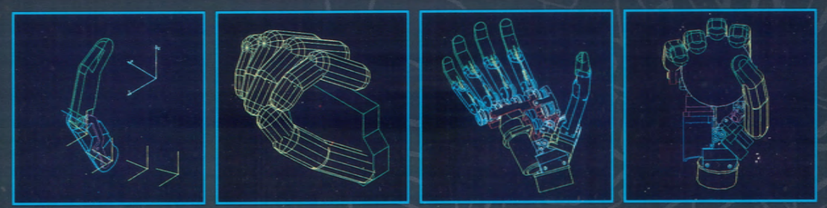
IRSST

ANNUAL REPORT 1989

Practical research: from theory to application



IRSST
Institut de recherche
en santé et en sécurité
du travail du Québec

This novel hand prosthesis, designed at the Institut de réadaptation de Montréal under a funding agreement with the IRSST, is currently undergoing clinical evaluation by hand amputees. Improved grip characteristics afforded by a considerably more natural range of thumb motion allows objects to be grasped with two as well as three fingers.

IRSST
Institut de recherche en santé et en sécurité du travail du Québec

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5. Commitments

a) The Corporation is committed to a non-cancellable commercial lease.
Operating expenses and taxes are added to the following basic commitments of this lease.

1990	1 312 650 $
1991	843 600
	2 156 250 $

b) Commitments at year-end:

Scholarships and grants	1990	1991	Total
Associated research groups	1 484 624 $	570 442 $	2 055 066 $
Subsidized research			
Research grants	463 041	77 272	540 313
Research contracts	610 571	235 680	846 251
Research scholarships	163 500		163 500
	2 721 736 $	883 394 $	3 605 130 $

6. Expenditures by activity-Operating fund

Research and technical support	**1989**	1988
Management and coordination	**864 173 $**	991 524 $
Administrative services	**1 267 312**	1 355 025
Research	**10 645 551**	9 666 706
Communications	**691 066**	644 101
Information services	**552 587**	
	14 020 689	12 657 356
Laboratory services to network members	**1 798 428**	2 133 630
	15 819 117 $	14 790 986 $

ANNUAL REPORT IRSST 1989

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In this report "IRSST" refers to the Institut de recherche en santé et en sécurité du travail du Québec (Québec occupational Health and Safety Research Institute). "CSST" refers to the Comission de la santé et sécurité du travail du Québec (Québec Occupational Health and Safety Commission).

PRESIDENT'S MESSAGE

It is generally considered premature to evaluate a research centre's performance before it is at least ten years old. The recruitment of competent researchers and their integration into clearly-defined research programmes, the creation and consolidation of a productive research climate and of mechanisms for the application of research results, and the development of unique areas of expertise upon which the centre's reputation may be based, all appear to require at least ten years to materialise.

This being so, I feel indeed privileged to assume the presidency of the Institute as it begins its second decade, and after so much of its work has already been accomplished and its reputation established. My first duty, and one I discharge with pleasure, is to thank all the talented individuals who have contributed to the development of the Institute since its creation in November 1980.

The Institute's reputation for excellence, and the performance that underlies it, can only be maintained, however, by the continual upgrading of its expertise and fine-tuning of its administrative and programming policies. This approach is all the more indicated in these days of rapidly evolving knowledge and technology and decreasing human and financial resources.

It is my intention to remain faithful to this approach, and to ensure that the Institute remains as responsive as possible to the needs of our real shareholders, the employers and workers of Québec.

President,

Robert Diamant

3. Accounts receivable

	1989	1988
CSST		
Laboratory services	**821 253 $**	369 796 $
Other	**791**	654
Advance to the WDU Congress		175 174
Others	**86 351**	27 017
	908 395 $	572 641 $

4. Fixed assets

	Cost	Accumulated Depreciation	Net Value 1989	Net Value 1988
Operating fund				
Office furniture and equipment				
Laboratories	412 271 $	332 412 $	**79 859 $**	97 201 $
Other departments	839 108	636 273	**202 835**	238 000
Laboratory and research equipment	5 029 179	4 253 425	**775 754**	822 456
Computer equipment	1 111 721	838 492	**273 229**	262 486
Leasehold improvements				
Laboratories	2 296 627	1 948 277	**348 350**	556 940
Other departments	1 094 528	917 422	**177 106**	283 157
	10 783 434 $	8 926 301 $	**1 857 133 $**	2 260 240 $
Restricted fund				
Research equipment	54 192 $	16 258 $	**37 934 $**	——— $

Fixed assets acquisitions for the operating fund total 430 575 $ (457 510 $ in 1988) with a depriciation of 833 682 $ (856 741 $ in 1988)

Fixed assets acquisitions for the restricted fund total 54 192 $ with a depriciation of 16 258 $.

NOTES TO FINANCIAL STATEMENTS
year ending December 31, 1989

1. Status and Nature of Activities

The corporation, incorporated under Part III of the Québec Companies Act, assumes the responsibility for developing, co-ordinating and carrying out research activities which contribute to achieving the objectives of the Act respecting occupational health and safety. More specifically, the corporation is responsible for identifiying and eliminating risks to workers' health, safety and physical integrity at their source.

2. Principal accounting policies

Operating fund
Are part of the operation fund the research activities for which the corporation receives an annual grant from the CSST, the laboratory services provided to the network members and billed to the CSST on a monthly basis. Current operating expenditures related to these activities are charged to this fund.

Restricted fund
The restricted fund includes external contract activities as well as the J. H. Honoré Sauvé fund. Direct expenditures related to these activities are charged to this fund.

Inventory
Supplies are valued at the lower of cost or replacement value. Cost is determined essentially on to the first in, first out method.

Fixed assets
Acquisitions are charged against operations, and depreciation against the balance account.

Depreciation of furniture and equipment is calculated using the declining balance method at the following rates:

Office furniture and equipment	20 %
Laboratory and research equipment	30 %
Computer e quipment	30 %

Depreciation of leasehold improvements is calculated according to the straight-line method over the term of the lease (until 1991).

REPORT OF THE CHIEF EXECUTIVE OFFICER

This past year was marked by the fulfilment of the objectives set by the Institute, including greater concentration of our research activities in high-priority sectors, rigorous evaluation of the impact of our research, and strengthened and renewed ties with our partners in the research and prevention communities.

Application of research results

The Research Applications Transfer Unit (Service de transfert des applications de la recherche [STAR]), created in 1989 and headed by Jean-Charles Guindon, evaluated five internal and three external research projects. The internal research projects evaluated concerned protective equipment for the legs, shingle machines, fall arrest equipment, work organisation and safety in the forestry industry, and a dust-exposure generation system used in the diagnosis of asthma. The remaining three reports covered research performed by external research groups on the control and ill-effects of noise, and occupational lung disease.

These analyses clearly demonstrated the manner in which the application of research results is fundamentally dependent on the extent of collaboration between the Institute and the working community. Moreover, they indicate the necessity of extending the scope of such collaboration, so that the results of research activities in other fields may also find practical application. As a result of these evaluative studies, the Institute has developed a plan of action for the transfer of research-based knowledge to the most appropriate settings. Implementation of the plan is scheduled for 1990.

International Conference on work with Visual Display Units

The Institute had the opportunity to occupy the scientific community's centre stage this past September when it hosted the Second International Scientific Conference on Work with Visual Display Units.

The Conference proved a success in terms of participation (750 participants from 30 countries), communications (extensive print and electronic media coverage), and scientific quality (approximately 180 scientific presentations). Institute researchers have been very active in this field, and topics currently under investigation include the potential effects of radiation, other health effects, and the effect of factors related to the organization of visual display unit work.

Collaboration with our partners

Donat Savoie has been appointed contact-person for the development and follow-up of ties with joint sectorial occupational health and safety associations. These associations, by virtue of their bipartite nature, their direct links with industry, and above all, through the mechanism they provide for research and technology transfer in an entire economic sector, remain our most valuable partners in the working community.

In an effort to remain responsive to the needs of the working community, the Institute organised three workshops. These workshops, at which participants had the opportunity to meet and to exchange information, dealt with the economic aspects of occupational health and safety, the control of industrial noise, and repetitive movement injuries.

In a similar vein, a task force comprising the directors of the Institute's research groups and programmes established a development strategy for research on the safety of industrial machines.

Finally, collaboration between university researchers and the IRSST continued, and new working arrangements developed which better reflect the specific objectives of both parties.

Our joint activities have resulted in Institute researchers collaborating closer and more frequently with their counterparts in the university and private sectors. Such collaboration is advantageous and strongly encouraged.

New investment in research on back injuries

This past year has seen the Institute reaffirm its commitment to research on back injuries - in fact, resource allocation for research on this high-priority topic almost tripled in 1989. Programme orientation approved by the Board of Directors includes elements dealing with prevention, diagnosis, therapy, rehabilitation, and evaluation.

In the field of prevention-oriented research, two studies - on warehouse workers of the Québec Liquor Board (Société des alcools du Québec), and police officers from various Québec police forces assigned to auto-patrol duty - were undertaken in the past year, using methods drawn from the field of participatory ergonomics.

BALANCE SHEET
as of December 31

	1989	1988
Operating fund		
Current assets		
Cash	**880 833 $**	629 551 $
Accounts receivable (note 3)	**908 395**	572 641
Inventories	**86 834**	65 572
Prepaid expenses	**51 208**	49 271
Restricted fund accounts receivable	**141 369**	
	2 068 639	1 317 035
Fixed assets (note 4)	**1 857 133**	2 260 240
	3 925 772 $	3 577 275 $
Current liabilities		
Accounts payable and accrued liabilities	**1 118 215 $**	644 545 $
Account payable to restricted fund		84 189
Account payable to CSST (1988 surplus)	**571 386**	
	1 689 601	728 734
Balance	**2 236 171**	2 848 541
	3 925 772 $	3 577 275 $
Restricted fund		
Current assets		
Deposits	**6 331 $**	5 928 $
Accounts receivable	**149 251**	68 527
Operating fund account receivable		84 189
Work in progress	**85 492**	
	241 074	158 644
Fixed assets (note 4)	**37 934**	
	279 008 $	158 644 $
Current liabilities		
Account payable to operating fund	**141 369 $**	$
Balance	**137 639**	158 644
	279 008 $	158 644 $

Commitments (note 5)

ON BEHALF OF THE BOARD

,Director ,Director

ACCCOUNT BALANCES
year ending December 31

	1989	1988
Operating fund		
Balance at beginning of year	**2 848 541 $**	2 676 386 $
Excess of revenues for the year	**379 038**	571 386
Fixed assets financed through operations	**430 575**	457 510
	3 658 154	3 705 282
Depreciation of fixed assets	**833 682**	856 741
Recovery by the CSST of surpluses from 1986-1988	**588 301**	
	1 421 983	856 741
Balance at end of year	**2 236 171 $**	2 848 541 $
Representing:		
Fixed assets surplus	**1 857 133 $**	2 260 240 $
Operating surplus	**379 038**	588 301
	2 236 171 $	2 848 541 $

Restricted fund		
Balance at beginning of year	**158 644 $**	5 567 $
Excess of revenues for the year	**(58 939)**	153 077
Fixed assets finances through operations	**54 192**	
	153 897	158 644
Depreciation of fixed assets	**16 258**	
Balance at end of year	**137 639 $**	158 644 $
Representing:		
Fixed assets surplus	**37 934 $**	$
Operating surplus	**99 705 $**	158 644 $
	137 639 $	158 644 $

University researchers began work this past year on two major projects directly based on programming recommendations formulated in 1986 by the Québec Task Force on Spinal Disorders,a research group contracted by the Institute and headed by W.O. Spitzer.

The first research project is a three-year evaluative study being conducted by a group led by Dr L.L. Abenhaim of McGill University. Through an examination of the type of disorder and the duration of incapacity, the study will examine the cost and effectiveness of therapeutic modalities performed by practitioners such as doctors, occupational therapists, chiropractors, and physiotherapists on workers suffering from dorsal or lumbar back disorders.

This ambitious research programme uses new and specific indicators of lumbar and dorsal back disorders to evaluate medical, paramedical and ergonomic approaches to the management of occupational back injuries. By casting further light on intervention effectiveness, these studies will contribute to the programme's ultimate goal - the reduction of back injury chronicity, the principal source of the economic and social costs of these injuries.

In the second study, directed by Dr Richard Leclaire of Université de Montréal, researchers are attempting to determine the sensitivity and specificity of three new diagnostic techniques (thermography, triaxial dynamometry, and spinoscopy) for lumbar back disorders. This study is the first scientific evaluation of these technologies in the world.

Finally, mention should be made of the imminent commercialisation of a software package for the collection and analysis of accident data, developed by the Safety-Ergonomics Programme during their research on back injuries among hospital personnel.

Comings and goings

The past year was marked by the departure of our president, Monique Jérôme-Forget, to whom I would like to take this opportunity to pay tribute, especially for the interest she took in the Institute.

Robert Diamant, her successor, was already familiar with Institute, having sat on its Board of Directors since last March as the Department of Labour's observer. His extensive professional experience, most notably as Deputy Minister of Labour, will serve him well in facing the significant challenges of the coming years.

Michel Caron and Guy Dufresne finished their terms as employer representatives on the Board of Directors. L. Pierre Comtois was named to the Board as an employer representative. Céline Lamontagne is a new Board member, sitting as a labour representative.

Several members of the Scientific Advisory Board completed their terms over the past year. These include employer representatives Carl Devost and Michel Lesage, labour representatives Robert Bouchard and Gilles Martin, and scientific community representatives André Marsan and André Raynaud. These vacancies have been partially filled by the following new Board members: Michel Grimard, representing employers; André Forest and Serge Trudel, representing labour; and Maurice L'Abbé and Jean-Marie Toulouse, representing the scientific community.

Within the administration, Dr Ilkka Kuorinka, loaned to the Institute last year by the Finnish Institute for Occupational Health, is now director of the Safety-Ergonomics Programme, and lawyer Michèle Fitzgibbons comes to the Institute as assistant to the Chief Executive Officer.

Outlook for 1990

The Institute will be 10 years old in 1990, and is now a mature research and consulting body. It is only natural, therefore, to expect the coming year to be marked by a continued dedication to our larger objectives and a consolidation of our resources.

Investments in back research will continue at the pace established in 1989, industrial machine safety will become a new priority area of research, and research activities on the effects of repetitive movements and on noise control, areas in which the Institute has already developed considerable expertise, will be intensified. Greater emphasis will be placed on research topics drawn from the social sciences.

Through the Research Applications Transfer Unit, the Institute plans to systematize its technology transfer activities, and accelerate the rate at which these activities produce desired results. Collaboration with our partners in the working and scientific communities will continue, especially in the form of thematic workshops at which participants will have the opportunity to meet and to exchange information.

The Institute, in collaboration with the CSST and other organizations and associations involved in occupational health and safety,

REVENUES AND EXPENDITURES
RESTRICTED FUND
year ending December 31

	1989	1988
Revenues		
Outside contracts	**325 992 $**	354 422 $
Interest	**403**	361
	326 395	354 783
Expenditures		
Remuneration		
Salaries	**260 034**	151 627
Fringe benefits	**34 324**	20 969
	294 358	172 596
Postage and transport	**636**	150
Travel	**7 602**	3 324
Analysis	**16 193**	4 301
Sub-contracts	**12 353**	21 335
Fixed assets	**54 192**	
	385 334	201 706
Excess of revenues over expenditures for the year transferred to account balance	(58 939) $	153 077 $

REVENUES AND EXPENDITURES
OPERATING FUND
year ending December 31

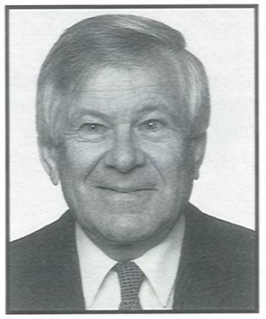
	1989	1988
Revenues		
Québec Occupational Health and Safety Commission	**14 069 000 $**	13 399 617 $
Laboratory services (CSST)	**1 783 326**	1 488 430
Interest	**331 849**	268 648
Other	**13 980**	205 677
	16 198 155	15 362 372
Expenditures*		
Remuneration	**6 120 151**	5 519 344
Professional services	**359 286**	279 560
Boards and committees	**74 946**	79 085
Administrative and other	**812 195**	759 160
Advertising and publications	**302 746**	223 898
Conferences	**108 070**	88 241
Travel	**204 137**	135 714
Laboratory operations	**693 019**	455 213
Network sampling material	**271 700**	270 822
Building	**2 183 946**	2 266 900
Fixed assets	**430 575**	457 510
Research grants and contracts	**4 258 346**	4 255 539
	15 819 117	14 790 986
Excess of revenues over expenditures for the year, transferred to account balance	**379 038 $**	571 386 $

* Breakdown of expenditures by activity: see Note 6

is organizing the 23rd International Congress on Occupational Health of the International Commission on Occupational Medicine. Jean-Yves Savoie, Scientific Director of the IRSST, and Dr Michel Lesage, consultant to the International Labour Office in Geneva, are co-presidents of this major scientific event to be held in Montréal in September 1990.

In closing, let me draw your attention to the Institute's participation in the 26th Congress of the Francophone Ergonomics Association (Société d'ergonomie de langue française), to be held in Montréal in October, and the 5th International Conference on Indoor Air and Climate, to be held in Toronto in July. In further related activities, in August the Institute will be hosting a NATO committee examining the question of indoor air quality.

In closing, I would like to sincerely thank all the Institute's staff, and particularly its external and internal researchers, for their contribution to the elimination of occupational disease and accidents. The institute's researchers will always remain our most precious asset.



Chief Executive Officer,

Louis Berlinguet

HIGHLIGHTS

RESEARCH ACTIVITIES

Back injuries

Back injuries remain among the most serious and costly of occupational health and safety problems: affecting some 60 000 Québec workers, they account for 3.3 million lost work-days and 174 million dollars in compensation costs annually. This past year, the Institute practically tripled the resources it allocated to back research in fields including prevention, diagnosis, and treatment of lumbar back disorders, and rehabilitation and assessment of injury.

•Researchers at McGill University began a major research project which will evaluate, over the next three years, various treatment modalities and patient-management strategies for lumbar and dorsal back disorders. The performance of such a research was one of the main recommendations of the Québec Task Force on Spinal Disorders, headed by Dr W.O. Spitzer.

Socio-demographic and occupational patterns related to back injury will be investigated, using medical records of some 3 000 workers, and their effect on resultant morbidity and costs characterized. This analysis will then be used as the basis for subsequent evaluations of the principal therapeutic techniques practised by various health professionals, including occupational therapists, chiropractors and physiotherapists. Information the populations of workers receiving each type of treatment will be obtained through a survey of medical and paramedical practitioners in each field. Data on dorsal and lumbar back disorders in these workers will then be compared to data on disorders of this kind in the general population.

As part of the project, the following indices are being developed: indices of specific dorsal and lumbar back disorders; indices of state of health, which provide an indirect measure of incapacity and quality of life; statistical indices for the prediction of the development of incapacity and relapses; economic indices for cost analysis.

Finally, and most importantly, this programme aims at conducting clinical trials, using these indices, of the management of workers suffering from dorsal or lumbar back disorders of different types and associated with different levels of incapacity. Two large-scale trials of medical, paramedical, and ergonomic interventions are planned.

FINANCIAL REPORT

AUDITORS' REPORT

To the members of
The Occupational Health and
Safety Research Institute

We have examined the balance sheet of The Occupational Health and Safety Research Institute as at December 31, 1989 and the statements of revenues and expenses and balance of funds for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of the Corporation as at December 31, 1989 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

SAMSON BÉLAIR / DELOITTE & TOUCHE
Chartered Accountants

Samson Bélair
Deloitte & Touche

Montréal, February 26, 1990

COMMUNICATIONS

In 1989, the Communications Division distributed over 37 000 occupational health and safety documents, either in response to requests or in the context of specific events related to occupational health and safety.

A total of 23 scientific reports, technical guides and newsletters were published this year, and subscription to the Institute's news magazine "L'IRSST" reached almost 5 500. Indepth profiles appearing in "L'IRSST" over the past year covered management of occupational safety (Spring 1989), work with visual display units (Summer-Autumn 1989), and mine safety (Winter 1989).

The Communications Division also organized colloquia on indoor air quality, and on successful strategies for the management of occupational safety, each of which attracted approximately 100 participants.

Taken together, these studies will not only provide detailed descriptive data on study populations, back injuries, and therapeutic modalities, but also allow the cost and effectiveness of available therapeutic alternatives to be evaluated. This, in turn, will contribute to the reduction of the rate at which such injuries become chronic conditions.

•The Institute is also funding a joint McGill-Université de Montréal study involving the clinical evaluation of spinoscopy, triaxial dynamometry, and thermography, three new diagnostic techniques claimed to be capable of confirming or excluding a diagnosis of lumbar back disorder. Thermography uses a highly-sensitive infrared camera to detect slight variations in skin temperature which may indicate the presence of pain or neurological lesion. Triaxial dynamometry measures the range of motion of, and overall force exerted on, the loaded spine in each of three planes. In spinoscopy, a series of electrodes placed along the back identifies underlying muscle spasms by measuring the extent and velocity of the motion of each vertebra.

The study objective is the evaluation of the sensitivity and specificity of this equipment in diagnosing lumbar back disorders. No rigorous scientific evaluation of these techniques has been performed to date, and this research has solicited considerable interest in the occupational health and safety community, both here and abroad.

•In the hospital sector, a software package for the collection and analysis of accident data (CANA) was validated over a one-year period in three hospitals. The software package was developed by the IRSST in the course of analyses of accidents suffered, and the ergonomics of handling operations performed, by hospital personnel. The software is easy to use and suitable for the collection and analysis of data from most occupational accidents, and will further understanding of the causes of accidents and the most appropriate preventive measures. Private-sector commercialization of the software is presently under discussion.

•In 1989, the Institute mandated ERGEV Inc. to perform an ergonomic analysis of hospital-patient transfer in order to identify hospital equipment which could be improved by the Institute in the course of its research and development programmes. The study therefore focused on equipment and furniture which hamper movement during patient transfers. The effects of training, work organisation, instruction, and remedial strategies on transfers were evaluated, and their relation to the prevalence of back injuries in health-care personnel analyzed.

•Research in the field of back injuries proceeded in other sectors as well. The Institute conducted a study of back problems in police officers assigned to auto-patrol duty. The first phase, completed in 1989, entailed the identification of back problems and their possible causes, in collaboration with police officers, worker and employer representatives, and manufacturers. This was complemented by biomechanical analysis of the position adopted while on patrol, and orthopaedic assessments. The complex nature of lumbar back disorders was evident during this phase.

The second phase of this project is almost completed. This phase, concerned with the elucidation of the causes of back problems among police officers, was marked by the participation of officers in the production of mock-ups of the passenger compartment of patrol cars, and of related documentation. The officers' practical knowledge contributed to the formulation of improved design specifications likely to result in a decrease of lumbar back disorders.

•As one of the components of a study of lumbar back disorders in warehouse workers employed by the Québec Liquor Board, a group of workers was trained in participatory ergonomics. This discipline is characterized by the high priority accorded to the exploitation of workers' knowledge of their job and of the conditions under which it is performed. Upon their return to their workplace, these workers, in collaboration with researchers from the IRSST, the Université de Québec à Trois-Rivières, and Université Laval, will identify the most significant problems and the appropriate corrective measures. University researchers have begun on-site analyses of task and accident characteristics.

SERVICES

In 1989, the Institute's Laboratory Division analyzed some 50 000 environmental and toxicological samples for the CSST's prevention network. An additional 9 000 other analyses were performed for research projects. Over 95% of the analyses were performed for Local Community Service Centres (Centres locaux de services communautaires, CLSC) and Community Health Departments (Départments de santé communautaire, DSC) in the course of their responsabilities of establishing corporate health protection programmes for companies in CSST-defined priority industrial sectors.

Solvent analyses accounted for 48% of all analyses, with metals and ions accounting for 9%, dusts for 11%, and toxicological analyses for 32%.

As always, the analyses performed for the CSST cover a wide spectrum of substances, with 225 different analytes being analyzed this year. Other services offered include calibration, maintenance, and repair services for instrumentation used in the sampling and measurement of gas concentrations and physical parameters such as noise.

The Laboratory Division offers its technical services to clients other than the CSST, and in 1989, also served employer and union groups, companies, and various other agencies.

RESEARCH ACTIVITIES

In 1989, internal research programmes and funded or contracted external research groups conducted 102 research and consulting projects. Of these, 39 were started, and 28 completed in 1989. The remaining 35 projets were started before 1989 and are scheduled for completion in coming years. A list of all projects active in 1989 appears in a supplementary report, available in French.

Internal research programs received funding of $ 5 973 820 in 1989. This bursements for external programs was 4 251 800 $ distributed as follows:

• External research groups:	$ 1 674 328
• Contract research:	$ 1 563 536
• Funded research:	$ 625 318
• Scolarship program:	$ 388 618

Through its Scholarship Program, the Institute funded one post-doctoral fellow, 13 doctoral students, and 11 masters students, working in high-priority fields.

Isocyanate exposure

Approximately 5 500 workers are occupationally exposed to isocyanates in Québec, with the majority employed in paint- and body-work shops. Between 5% and 10% of these workers could develop irreversible occupational allergic asthma. The low sensitivity of sampling and analytical methods available for use in occupational settings has militated against the implementation of effective preventive measures for this disease. A technique developed at the IRSST in 1988 is ten times more sensitive than older methods, and is noteworthy for its ability to discriminate between gas- and aerosol-phase isocyanates, and between monomeric and oligomeric forms.

•This technique found wide application in the past year. Isocyanate levels were measured in paint-shops supplied with various types of ventilation, and worker exposure was characterised as a function of work conditions and the type of ventilation system present.

•In related research, an isocyanate exposure chamber was developed, and will be used in studies of occupational asthma to be conducted at Sacré-Coeur Hospital. Using this chamber, challenge tests can be performed and dose-response data collected, under controlled conditions and without endangering the health of hospital personnel.

•Work started in 1989 on the establishment of performance criteria for the construction and operation of ventilation systems for enclosed paint cabins. By providing workers with the most effective ventilation systems, this research, performed in collaboration with the Joint Occupational and Safety Association, Automobile Services Sector (Association sectorielle paritaire, secteur de services automobiles), will ensure that workers are adequately protected against isocyanates, while allowing the Institute's partners to assume responsibility for follow-up.

•Finally, 1989 saw the commencement of work on the development of a new type of respiratory protection, which will completely eliminate exposure to isocyanate-based paints.

Indirect costs of occupational accidents

In keeping with its ongoing interest in the economic aspects of occupational health and safety, the Institute has funded research on the development of a simple and accurate method for the calculation of the indirect costs of occupational accidents. This work, in progress since 1986, was completed in the past year, and confirms the existence of substantial indirect costs, a finding which should stimulate employer investment in prevention activities. The multivariate model developed allows the average indirect cost associated with accidents to be precisely calculated as a function of a number of enterprise-, economic sector-, and worker- specific parameters. Managers may estimate the average indirect costs of accidents in their company, using a table of indirect costs. It should be noted that this research was based on accidents for which compensation was paid by the Québec Occupational Health and Safety Commission (Commission de la santé et de la sécurité du travail du Québec, [CSST]).

Occupational stress

Both management and labour recognize the magnitude of the problem posed by occupational stress among hospital personnel. Building on this consensus, IRSST-funded researchers undertook action-oriented research on stress among emergency room and intensive care personnel in 30 Québec hospitals in 1989. A questionnaire on the causes and effects of occupational stress was completed by personnel normally assigned to these units, mostly nurses, nurses' aides, and head nurses.

The study provides an overview of the problem and highlights the determinant effect of the following three factors on job dissatisfaction and the desire to leave the profession: conflicting and contradictory tasks or priorities, ambiguous task definition, and the feeling of not being appreciated. In barely one year, researchers observed a 16% departure rate and an extended leave rate of 8-9% among the personnel studied,

FUNDING

Revenue for the IRSST in 1989 was $ 16 524 550, including a grant of $ 14 069 000 from the CSST. The distribution of revenues and expenditures for 1989 is illustrated in Figures I and II.

FIGURE I
(Revenue: $ 16 524 550 = 100%)

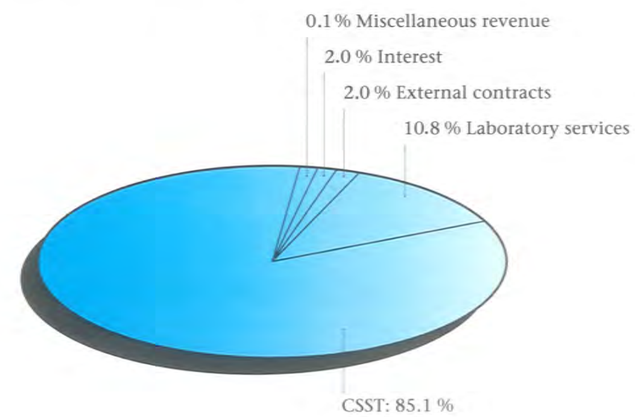
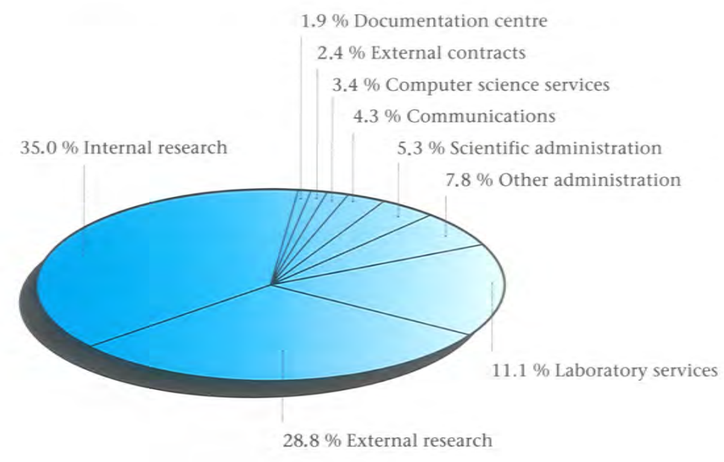


FIGURE II
(Expenditures: $ 16 204 451 = 100%)



PERSONNEL

The distribution of the Institute's 126 employees at the end of 1988 was as follows:

13 management personnel
55 professionals and researchers
34 technicians
24 technical and administrative support staff

University diplomas are held by 68 Institute employees (53%), with 16 holding doctoral, 30 holding masters, and 22 holding bachelor's degrees. A total of 124 training or refresher courses were taken by 63 employees.

corresponding to an overall turnover rate of approximately 25%. This turnover rate was significantly correlated to an expressed desire to leave the profession.

The researchers recommend the immediate implementation of a programme comprising the creation of local joint committees in nursing units, adoption of a joint nursing-medical personnel approach, and collaboration of management and labour.

Noise control

Researchers at the Acoustical Research Group of the Université de Sherbrooke completed their study on soundproof enclosures used for insulating noisy industrial machines. Their analysis resulted in the derivation of equations describing the acoustic behaviour of enclosures, and the dispersion of low-frequency sound waves poorly contained by the enclosures.

Two software packages incorporating these calculations were developed. The first is essentially a research tool for the resolution of complex equations. The second, suitable for use on a microcomputer, is simpler, and is designed for use by both enclosure manufacturers and end-users. In the former case, the software may be used to improve the design characteristics of enclosures, while in the latter case it can be used to evaluate the effectiveness of installed enclosures.

The research group also drew up technical specifications, based on simulations, which will allow enclosure designers to follow a logical development cycle, and so avoid the most common and most serious design errors.

Mine safety

The mining sector is without question one of the high-priority sectors in occupational health and safety: the annual incidence of occupational injury in some sub-sectors is greater than 30%, compared to 13% among all manual workers in Québec.

•An IRSST-funded research project conducted by two engineers at the École Polytechnique de Montréal studied ways to automate ore

loading and transport in underground mines. Such automation would allow miners to work dangerous sites from a distance, and facilitate access to ore veins whose extraction is currently considered too dangerous.

A prototype electrical vehicle equipped with sensors, a camera and a microcomputer was designed at the École Polytechnique. The vehicle may be remote-controlled from a central location, or may operate on auto-pilot, under control of its microcomputer and an artificial vision system which detects optical guides installed in the ceiling.

Protective equipment

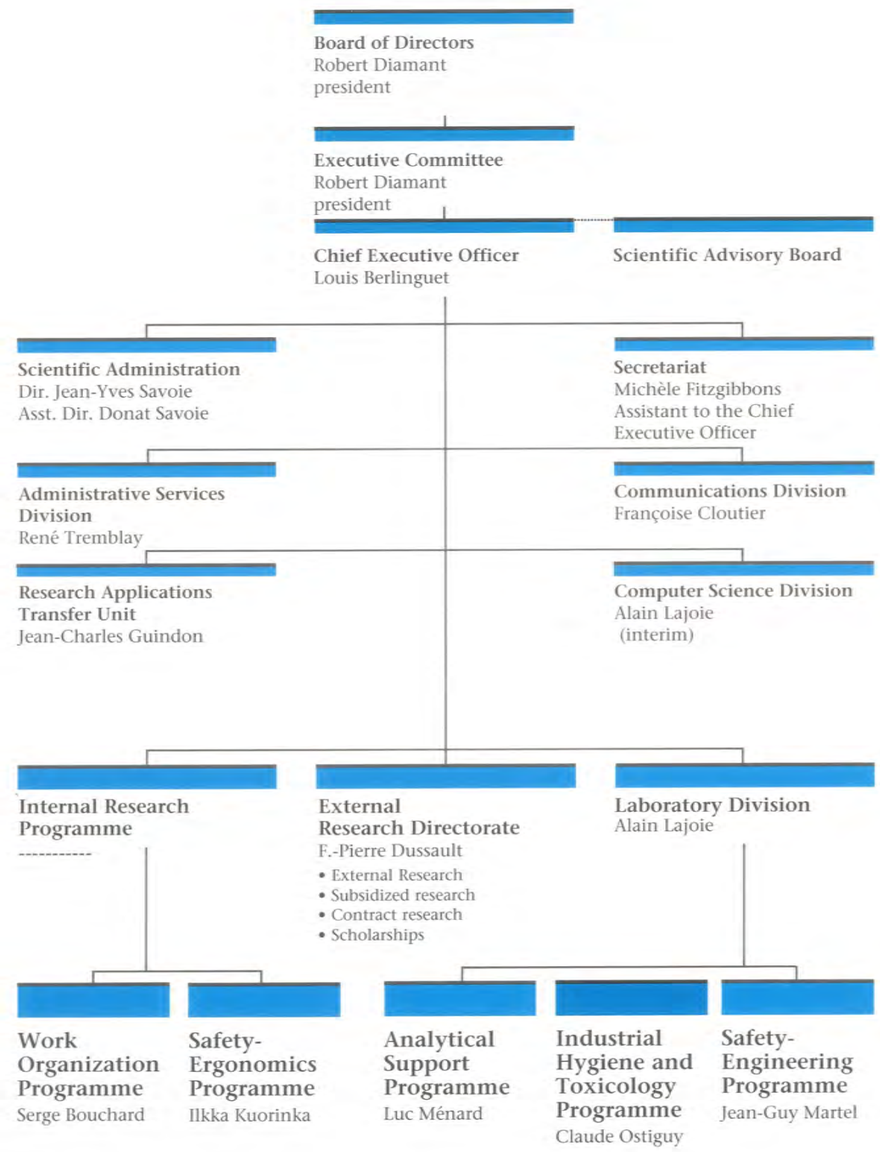
A study conducted by the Université de Montréal Research Group on the Social Aspects of Prevention furnished new data on protective equipment worn by workers in the manufacturing sector. The results of this study indicate that 63% of these workers regularly wear safety shoes, 28-30% wear safety glasses or hearing protection, 40% wear protective gloves, and 9% wear respiratory protection. While this data illustrates the significant resources currently being devoted to prevention activities, it also indicates the magnitude of occupational hazards to which workers are exposed and the amount of work remaining in the elimination of these hazards at their source.

Although users generally consider their protective equipment to be effective, the equipment are also the cause of new problems. Thus, 35% of workers wearing safety shoes reported foot injuries, more than 30% of workers wearing safety glasses complained of excessive eye fatigue or irritation, and almost 25% of workers find that the use of protective equipment disrupts their concentration or work rhythm.

The improvement of protective equipment design is therefore essential, the report concludes, and must take the end-user's perspective into account. Further, those responsible for the management of protective equipment (coordinators, health and safety committees, etc.) must better inform workers about the potential problems posed by protective equipment, and improve monitoring of problems arising during equipment use. Finally, research into the elimination at source of health hazards should continue.

ORGANIZATIONAL FLOW CHART

(as of December 31, 1989)



ADMINISTRATIVE REPORT

ORGANIZATIONAL STRUCTURE

The Institut de recherche en santé et en sécurité du travail du Québec was created in 1980. Its mandate is to contribute through scientific research to the identification and elimination at the source of occupational hazards, and to the rehabilitation of workers injured by these hazards.

The Institute fulfils its mandate by:

- performing, contracting, and funding research reflecting the needs of the working community
- providing laboratory and consulting services to the Québec occupational health and safety prevention network
- communicating the knowledge gleaned from its research activities to the working community
- contributing to the training of new researchers

The Institute is headed by the Chief Executive Officer who is supported by the Secretariat and advised on the orientation and evaluation of research activities by the Scientific Director.

Research activities are administered by three directorates:

•The Internal Research Directorate, responsible for the Safety-Ergonomics and Work Organisation Programmes

•The External Research Directorate, responsible for the External Research Group, Contract, Subsidized Research, and Researcher Training Programmes

•The Laboratory Division, which: performs environmental and toxicological analyses; provides consulting and analytical services; and carries out research and development projects through the Industrial Hygiene and Toxicology, Analytical Support, and Safety-Engineering Programmes.

The other organizational units have the following responsibilities: Research Applications Transfer Unit: evaluation and optimization of the application of Institute research; Computer Science Division: development of appropriate information systems; Administrative Services Division: administration and resource management; Communications Division: dissemination of research results to the Institute's clients.

Rehabilitation

The major development in this field over the past year was the production, by researchers at the École Polytechnique de Montréal and the Montréal Rehabilitation Institute (Institut de réadaptation de Montréal), of a new hand prosthesis offering greater functionality than other models previously available to hand amputees.

Ergonomic analysis was used to identify the thumb's optimal plane of motion, located at a 45° angle relative to the plane of motion of the other fingers. By ensuring that the prosthesis provides motion in this plane, rather than in the parallel plane of motion used in conventional prostheses, clearly superior grip characteristics have been obtained. By providing two types of grip, the prosthesis affords improved control of gripped objects. Better control of manipulated objects has also minimized compensatory trunk and arm movements.

Six prototypes have been produced, and are currently undergoing clinical evaluation by hand amputees. Following this evaluation, final modifications will be effected, and commercialization of the prosthesis initiated.

CONSULTATION

Rehabilitation

At the request of the Rehabilitation Department of the CSST, the Institute developed a system with which counsellors may asses the functional capacity of accident victims, inherent restrictions presented by the victim's workstation, and conditions necessary for the victim's return to work, either at his or her regular workstation or at another workstation in the same company.

The production of such a system required the development of tools which allow the various members of the multidisciplinary team involved in the rehabilative process, including doctors, ergonomists, occupational therapists, and rehabilitation counsellors, to evaluate physiological and psychological deficits and resultant incapacities in areas such as locomotion and dexterity, and to communicate this information in mutually comprehensible terms.

In the first phase of this research, limited to victims of musculoskeletal injuries, questionnaires were developed for the collection of information on: 1) the extent of functional restriction; 2) ergonomic job analysis; 3) job and workstation modification; 4) technical and organizational characteristics of the workplace; and 5) the return-to-work protocol.

These questionnaires were validated in simulations and field trials, and a condensed guide, emphasizing workload and workstation factors, is now a standard tool used by CSST counsellors. A training manual was also produced. Similar forms can be developed in the future for other types of incapacity, including sensory, mental, psychological, etc.

Indoor air quality

Over the last three years, and particularly as a result of its studies of several office buildings located in downtown Montréal, the IRSST has developed considerable expertise in the field of indoor air quality.

•In 1989, the Institute produced its "Study Protocol for Indoor Air Quality in Office Buildings (published in French under the title "Stratégie d'étude de la qualité de l'air dans les édifices à bureaux"), intended for building owners and managers, and employers and employees working in these buildings. The suggested protocol involves: 1) identification of problems and their causes, through the

EMPLOYER REPRESENTATIVES

Alexandre Beaulieu
President
Alexandre Beaulieu inc.

Michel Grimard
Consultant
Occupational and environmental health

Richard Lapointe
Toxicologist
Société d'électrolyse et de chimie
Alcan ltée (Alcan Smelters and Chemicals Ltd.)

WORKER REPRESENTATIVES

André Forest
Coordinator,
Occupational health and safety
FTQ-Construction

Charles Prévost
Union consultant
Industrial Engineering
Confédération des syndicats nationaux
(Confederation of National Trade Unions, CNTU)

Monique Simard
First Vice President
Confédération des syndicats nationaux
(Confederation of National Trade Unions, CNTU)

Serge Trudel
Occupational health and
safety representative
Fédération des travailleurs et
des travail-leuses du Québec
(Québec Federation of Labour, QFL)

MEMBERS REPRESENTING THE SCIENTIFIC COMMUNITY

Clifford Nelson Baronet
Executive Vice President, Research
and Development,
Centre de recherche industrielle du Québec
(Québec Industrial Research Centre)

Madeleine Blanchet
President
Conseil des affaires sociales de la famille
(Family and Social Affairs Council)

Maurice Brossard
Vice President, Science
National Research Council Canada

Maurice L'Abbé
President
Science and technology council

Jean-Marie Toulouse
Maclean-Hunter Professor of
Entrepreneurship
École des Hautes Études
Commerciales de Montréal

DEPARTURES DURING 1989

Carl Devost
Director of Occupational Health
and Safety Technical Services
Conseil du patronat du Québec
(Québec Employer's Council)

Michel Lesage
Consulting physician, Occupational
Health and Safety
Corporate Medical Director
Dominion Textile Inc.

Robert Bouchard
Director, Occupational Health
and Safety Services
Fédération des travailleurs et
des travailleuses du Québec
(Québec Federation of Labour, QFL)

Gilles Martin
Occupational Health and Safety
Representative Canadian Union of
Public Employees
Fédération des travailleurs et
des travailleuses du Québec
(Québec Federation of Labour, QFL)

André Marsan
Director of the External Research Program
Biotechnology Research Institute

André Raynauld
Professor of Economics
Université de Montréal

THE SCIENTIFIC ADVISORY BOARD

The Scientific Advisory Board of the IRSST is a tripartite body presided over by the Chief Executive Officer of the Institute and composed of 15 members distributed as follows: six members of the scientific community named by the Board of Directors on the recommendation of the Chief Executive Officer; four employer and four worker representatives, named by employer and union administrators respectively; and the Scientific Director, who sits as a non-voting member.

The Scientific Advisory Board acts in a consultative capacity vis-à-vis the Chief Executive Officer. At his request, the Board advises on such issues as the Institute's scientific policy, the orientation of research activities and laboratory services, and the communication of research reports and results.

The Board is also called upon to evaluate the relevance, priority and scientific quality of internal and external research programmes and projects. Evaluation of the scientific quality of research projects is generally based on the analysis and recommendations of expert committees recruited from the scientific community.

MEMBERS OF THE SCIENTIFIC ADVISORY BOARD

(as of December 31, 1989)

CHAIRMAN

Louis Berlinguet
Chief Executive Officer

SCIENTIFIC DIRECTOR

Jean-Yves Savoie*

OBSERVER

Lise Langlois*
Vice President, Planning and Programme Development
Commission de la santé et de la sécurité du travail du Québec
(Québec Occupational Health and Safety Commission)

* Non-voting member

use of site and equipment inspections, and a questionnaire; 2) measurement of contaminants, ventilation parameters, and noise and lighting levels using appropriate techniques and equipment; and 3) determination of corrective and control measures. CSST inspectors were trained in the use of this protocol by IRSST specialists in collaboration with CSST personnel to maximize the effectiveness of the inspectors' activities.

•Two new projects, concerned with microbial decontamination of ventilation systems, and the use of carbon dioxide levels in the verification of indoor air quality, were initiated in 1989.

•A member of the IRSST sits on the organizing committee of the 5th International Conference on Indoor Air Quality and Climate, to be held in Toronto in 1990, and participates in a NATO committee on indoor air quality.

The NATO pilot project involves the review of the results of national programmes implemented by its members, particularly the United States, Canada, and the Scandinavian countries. The committee is expected to establish a list of research needs in areas including the effects of indoor air quality on health, prevention and elimination strategies for certain pollutants, and the economic implications of indoor air quality pollution, regulation, and control.

BOARD OF DIRECTORS

The Board of Directors, composed of the president of the Institute, seven employer representatives and seven worker representatives, establishes the Institute's long-term objectives, development plan, and funding. Board members also sit as the Board of Directors of the Québec Occupational Health and Safety Commission.

MEMBERS OF THE BOARD
(as of December 31, 1989)

CHAIRMAN[1]

Robert Diamant
President and Chief Executive Officer
Commission de la santé et de la sécurité du travail du Québec (Québec Occupational Health and Safety Commission)

EMPLOYER REPRESENTATIVES

L. Pierre Comtois
Regional Legal Advisor
Director of Public Affairs - Québec
General Motors of Canada Ltd.

Ghislain Dufour
President
Conseil du patronat du Québec
(Québec Employer's Council)

Franco Fava
Secretary
Neilson Excavation Inc.

Michel Guillemette
Director of Medical Services
Canadian Pacific Forest Products Ltd.

Jean-Marc Turcotte
President and Chief Executive Officer
Tioxide Canada Inc.

Guy Dufresne
President and Head of Operations
Kruger Inc.

[1] Occupied by Monique Jérôme Forget until December 11, 1989.

WORKER REPRESENTATIVES

Andrée Bouchard
Secretary
Confederal Health and Safety Committee
Confédération des syndicats nationaux
(Confederation of National Trade Unions, CNTU)

Claude Gingras
President
Centrale des syndicats démocratiques
(Congress of Democratic Unions)

Clément Godbout
Director
United Steelworkers of America

Louis Laberge
President
Fédération des travailleurs et des travailleuses du Québec, FTQ
(Québec Federation of Labour, QFL)

Céline Lamontagne
Third Vice President
Confédération des syndicats nationaux
(Confederation of National Trade Unions, CNTU)

Jean Lavallée
Chief executive officer
and Financial Secretary
Fraternité inter-provinciale des ouvriers en électricité (Interprovincial Brotherhood of Electrical Workers)
Vice President
Fédération des travailleurs et des travailleuses du Québec (Québec Federation of Labour, QFL)

Claude Morisseau
Regional Director
Canadian Union of Public Employees

CHIEF EXECUTIVE OFFICER

Louis Berlinguet*

SCIENTIFIC DIRECTOR

Jean-Yves Savoie*

OBSERVER FOR THE MINISTÈRE DE LA SANTÉ ET DES SERVICES SOCIAUX DU QUÉBEC
(Québec Department of Health and Social Services)

Marc Dionne*
Director of Public Health
Ministère de la Santé et des Services sociaux du Québec

OBSERVER FOR THE MINISTÈRE DU TRAVAIL*
(Québec Department of Labour)

vacant[2]

* Non-voting member.
[2] Occupied by Robert Diamant until December 11, 1989.

DEPARTURES DURING 1989

Monique Jérôme Forget
President and Chief Executive Officer
Commission de la santé et de la sécurité du travail du Québec
(Québec Occupational Health and Safety Commission)

Michel A. Caron
Groupe Tremca Inc.

EXECUTIVE COMMITTEE

Robert Diamant, president
Ghislain Dufour
Louis Laberge
Louis Berlinguet*