scientific professionals, 7 support professionals, 41 technicians, 13 managers, and 9 office workers. Recruitment efforts were ongoing to fill three of the new positions created.



APPOINTMENTS

Serving the IRSST for 25 years, **Louis Lazure** was appointed **senior director** in the Executive Office. As such, he oversees the implementation of the knowledge transmission plan, among other things, and supports the integration of new managers as staff members retire. An engineer by training, he held several earlier positions at the Institute: researcher, Safety-Ergonomics director, director of the former Knowledge Transfer and Partner Relations Department, and director of the Communications and Knowledge Transfer Division. He also served as the acting director of the Scientific Division.

Kannan Krishnan, a recipient of a postdoctoral scholarship from The Hamner Institutes for Health Sciences and holder of a doctorate in community health (Environmental Toxicology) from Université de Montréal (UdeM), was named the IRSST's **scientific director.** He brings with him over 20 years of research experience, acquired as vice-dean of research at UdeM, director of the Interuniversity Centre for Research in Toxicology, director of the Department of Occupational and Environmental Health of the Public Health Research Institute of UdeM, and director of the risk assessment component of the Canadian Network of Toxicology Centres. Until recently, he held the position of senior vice-president, Chemical Risk Assessment, at Risk Sciences International Inc.

Charles Gagné, who has a master's degree, an OHS certificate, and solid experience in knowledge transfer, was promoted **director of the Communications and Knowledge Transfer Division.**

In addition to completing a master's program in public management, he remains a permanent member of Équipe RENARD, the first cross-disciplinary group devoted to partnership research on knowledge transfer in the field of social interventions, specifically with regard to the education, health, and community sectors. Previously, he served as a knowledge transfer advisor for 10 years at the IRSST.

With a bachelor's degree in business administration and credentials as a CPA, CGA auditor, **Ingrid Dallaire** was named **director of the Financial and Physical Resources Division.** She is also a member of the Ordre des comptables agréés du Québec and has 17 years of experience in an accounting firm.

Beginning in 2007 and before joining the IRSST team, she served as assistant director at SCF Montérégie inc., a chartered accountants firm.

Louis-Alexandre Taillon, who holds a multi-disciplinary bachelor's degree and a concentration in computer science, was appointed **director of information technologies** within the IRSST's Finance and Administration Division. Prior to that, he held the job of director of the Information Technology Department at National Bank, where he performed various functions.

His past accomplishments include supervision of a team of software developers in the automobile industry at ADP Dealer Services Canada, and working as an analyst and programmer at SNC-Lavalin and ASP One Technologies.

EXTERNAL RESEARCH

Complementing our internal resources is the strong research potential of our external researchers whose OHS studies are funded by the IRSST. In 2017, this resource pool included **170 active scientists** listed in the database of the Research and Expertise Division. These specialists, who essentially come from the universities and public or private research centres, increase OHS research capacities in Québec, while also providing a substantial pool of potential future researchers.

The Institute encourages interdisciplinary and multidisciplinary studies by supporting the initiatives of teams comprising internal and external researchers. The year 2017 was no exception. Of **164** active projects, **more than two-thirds (109)** were conducted jointly by internal and external resources. The other projects were carried out exclusively either by external scientists **(35)** or IRSST personnel **(20).**

TRAINEES

Drawn by scientific research, the IRSST's mission, and the experience of its personnel, **37 students or collaborators** did traineeships in the Institute's laboratories and at other work premises. By opening its doors in this way, the Institute shares its expertise and passion for science, while encouraging students and collaborators to pursue a career in OHS. This group of 37 trainees comprised mainly students in secondary school **(1)**, CEGEP **(2)**, bachelor's **(3)**, master's **(10)**, doctoral **(4)**, or postdoctoral programs **(6)**. Eleven collaborators also completed a training program at the Institute in 2017.

OUR EMPLOYEES' OCCUPATIONAL HEALTH AND SAFETY

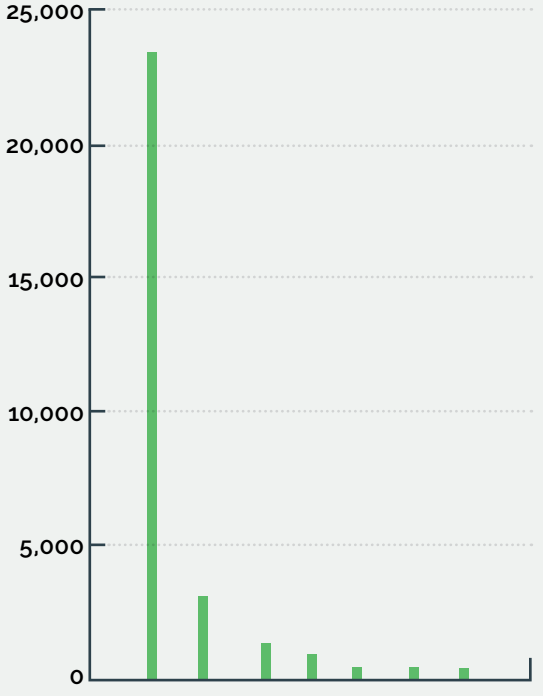
Leading by example, the Institute has its own volunteer-run occupational health and safety committee (OHSC), with equal labour/management representation. Its members met eight times in 2017. One accident and nine incidents were reported during the year and recorded in the accident register. To prevent such events from happening, the OHSC made recommendations and took action. Specifically, it purchased appropriate tools and equipment, displayed prevention-related posters, modified work methods, took air samples, offered training, and updated the policy for preventing electric shocks during repair operations on laboratory equipment by incorporating a follow-up procedure.

The IRSST's injury performance was such that its assessment rate at the CNESST was lower than the unit rate paid by other organizations operating in the same activity sector.

FINANCIAL OVERVIEW

The financial results as at December 31, 2017 were:

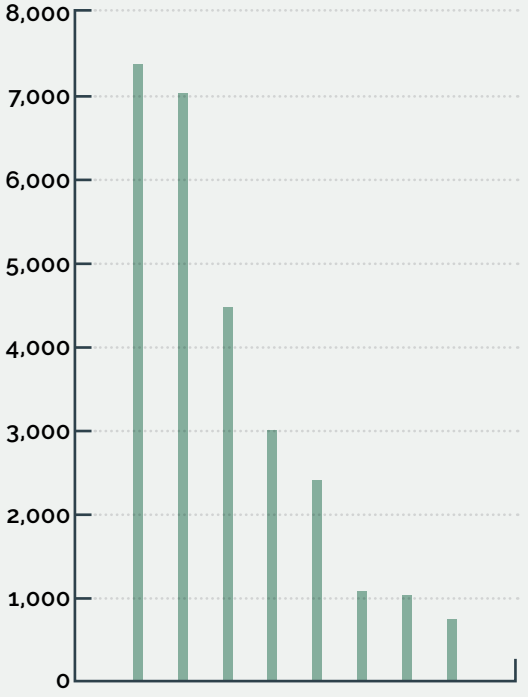
TOTAL REVENUES OF $27,717,301



DISTRIBUTED AS FOLLOWS:

Grant from the CNESST	$23,373,000
Laboratory services	$2,721,884
Special projects	$969,958
External contracts	$534,725
Interest income	$64,194
Beryllium project	$40,074
Other	$13,466

TOTAL EXPENDITURES OF $27,182,694



DISTRIBUTED AS FOLLOWS:

Internal research	$7,384,349
Laboratory services	$7,027,876
External research	$4,473,142
Finance and administration	$3,008,473
Scientific support for internal and external research	$2,414,999
Knowledge transfer service	$1,039,764
Executive Office	$1,080,433
Communications and institutional events	$753,658

GOVERNANCE

BOARD OF DIRECTORS

The Board of Directors is composed of seven representatives each of employer and worker associations, and a chair. It is based on the principle of equal (labour/management) representation. Appointed by the Québec government, its members manage the Institute's affairs, set its strategic orientations, determine its development framework, and allocate the resources needed for its operations.

In 2017, the members of the Board and those of the Executive Committee met **seven** and **eight** times respectively.

CHAIR

Manuelle Oudar*

EMPLOYER REPRESENTATIVES

/ Martine Bélanger / Stéphane Forget
/ Yves-Thomas Dorval* / France Dupéré
/ Martine Hébert / Patricia Jean / Norma Kozhaya

WORKER REPRESENTATIVES

/ Martin L'Abbée / Serge Cadieux* / Alain Croteau
/ Jean Lacharité / Yves Ouellet / Denis Bolduc
/ Francine Lévesque

IRSST REPRESENTATIVE

Marie Larue

OBSERVER

Jean Poirier

Appointments: none
Departures: Francine Lévesque

* Members of the Executive Committee

SCIENTIFIC ADVISORY BOARD

The Scientific Advisory Board (SAB) is a tripartite advisory board composed of six members of the scientific and technical community, four worker representatives, and four employer representatives. Chaired by the Institute's president and CEO, the SAB formulates opinions on the relevance, priority, and scientific merit of internal and external research programs and projects. The SAB met **eleven** times in 2017.

CHAIR

Marie Larue

EMPLOYER REPRESENTATIVES

/ Lionel Bernier / Gilles Rousseau
/ Dominique Malo / Marie-France Turcotte

WORKER REPRESENTATIVES

/ Denis Mailloux / Ana Maria Seifert
/ Daniel Demers / Jean-Pierre Devost

SCIENTIFIC REPRESENTATIVES

/ Léonard Aucoin / Benoit Lévesque
/ Alain Rondeau / Gaétan Lantagne
/ Louis Cloutier / André Dufresne

OBSERVER

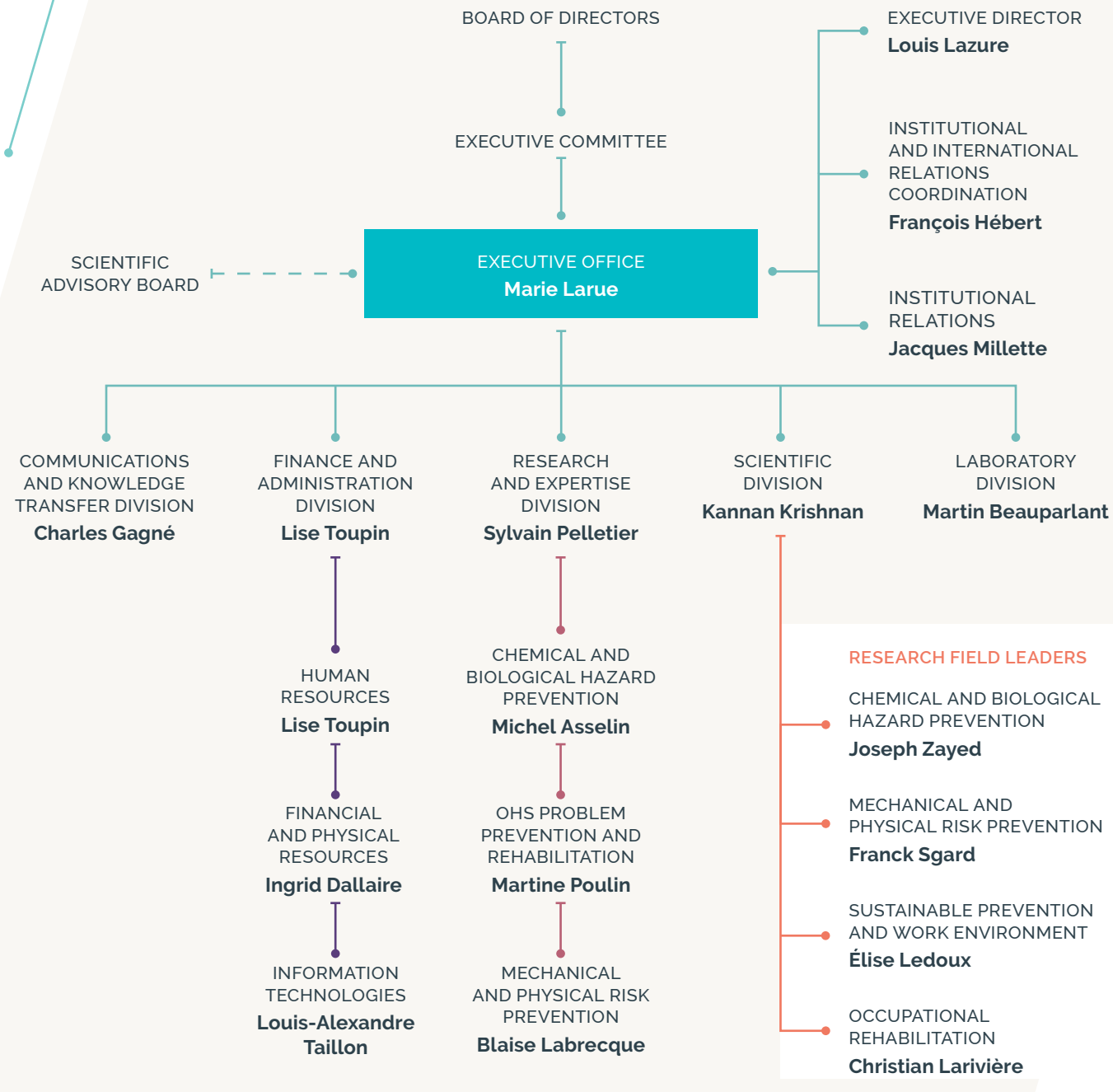
Claude Sicard

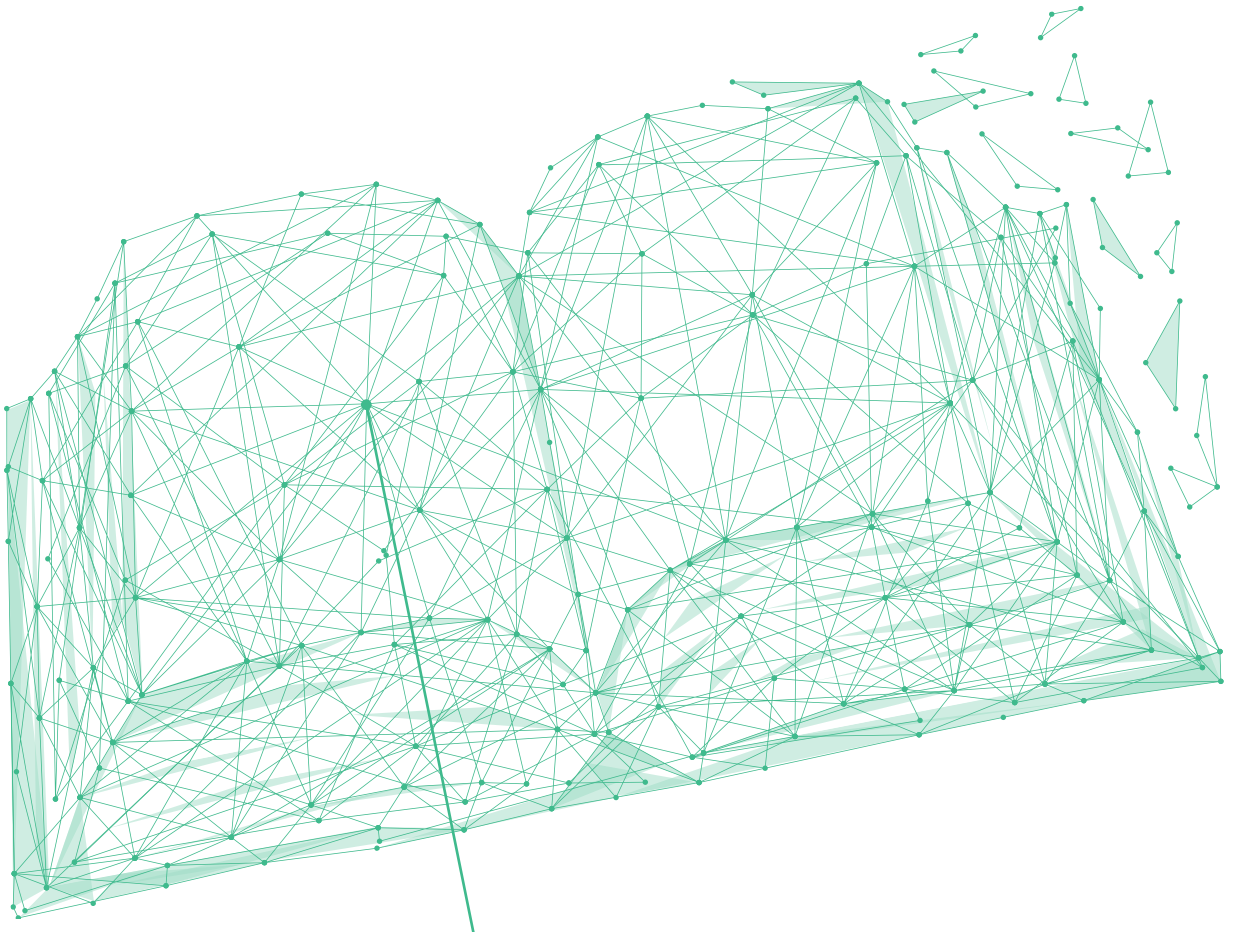
Appointments: none
Departures: Louis Cloutier and André Dufresne

DEATH OF LOUIS CLOUTIER

It is with great sadness that members of the Scientific Advisory Board learned of the passing of their colleague and former dean of the Faculty of Sciences and Engineering at Université Laval. On behalf of the Board, IRSST president and CEO Marie Larue salutes the contribution made by Louis Cloutier to OHS research and to the development of the engineering profession: "We will all remember this top-flight scientist, a man who was sensitive to people's well-being, worker health, and healthy workplaces, and who had a brilliant university career".

2017 ORGANIZATION CHART





PRODUCTION CATALOGUE

This section lists, for each research field, the **projects** begun, **reports** published, **videos** disseminated, and **publications** most frequently downloaded in 2017. It also lists the year's **scientific publications**, including journal articles, peer-reviewed articles published in conference proceedings, books, book chapters, and theses.

CHEMICAL AND BIOLOGICAL HAZARD PREVENTION

PROJECTS AND ACTIVITIES BEGUN IN 2017

1. **2013-0054** — Evaluation of the performances of a range of filtering facepiece respirators against ultrafine particles (UFPs)

2. **2015-0010** — Development of strategies to control contamination caused by disinfection byproducts in swimming pools

3. **2015-0083** — Assessment of occupational chemical contaminant exposure and health risk in Québec's primary e-waste recycling industry

4. **2015-0084** — Highly sensitive measurements of the passage of nanometric contaminants through protective gloves, using medical imaging

5. **2016-0016** — Assessing embalmer exposure to bioaerosols and the associated health risk

6. **2017-0005** — Use of microbial volatile organic compounds (MVOCs) as exposure biomarkers for mould in the workplace – knowledge summary

7. **2017-0033** — Knowledge transfer activity: Preventing exposure to pesticides: why and how to choose personal protective equipment (PPE)

8. **2017-0039** — State-of-the-art review of the influence of welding parameters on worker exposure to fumes generated during electric-arc welding operations

RESEARCH REPORTS AND OTHER PUBLICATIONS

1. **R-952** Évaluation de méthodes de prélèvement et de caractérisation de nanomatériaux manufacturés dans l'air et sur des surfaces des milieux de travail

2. **R-954** Green Jobs in Québec: Definition and Assessment of Potential Chemical and Biological Risks to Workers' Health

3. **R-960** Évaluation des bioaérosols et des composés gazeux émis lors des compostages de résidus agroalimentaires et résidentiels

4. **R-964** Exposition des travailleurs québécois à des cancérogènes — Industries et groupes professionnels

5. **RA-964** Exposition des travailleurs québécois à des cancérogènes — Industries et groupes professionnels – Fiches

6. **R-965** Évaluation de la biomasse mycologique sur les surfaces des réseaux aérauliques des systèmes de ventilation

7. **R-990** Activation des éosinophiles humains par des nanoparticules

PRESENTATIONS, LECTURES, AND REPORTS ON VIDEO FILE

1. **Aubin, S., Roberge, B.** (April 6, 2017). Guide for Safe Use of Isocyanates. [Video file] Retrieved from *http://www.irsst.qc.ca/en/publications-tools/video/i/100340/n/utilisation-securitaireisocyanates*

2. **Aubin, S.** (January 12, 2017). Implantation d'une méthode d'analyse pour la détermination des fumées d'asphalte dans l'air. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100328/n/methode-analyse-fumees-asphalte*

3. **Bahloul, A.** (January 9, 2017). Évaluation de la performance d'un modèle de filtre N95. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100324/n/evaluation-de-la-performance-d-un-modele-de-filtre-n95*

4. **Gagné, S.** (January 10, 2017). Développement d'un nouveau dispositif d'échantillonnage afin de prélever de façon efficace et sécuritaire les aérosols de méthylène diphénile diisocyanate (MDI). [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100325/n/dispositif-echantillonnage-aerosols-mdi*

5. **Lord, J.** (February 9, 2017). Proposition pour un diagnostic du dépassement d'un seuil en présence d'un petit nombre d'échantillons. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100332/n/diagnostic-depassement-seuil-presence-petit-nombre-echantillons*

6. **Marchand, G.** (April 7, 2017). Survol de la problématique liée à la subtilisine présente dans les savons enzymatiques. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100343/n/problematique-subtilisine-savons-enzymatiques*

7. **Marchand, G.** (April 27, 2017). Détection moléculaire des bactéries du genre Legionella dans l'eau des tours de refroidissement et l'eau de consommation. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100347/n/detection-bacteries-legionella-tours-refroidissement*

8. **Tuduri, L.** (February 10, 2017). Optimisation de SATURISK, l'outil de calcul du temps de service des cartouches de protection respiratoire contre les vapeurs organiques. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100334/n/saturisk-outil-temps-service-cartouches-vapeurs-organiques*

9. **Tuduri, L.** (August 16, 2017). Prévention des risques chimiques liés à l'usage de pesticides chez les producteurs de pommes québécois. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100351/n/risques-chimiques-pesticides-producteurs-pommes-quebecois*

MECHANICAL AND PHYSICAL RISK PREVENTION

PROJECTS AND ACTIVITIES BEGUN IN 2017

1. **2015-0073** — Knowledge transfer activity: Lifelines for residential roofing work

2. **2015-0074** — Knowledge transfer activity: Fact sheet to guide choice of appropriate values for reduced-energy speeds and/or forces during interventions on machines

3. **2016-0008** — Suspension seats: A state-of-the-art review

4. **2016-0027** — Assessing the impact of wearing hearing aids on postural control in workers with hearing loss

5. **2017-0032** — Development of a voice-based method for objective occlusion effect measurement

RESEARCH REPORTS AND OTHER PUBLICATIONS

1. **R-929** Utilisation de prothèses auditives en milieu de travail bruyant

2. **R-947** Évaluation d'un système de corde d'assurance horizontale, de connecteurs d'ancrage et de fermes contreventées comme structure d'accueil lors de la pose de toitures résidentielles

3. **R-955** Development of a Confined Space Risk Analysis and Work Categorization Tool

4. **R-956** Study of Machine Safety for Reduced-Speed or Reduced-Force Work

5. **R-961** Performance d'outils de modélisation pour la résolution de deux problématiques de bruit et de vibrations de type impulsionnel

6. **R-966** Secteur minier — Approche intégrée de mesure de contraintes *in situ* par méthode inverse

7. **R-970** Plastic Injection Moulding Machines with Auxiliary Equipment — Safety During Maintenance and Production Interventions

8. **R-971** Design of Horizontal Lifeline Systems for Fall Protection — Update of Technical Guide

9. **R-974** Robotique collaborative — Évaluation des fonctions de sécurité et retour d'expérience des travailleurs, utilisateurs et intégrateurs au Québec

10. **R-977** Performance acoustique des alarmes de recul tonales et à large bande en milieu ouvert en vue d'une utilisation optimale

11. **R-975** Implantation du cadenassage des équipements mobiles dans le secteur municipal — Étude exploratoire

12. **R-980** Machine Safety — Hands-On Experimentation with Risk Estimation Parameters and Tools

13. **R-987** Effet des fluides de coupe sur la résistance à la coupure et à la perforation des gants de protection

14. **R-988** Evaluation of a Horizontal Lifeline System, Anchorage Connectors and Braced Trusses as Host Structure for Residential Roofing Work

15. **RF-951** How to Choose Slip-Resistant Occupational Footwear — Pamphlet 1

16. **RF-950** Reconnaître le syndrome du marteau hypothénarien

17. **RF-959** Recognizing Hypothenar Hammer Syndrome

PRESENTATIONS, LECTURES, AND REPORTS ON VIDEO FILE

1. **Lan, A., Galy, B.** (February 8, 2017). Évaluation d'un système de corde d'assurance horizontale, de connecteurs d'ancrage et de fermes contreventées comme structure d'accueil lors de la pose de toitures résidentielles. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100333/n/corde-assurance-connecteurs-ancrage-fermes-contreventees*

2. **Leroux, T.** (March 1, 2017). Utilisation des prothèses auditives en milieu de travail bruyant. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100345/n/outils-evaluer-protection-auditive-individuelle-travailleurs*

3. **Nélisse, H., Sgard, F.** (April 12, 2017). Développement d'outils et de méthodes pour mieux évaluer et améliorer la protection auditive individuelle des travailleurs. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100345/n/outils-evaluer-protection-auditive-individuelle-travailleurs*

4. **Turcot, A.** (March 6, 2017). Le syndrome du marteau hypothénarien : un grand méconnu [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100337/n/syndrome-marteau-hypothenarien*

5. **Turcot, A.** (March 6, 2017). Hypothenar Hammer Syndrome: A Great Unknown. [Video file] Retrieved from *http://www.irsst.qc.ca/en/publications-tools/publication/i/100918/n/hypothenar-hammer-syndrome*

6. **Turcot, A.** (August 17, 2017). Caractérisation du syndrome du marteau hypothénarien chez les travailleurs utilisant des outils manuels et exposés aux vibrations mains-bras. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100352/n/syndrome-marteau-hypothenarien-outils-manuels-vibrations-mains-bras*

SUSTAINABLE PREVENTION AND WORK ENVIRONMENT

PROJECTS AND ACTIVITIES BEGUN IN 2017

1. **2016-0045** — Development of tools and analytical methods for evaluating an intervention designed to prevent musculoskeletal disorders in the poultry slaughter industry: implementation process and economic impacts

2. **2017-0036** — Knowledge transfer activity: Production of tools to promote implementation of integrated strategies for preventing musculoskeletal disorders in nursing staff

3. **2017-0037** — Knowledge transfer activity: Tool for evaluating occupational health and safety-related risks — For teachers supervising internships in the Work-Oriented Training Path program

4. **2017-0045** — Knowledge transfer activity: Tool designed to improve safety in job integration processes in the forestry sector

RESEARCH REPORTS AND OTHER PUBLICATIONS

1. **DI-962-1** Intégration sécuritaire des nouveaux travailleurs dans les entreprises minières

2. **DI-962-2** L'intégration d'Antoine au poste d'opérateur de camion à benne surdimensionné — Illustration d'un processus d'intégration

3. **DI-973-1** Safe Integration of New Workers in Mining Companies — Self-Diagnostic Tool

4. **DI-973-2** Anthony's Integration Into the Job of Oversized Dump Truck Operator — Example of a Worker Integration Process

5. **DS-958** Le travail du technicien ambulancier paramédical : comprendre les risques pour prévenir les troubles musculosquelettiques

6. **DS-999** The work of emergency medical technician-paramedics: Understanding the risks in order to prevent musculoskeletal disorders

7. **R-944** Mesure de l'exposition du technicien ambulancier paramédical aux facteurs de risque de troubles musculosquelettiques

8. **R-948** Vers l'amélioration des services et des soins palliatifs de fin de vie — Adapter et implanter des programmes de soutien en milieu de travail et évaluer leur effet sur la satisfaction, le sens au travail et le bien-être des infirmières (SATIN II)

9. **R-957** OHS Risks — Strategies Used by Adolescent Trainees in Semiskilled Trades During Unforeseen Events

10. **R-968** Évaluation des risques liés à la SST — Les critères de conception d'un outil pour les superviseurs du stage « Parcours de formation axée sur l'emploi »

11. **R-969** A Portrait of Work and OHS Among 15-Year-Olds in Québec

12. **R-981** Conditions Facilitating Managers' Adoption of Organizational Interventions Designed to Prevent Mental Health Problems in the Workplace

13. **R-985** Application des pratiques préventives par les infirmières et infirmiers — La perspective innovante de la capacité d'absorption

14. **R-986** Analyse comparative du contexte de travail et portrait statistique des problèmes de santé et sécurité au travail en fonction de la taille des entreprises

PRESENTATIONS, LECTURES, AND REPORTS ON VIDEO FILE

1. **Corbeil, P.** (April 11, 2017). Technicien ambulancier paramédical : un métier à risque. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100344/n/technicien-ambulancier-paramedical*

2. **Corbeil, P.** (December 6, 2017). Mesure de l'exposition du technicien ambulancier paramédical aux facteurs de risque de troubles musculosquelettiques. [Video file] Retrieved from *https://www.irsst.qc.ca/publications-et-outils/video/i/100357/n/mesure-exposition-technicien-ambulancier-paramedical-facteurs-risque-troubles-musculosquelettiques*

3. **Delisle, A.** (December 8, 2017). Estimation du chargement au dos Développement d'une méthode ambulatoire intégrant la cinématique du dos et de l'électromyographie. [Video file] Retrieved from *https://www.irsst.qc.ca/publications-et-outils/video/i/100358/n/estimation-du-chargement-au-dos-developpement-d-une-methode-ambulatoire-integrant-la-cinematique-du-dos-et-de-l-electromyographie*

4. **Laberge, M**. (June 29, 2017). Critères de conception d'un outil d'aide à l'évaluation des risques liés à la santé et à la sécurité du travail Superviseurs de stage. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100350/n/criteres-conception-outil-evaluation-risques-sst*

5. **Ledoux, É.** (January 11, 2017). Portrait du travail et de la santé et de la sécurité du travail chez les jeunes de 15 ans au Québec. [Video file] Retrieved from *http://www.irsst.qc.ca/resultats-recherche?q=100327#gsc.tab=0&gsc.q=100327&gsc.page=1*

6. **Lortie, M.** (May 2, 2017). Solutions visant l'amélioration des conditions de santé et de sécurité des poseurs de revêtements de sol. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100348/n/sante-securite-poseurs-revetements-sol*

7. **Montreuil, S.** (January 11, 2017). Portrait des pratiques de prévention primaire et secondaire en bureautique au Québec chez les intervenants et dans les milieux de travail. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100326/n/pratiques-prevention-primaire-secondaire-bureautique*

8. **Papillon, G., Paris, M., Sylvestre, R., Therrien, B., Paris, H., Campos, V.** (October 3, 2017). Les poseurs de revêtements souples et la santé et la sécurité du travail. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100355/n/poseurs-revetements-souples-sst*

9. **Robitaille, A., Fillion, L., Desbiens, J.-F., Gélinas, C., Vachon, M., Truchon, M.** (January 24, 2017). Stress et satisfaction au travail des infirmières en soins palliatifs. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100329/n/stress-satisfaction-travail-infirmieres-soins-palliatifs*

OCCUPATIONAL REHABILITATION

PROJECTS AND ACTIVITIES BEGUN IN 2017

1. **2016-0029** — Occupational injuries to the rotator cuff: Development of content for a practical guide to optimize workers' care and to foster a return to work

2. **2016-0044** — Development of content for a tool to improve the intercultural skills of Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) staff through a co-construction approach

3. **2017-0043** — Knowledge transfer activity: Webinar and memory aid The effectiveness of rehabilitation programs: For whom, why, and how?

RESEARCH REPORTS AND OTHER PUBLICATIONS

1. **DS-994** Troubles musculosquelettiques — Les cinq composantes du succès d'un programme de réadaptation incluant une intervention en milieu de travail (Aide-mémoire)

2. **R-942** Troubles musculosquelettiques — Revue réaliste sur les bases théoriques des programmes de réadaptation incluant le milieu de travail

3. **R-949** Clinical Evaluation, Treatment and Return to Work of Workers Suffering from Rotator Cuff Disorders — A Knowledge Review

4. **R-967** Relations interculturelles — Comprendre le processus de réadaptation et de retour au travail

5. **R-972** Return-to-Work Coordination Practices of Large Organizations in Québec

6. **R-979** Modulation du gain auditif central dans une perspective de réadaptation des travailleurs souffrant d'acouphènes

7. **R-982** Validation of Return-to-Work Obstacles and Self-Efficacy Scale (ROSES) with Workers Suffering from a Common Mental Disorder or Musculoskeletal Disorder

8. **R-983** Pratiques des milieux de travail pour assurer un retour en emploi sain et durable

PRESENTATIONS, LECTURES, AND REPORTS ON VIDEO FILE

1. **Corbière, M.** (April 18, 2017). Validation du questionnaire Obstacles au retour au travail et sentiment d'efficacité pour les surmonter (ORTESES) auprès de travailleurs souffrant d'un trouble mental courant ou d'un trouble musculosquelettique. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100346/n/travailleurs-trouble-mental-tms*

2. **Côté, D.** (May 3, 2017). Relations interculturelles — Comprendre le processus de réadaptation et de retour au travail. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100349/n/relations-interculturelles-processus-readaptation-retour-travail*

3. **Coutu, M.-F.** (January 25, 2017). Développement et implantation d'un programme de prise de décision sur l'incapacité au travail. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100330/n/implantation-programme-decision-incapacite-travail*

4. **Durand, M.-J.** (February 7, 2017). Pratiques des grandes entreprises au Québec en regard de la coordination de retour au travail. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100331/n/pratiques-grandes-entreprises-quebec-coordination-retour-travail*

5. **Durand, M.-J.** (November 15, 2017). Troubles musculosquelettiques Revue réaliste sur les bases théoriques des programmes de réadaptation incluant le milieu de travail. [Video file] Retrieved from *https://www.irsst.qc.ca/publications-et-outils/video/i/100356/n/tms-revue-bases-theoriques-programmes-readaptation*

6. **Larivière, C.** (April 6, 2017). Développement préliminaire d'une règle de prédiction clinique pour dépister les patients ayant une lombalgie non aiguë répondant favorablement à un programme d'exercice de stabilisation lombaire. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100342/n/regle-prediction-clinique-depister-lombalgie-programme-exercice-stabilisation-lombaire*

7. **Nastasia, I.** (December 13, 2017). Pratiques des milieux de travail pour un retour au travail sain et durable des travailleurs ayant subi un trouble musculosquelettique. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100359/n/retour-travail-durable-trouble-musculosquelettique*

SPECIAL PROJECTS

PROJECT OR ACTIVITY BEGUN IN 2017

2016-0015 — Costs of work-related road accidents in Québec 2000-2013

RESEARCH REPORTS

1. **R-945** Immigrant Workers and OHS in Québec — State of Knowledge from Published Statistical Surveys and Available Data Sources
2. **R-953** Summer Temperatures, Ozone Concentrations and Occupational Injuries Accepted for Compensation in Québec
3. **R-963** Lésions professionnelles indemnisées au Québec en 2010-2012 — Profil statistique par industrie et catégorie professionnelle (version révisée)
4. **RA-963** Lésions professionnelles indemnisées au Québec en 2010-2012
5. **R-976** Lésions avec atteinte permanente à l'intégrité physique ou psychique — Analyse du risque au Québec
6. **R-989** Impact de l'allongement de la période de maturité des données sur les indicateurs de santé et de sécurité du travail

PRESENTATIONS, LECTURES, AND REPORTS ON VIDEO FILE

1. **Duguay, P.** (April 25, 2017). Les indicateurs de lésions professionnelles indemnisées. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100339/n/indicateurs-lesions-professionnelles*

1. **Labrèche, F.** (February 20, 2017). Température estivale, concentrations d'ozone et lésions professionnelles acceptées au Québec. [Video file] Retrieved from *http://www.irsst.qc.ca/publications-et-outils/video/i/100335/n/temperature-estivale-concentrations-ozone-lesions-professionnelles*

CONFERENCE

1. **CA-979** Les actes du Forum sur les cancérogènes professionnels
2. **CA-993** Montréal Symposium on Occupational Carcinogens: Stakeholder Report

MOST FREQUENTLY DOWNLOADED PUBLICATIONS

IN FRENCH

RG-552 Sécurité des machines — Prévention des phénomènes dangereux d'origine mécanique, protecteurs fixes et distances de sécurité

R-624 Donner un sens au travail — Promouvoir le bien-être psychologique

RG-484 Guide de prévention — Le travail de manutention et le service à la clientèle dans les magasins-entrepôts

B-023 Procédure d'intégration professionnelle à l'usage du conseiller en réadaptation

T-06 Guide d'échantillonnage des contaminants de l'air en milieu de travail

R-319 Guide pratique de protection respiratoire

Manuel d'ergonomie pratique en 128 points — Organisation du travail, Bureau international du travail, Association internationale d'ergonomie, IRSST, 2006

RG-618 Guide pour une démarche stratégique de prévention des problèmes de santé psychologique au travail

RG-779 Les TMS des membres supérieurs — Mieux les comprendre pour mieux les prévenir

R-543 Sens du travail, santé mentale au travail et engagement organisationnel

IN ENGLISH

RG-597 Machine Safety — Prevention of Mechanical Hazards — Fixed Guards and Safety Distances

RG-126 Work-Related Musculoskeletal Disorders (WMSDs) — A Better Understanding for More Effective Prevention

T-15 Sampling Guide for Air Contaminants in the Workplace

R-590 Technical fact sheet intended for personnel assigned to heavy vehicle repair and maintenance — Heavy Vehicles Tire Blowout and Explosion

R-787 The Costs of Occupational Injuries

RF-651 Safeguarding of Hydraulic Power Press Brakes

CG-002 Prevention Guide — Safe Handling of Hazardous Drugs

RF-867 Choosing a Safe Efficient Blow Gun

R-823 Supporting a Return to Work after an Absence for a Mental Health Problem — Design, Implementation, and Evaluation of an Integrated Practices Program

T-22 Guide for the adjustment of permissible exposure values (PEVs) for unusual work schedules

SCIENTIFIC PUBLICATIONS

PEER-REVIEWED JOURNAL ARTICLES

Biyeyeme Mve Bi, M.-J., Cloutier, Y., Lacombe, N., Lavoie, J., Debia, M. and Marchand, G. (2017). Comparaison of methods to evaluate the fungal biomass in heating, ventilation, and air-conditioning (HVAC) dust. *Environmental Monitoring and Assessment, 189*(1). doi: 10.1007/s10661-016-5682-8

Bonifait, L., Marchand, G., Veillette, M., M'Bareche, H., Dupuis, M.-É., Pépin, C., ... Duchaine, C. (2017). Workers' exposure to bioaerosols from three different types of composting facilities. *Journal of Occupational and Environmental Hygiene, 14*(10), 815-822. doi: 10.1080/15459624.2017.1335054

Boucher, J.-A., Roy, N., Preuss, R. and Larivière, C. (2017). The effect of two lumbar belt designs on trunk repositioning sense in subjects with and without low back pain. *Annals of Physical and Rehabilitation Medicine, 60*(5), 306-311. doi: 10.1016/j.rehab.2017.03.002

Burlet-Vienney, D., Chinniah, Y. and Aucourt, B. (2017). Maintaining Mobile Equipment: Controlling Hazardous Energy. *Professional Safety, 62*(12), 26-32.

Corbière, M., Lecomte, T., Lachance, J.-P., Coutu, M-F., Negrini, A. and Laberon, S. (2017). Stratégies de retour au travail d'employés ayant fait l'expérience d'une dépression : perspectives des employeurs et des cadres de ressources humaines. *Santé mentale au Québec, 42*(2), 173-196.

Corbière, M., Negrini, A., Durand, M.-J., St-Arnaud, L., Briand, C., Fassier, J.-B., ... Lachance, J.-P. (2017). Development of the return-to-work obstacles and self-efficacy scale (ROSES) and validation with workers suffering from a common mental disorder or musculoskeletal disorder. *Journal of Occupational Rehabilitation, 27*(3), 329-341. doi: 10.1007/s10926-016-9661-2

Dagenais, C., Plouffe, L., Gagné, C., Toulouse, G., Breault, A.-A. and Dupont, D. (2017). Improving the health and safety of 911 emergency call centre agents: An evaluability assessment of a knowledge transfer strategy. *International Journal of Occupational Safety and Ergonomics, 23*(1), 50-59. doi: 10.1080/10803548.2016.1216355

Denis, D., Gonella, M., Ledoux, É., Calvet, B. and Comeau, M. (2017). L'accompagnement au poste de travail des assembleurs du secteur aéronautique : réalités et défis. *Éducation permanente, HS9*, 69-77.

Dubuis, M.-È., M'Bareche, H., Veillette, M., Bakhiyi, B., Zayed, J., Lavoie, J. and Duchaine, C. (2017). Bioaerosols concentrations in working areas in biomethanization facilities. *Journal of the Air & Waste Management Association, 67*(11), 1258-1271. doi: 10.1080/10962247.2017.1356762

Durand, M.-J., Nastasia, I., Coutu, M-F. and Bernier, M. (2017). Practices of return-to-work coordinators working in large organizations. *Journal of Occupational Rehabilitation, 27*(1), 137-147. doi: 10.1007/s10926-016-9640-7

Durocher, I., Noël, C., Lavastre, V. and Girard, D. (2017). Evaluation of the in vitro and in vivo proinflammatory activities of gold (+) and gold (-) nanoparticles. *Inflammation Research, 66*(11), 981-992.

Gaudreau, M.-A., Sgard, F., Laville, F. and Nélisse, H. (2017). A finite element model to improve noise reduction based attenuation measurement of earmuffs in a directional sound field. *Applied Acoustics, 119*, 66-77. doi: 10.1016/j.apacoust.2016.12.003

Ghezelbash, F., Shirazi-Adl, A., Plamondon, A., Arjmand, N. and Parnianpour, M. (2017). Obesity and obesity shape markedly influence spine biomechanics: A subject-specific risk assessment model. *Annals of Biomedical Engineering, 45*(10), 2373-2382. doi: 10.1007/s10439-017-1868-7

Gravel, S., Dubé, J., Côté, D., White, B. and Gratton, D. (2017). Le retour au travail d'immigrants ayant subi une lésion professionnelle : les embûches de la rencontre interculturelle et la précarité du lien d'emploi. *Alterstice, 7*(1), 21-38. Retrieved from *https://www.journal.psy.ulaval.ca/ojs/index.php/ARIRI/article/view/Gravel_Alterstice7%281%29*

Hong, Q. N., Coutu, M-F. and Berbiche, D. (2017). Evaluating the validity of the work role functioning questionnaire (Canadian French version) using classical test theory and item response theory. *Work: A Journal of Prevention, Assessment & Rehabilitation, 57*(4), 501-515. doi: 10.3233/WOR-172585

Jocelyn, S., Chinniah, Y., Ouali, M.-S. and Yacout, S. (2017). Application of logical analysis of data to machinery-related accident prevention based on scarce data. *Reliability Engineering & System Safety, 159*, 223-236. doi: 10.1016/j.ress.2016.11.015

Kouassi, S., Catto, C., Ostiguy, C., L'Espérance, G., Kroeger, J. and Debia, M. (2017). Exposure assessment in a single-walled carbon nanotubes primary manufacturer. *Annals of Work Exposures and Health, 61*(2), 260-266.

Labrèche, F., Song, C., Pahwa, M., Peters, C. E., Arrandale, V. H., McLeod, C. B., ... Demers, P. A. (2017). Calculating the current burden of occupational cancers in Canadian women. *Occupational & Environmental Medicine, 74*(S1), 118-119. Retrieved from *http://oem.bmj.com/content/74/Suppl_1/A118.3*

Lan, A. and Galy, B. (2017). Evaluation of a horizontal lifeline system used during installation of residential roofs. *Journal of Construction Engineering and Management, 143*(5). doi: 10.1061/(ASCE)CO.1943-7862.0001247

Légaré, F., Stacey, D., Forest, P.-G., Coutu, M-F., Archambault, P., Boland, L., ... Giguère, A. M. (2017). Milestones, barriers and beacons: Shared decision making in Canada inches ahead. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen, 123-124*, 23-27. doi: 10.1016/j.zefq.2017.05.020

Maillette, P., Coutu, M-F. and Gaudreault, N. (2017). Workers' perspectives on return to work after total knee arthroplasty. *Annals of Physical and Rehabilitation Medicine, 60*(5), 299-305. doi: 10.1016/j.rehab.2017.01.004

Marchand, A. and Haddad, S. (2017). Simultaneous exposures to heat and chemicals and the impact on toxicokinetics and biomonitoring. *Current Opinion in Toxicology, 4*, 22-27. doi: 10.1016/j.cotox.2017.03.006

Marchand, G., Gardette, M., Nguyen, K., Amano, V., Neesham-Grenon, E. and Debia, M. (2017). Assessment of workers' exposure to grain dust and bioaerosols during the loading of vessels' hold: An example at a port in the province of Québec. *Annals of Work Exposures and Health, 61*(7), 836-843. doi: 10.1093/annweh/wxx045

Martin, J., Beauparlant, M., Sauvé, S. and L'Espérance, G. (2017). Effect of accelerating voltage on beam damage of asbestos fibers in the transmission electron microscope (TEM). *Micron, 96*, 1-8. doi: 10.1016/j.micron.2017.01.006

Martin, J., Beauparlant, M., Sauvé, S. and L'Espérance, G. (2017). Effect of temperature on beam damage of asbestos fibers in the transmission electron microscope (TEM) at 100 kV. *Micron, 94*, 26-36. doi: 10.1016/j.micron.2016.11.011

M'Bareche, H., Veillette, M., Bonifait, L., Dupuis, M.-É., Bernard, Y., Marchand, G., ... Duchaine, C. (2017). A next generation sequencing approach with a suitable bioinformatics workflow to study fungal diversity in bioaerosols released from two different types of composting plants. *Science of the Total Environment, 601-602*, 1306-1314. doi: 10.1016/j.scitotenv.2017.05.235

Nguyen-Tri, P., Tuduri, L., Gauvin, C., Triki, E. and Vu-Khanh, T. (2017). Swelling behavior of polymeric membranes to metalworking fluids. *Journal of Applied Polymer Science, 135*(3). doi: 10.1002/app.45717

Padois, T., Doutres, O., Sgard, F. and Berry, A. (2017). Time domain localization technique with sparsity constraint for imaging acoustic sources. *Mechanical Systems and Signal Processing, 94*, 85-93. doi: 10.1016/j.ymssp.2017.02.035

Padois, T., Sgard, F., Doutres, O. and Berry, A. (2017). Acoustic source localization using a polyhedral microphone array and an improved generalized cross-correlation technique. *Journal of Sound and Vibration, 386*, 82-99. doi: 10.1016/j.jsv.2016.09.006

Pahwa, M., Labrèche, F., Kim, J., Harris, M. A., Song, C. and Demers, P. A. (2017). Quantifying the impact of shift work on breast cancer: Results from the burden of occupational cancer in Canada study. *Occupational & Environmental Medicine, 74*(S1), 88. Retrieved from *http://oem.bmj.com/content/74/Suppl_1/A88.1*

Plamondon, A., Larivière, C., Denis, D., Mecheri, H. and Nastasia, I. (2017). Difference between male and female workers lifting the same relative load when palletizing boxes. *Applied Ergonomics, 60*, 93-102. doi: 10.1016/j.apergo.2016.10.014

Pompoli, F., Bonfiglio, P., Horoshenkov, K., Kahn, A., Bécot, F.-X., Jaouen, L., ... Boeckx, L. (2017). How reproducible is the acoustical characterization of porous media?. *Journal of the Acoustical Society of America, 141*(2), 945-955. doi: 10.1121/1.4976087

Prairie, J., Plamondon, A., Larouche, D., Hegg-Deloye, S. and Corbeil, P. (2017). Paramedics' working strategies while loading a stretcher into an ambulance. *Applied Ergonomics, 65*, 112-122.

Puscasu, S., Aubin, S., Sarazin, P., Richard, L., Spence, M. and Gagné, S. (2017). Use of the novel derivatizing agent 1,8-diaminonapthalene with the CIP10 sampler to measure 4,4'-methylene diphenyl diisocyanate atmospheres. *Annals of Work Exposures and Health, 61*(5), 566-574. doi: 10.1093/annweh/wxx023

Robert-Lachaine, X., Mecheri, H., Larue, C. and Plamondon, A. (2017). Accuracy and repeatability of single-pose calibration of inertial measurement units for whole-body motion analysis. *Gait & Posture, 54*, 80-86. doi: 10.1016/j.gaitpost.2017.02.029

Robert-Lachaine, X., Mecheri, H., Larue, C. and Plamondon, A. (2017). Effect of local magnetic field disturbances on inertial measurement units accuracy. *Applied Ergonomics, 63*, 123-132. doi: 10.1016/j.apergo.2017.04.011

Robert-Lachaine, X., Mecheri, H., Larue, C. and Plamondon, A. (2017). Validation of inertial measurement units with an optoelectronic system for whole-body motion analysis. *Medical & Biological Engineering & Computing, 55*(4), 609-619. doi: 10.1007/s11517-016-1537-2

Shahvarpour, A., Henry, S. M., Preuss, R., Mecheri, H. and Larivière, C. (2017). The effect of an 8-week stabilization exercise program on the lumbopelvic rhythm and flexion-relaxation phenomenon. *Clinical Biomechanics, 48*, 1-8. doi: 10.1016/j.clinbiomech.2017.06.010

Sullivan, M., Adams, H., Thibault, P., Moore, E., Carrière, J. and Larivière, C. (2017). Return to work helps maintain treatment gains in the rehabilitation of whiplash injury. *Pain, 158*(5), 980-987. doi: 10.1097/j.pain.0000000000000871.

Tardif, R., Rodriguez, M., Catto, C., Charest-Tardif, G. and Simard, S. (2017). Concentrations of disinfection by-products in swimming pools following modifications of the water treatment process: An exploratory study. *Journal of Environmental Sciences, 58*, 163-172.

Tompa, E., Kalcevich, C., McLeod, C., Lebeau, M., Song, C., McLeod, K., ... Demers, P. A. (2017). The economic burden of lung cancer and mesothelioma due to occupational and paraoccupational asbestos exposure. *Occupational & Environmental Medicine, 74*(11), 816-822. doi: 10.1136/oemed-2016-104173

Triki, E., Nguyen-Tri, P., Gauvin, C. et Vu-Khanh, T. (2017). Combined puncture and cutting of elastomer membranes: A fracture energy approach. *Journal of Applied Polymer Science, 134*(25). doi: 10.1002/app.44945

PEER-REVIEWED ARTICLES PUBLISHED IN CONFERENCE PROCEEDINGS

Beaugrand, S., Ledoux, É., Gagné, C., Savoie, L., Jolly, C. and Fournier, P.-S. (2017). *Conditions favorables pour intégrer les nouveaux travailleurs du secteur minier : un outil d'autodiagnostic.* Communication presented at the48e Congrès annuel de l'Association canadienne d'ergonomie et 12e symposium international sur l'ergonomie de conception organisationnelle et de gestion (ODAM), Banff, Alberta (p. 507-512). Retrieved from *https://ace-ergocanada.ca/files/ACE_2017/ACE-ODAM%202017%20eProceedings_sm.pdf*

Denis, D., Ledoux, É., Gonella, M. and Fournier, S. (2017). Portrait de la formation du personnel de métier dans le secteur aéronautique : réalités, défis et pistes de solution. In B. Barthe, O. Gonon and C. Brun (Eds)., *Actes du 52e Congrès de la Société d'ergonomie de langue française : présent et futur de l'ergonomie. Répondre aux défis actuels et être acteur des évolutions de demain* (p. 506-510). Paris, France: SELF. Retrieved from *http://self2017.org/upload/SELF17-vDef2.pdf*

Gaudreau, M.-A., Padois, T., Laville, F. and Marcotte, P. (2017). *Noise and vibration measurement of framing nailers: Development and validation of a mechanized test bench*. Communication presented at the 46th International Congress and Exposition on Noise Control Engineering (Internoise 2017): Taming Noise and Moving Quiet, Hong Kong, China (p. 3879-3885).

Gonella, M., Denis, D., Calvet, B., Ledoux, É. and Comeau, M. (2017). Comment forme-t-on le personnel de métier en aéronautique : aperçu des contenus échangés et des modalités pédagogiques utilisées. In B. Barthe, O. Gonon and C. Brun (Eds). *Actes du 52e Congrès de la Société d'ergonomie de langue française: présent et futur de l'ergonomie. Répondre aux défis actuels et être acteur des évolutions de demain* (p. 511-516). Paris, France: SELF. Retrieved from *http://self2017.org/upload/SELF17-vDef2.pdf*

Jocelyn, S., Burlet-Vienney, D. and Giraud, L. (2017). Experience feedback on implementing and using human-robot collaboration in the workplace. In *Proceedings of the Human Factors and Ergonomics Society 2017 Annual Meeting* (p. 1690-1694). Thousand Oaks, CA : Sage Publishing. doi: 10.1177/1541931213601911

Jocelyn, S., Ouali, M.-S. and Chinniah, Y. (2017). Improving maChinary-related risk identification and estimation with accident reporting and logical analysis of data. In *Proceedings of the Human Factors and Ergonomics Society 2017 Annual Meeting* (p. 1659-1663). Thousand Oaks, CA: Sage Publishing. doi: 10.1177/1541931213601903

Kim, J., Labrèche, F., Peters, C., Davies, H., Lavoué, J., Arrandale, V., … Demers, P. A. (2017). Comparison of occupational cancer burden estimates. *Occupational & Environmental Medicine, 74*(S1), 149. doi: 10.1136/oemed-2017-104636.388

Laroche, C., Vaillancourt, V., Giguère, C., Bibeau, M., Carroll, V., Gula, E., ... Boutin, J. (2017). Effect of personal safety equipment (hearing protection and helmet) on the localization of reverse alarms. Communication presented at the 12th International Congress on Noise as a Public Health Problem (ICBEN), Zurich, Switzerland (p. 1-8). Retrieved from *http://www.icben.org/2017/ICBEN%202017%20Papers/SubjectArea02_Laroche_0205_3975.pdf*

Nastasia, I., Gaspard, S. Ergonomics contribution in the RTW of workers after work-related musculoskeletal disorders. In R.H.M. Goossens (Eds)., *Advances in social & occupational ergonomics: Proceedings of AHFE 2017 International Conference on Social & Occupational Ergonomics* (p. 264-271). New York: Springer International Publishing AG. Retrieved from *https://link.springer.com/chapter/10.1007/978-3-319-60828-0_27*

Pompoli, F., Bonfiglio, P., Horoshenkov, K., Kahn, A., Jaouen, L., Bécot, F.-X., … Boeckx, L. (2017). *A round robin test of the acoustical properties of porous media.* Communication presented at the 46th International Congress and Exposition on Noise Control Engineering (Internoise 2017): Taming Noise and Moving Quiet, Hong Kong, China (p. 1-9).

Sarazin, P., Labrèche, F., Lesage, J. and Lavoué, J. (2017). Using data from exposure databanks: Comparing measurement levels in LIMS (Quebec, Canada) and IMIS (USA). *Occupational & Environmental Medicine, 74*(S1), 94-95. Retrieved from *http://oem.bmj.com/content/74/Suppl_1/A94.3*

Sgard, F., Nélisse, H., Benacchio, S., Doutres, O., Padois, T. and Gaudreau, M.-A. (2017). *A finite–element model to predict incidence dependent and diffuse field noise reduction based attenuation of earmuffs.* Communication presented at the 24th International Congress on Sound and Vibration (ICSV24) , London, United Kingdom (p. 1-8).

Terroir, J., Doutres, O. and Sgard, F. (2017). *Towards a "global" definition of the comfort of earplugs.* Communication presented at the 46th International Congress and Exposition on Noise Control Engineering (Internoise 2017): Taming Noise and Moving Quiet, Hong Kong, China (p. 1-7)

.

BOOK

Dolez, P. I., Vermeersch, O. and Izquierdo, V. (Eds). (2017). *Advanced characterization and testing of textiles.* Duxford, United Kingdom: Elsevier.

BOOK CHAPTERS

Adolphe, D. and Dolez, P. I. (2017). Advanced strength testing of textiles. In P. I. Dolez, O. Vermeersch and V. Izquierdo (Eds). *Advanced characterization and testing of textiles*, (p. 25-58). Duxford, United Kingdom: Elsevier.

Dolez, P. I. and Benaddi, H. (2017). Toxicity testing of textiles. In P. I. Dolez, O. Vermeersch and V. Izquierdo (Eds). *Advanced characterization and testing of textiles*, (p. 151-188). Duxford, United Kingdom: Elsevier.

Dolez, P. I. and Izquierdo, V. (2017). Specific testing of protective clothing. In P. I. Dolez, O. Vermeersch and V. Izquierdo (Eds). *Advanced characterization and testing of textiles*, (p. 301-350). Duxford, United Kingdom: Elsevier.

Dolez, P. I. and Vermeersch, O. (2017). Introduction to advanced characterization and testing of textiles. In P. I. Dolez, O. Vermeersch and V. Izquierdo (Eds). *Advanced characterization and testing of textiles*, (p. 3-22). Duxford, United Kingdom: Elsevier.

Dolez, P. I. (2017). Specific testing of geotextiles and textile-based geosynthetics. In P. I. Dolez, O. Vermeersch and V. Izquierdo (Eds). *Advanced characterization and testing of textiles*, (p. 239-300). Duxford, United Kingdom: Elsevier.

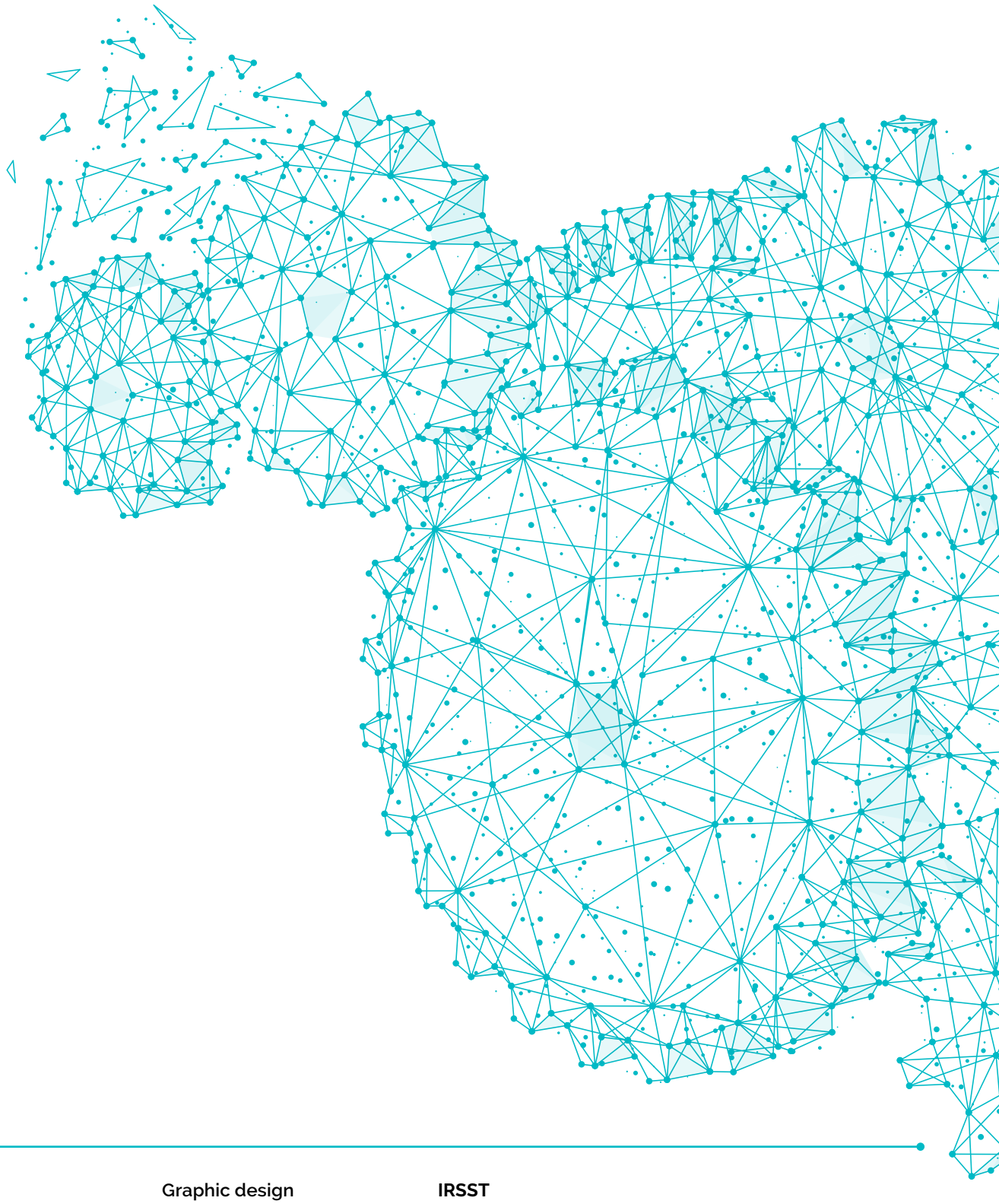
Richaud, M., Vermeersch, O. and Dolez, P. I. (2017). Specific testing of textiles for transportation. In P. I. Dolez, O. Vermeersch and V. Izquierdo (Eds). *Advanced characterization and testing of textiles*, (p. 399-432). Duxford, United Kingdom: Elsevier.

Shao, Y., Izquierdo, V. and Dolez, P. I. (2017). Advanced chemical testing of textiles. In P. I. Dolez, O. Vermeersch and V. Izquierdo (Eds). *Advanced characterization and testing of textiles*, (p. 127-150). Duxford, United Kingdom: Elsevier.

DOCTORAL THESIS

Jocelyn, S. (2017). *Estimation quantitative du risque lié aux machines en exploitant des rapports d'enquête d'accident et l'analyse logique de données* (Doctoral thesis, Polytechnique Montréal, Montréal, QC). Retrieved from *http://publications.polymtl.ca/2763/*

Martin, J. (2017). *Optimisation des paramètres expérimentaux pour l'analyse des fibres d'amiante par microscopie électronique en transmission* (Doctoral thesis, Université de Montréal, Montréal, QC). Retrieved from *http://hdl.handle.net/1866/18437*



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