

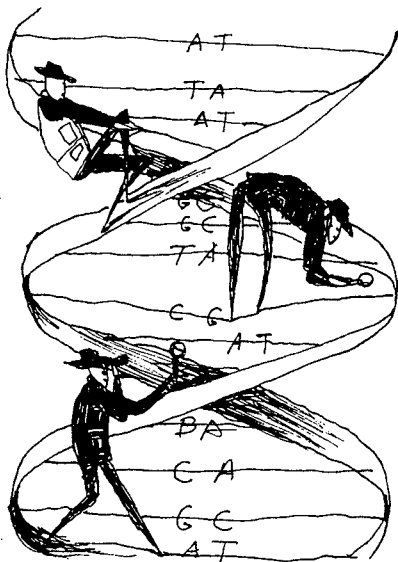
sues about what all will be defined as a genetic disease. As diagnostic procedures are simplified and used more widely, opportunities for genetically-based discrimination will increase (especially in the absence of cures). This is most likely to become apparent in the areas of employment and insurance and in forensics.

have been exposed to radioactive dust at their workplace. Some of the difficulties are conceptual and technical because the training natural scientists receive usually does not prepare them to do joint projects with their research subjects. Others arise from the fact that scientists outside her research group, with whom Messing

While research into the identification and localization of genes is flourishing, other areas of genetic inquiry are lying fallow or actively discouraged.

In this issue of *geneWATCH*, we are publishing another of the CRG's position papers, which addresses the problem of genetic discrimination and includes a set of policy proposals to counter this form of discrimination. Paul Billings, M. D., Director of the Clinic for Inherited Diseases at the New England Deaconess Hospital in Boston, has been working with a group of scientists, documenting instances of genetic discrimination and describes some of them in his article.

While research into the identification and localization of genes is flourishing, other areas of genetic inquiry are lying fallow or actively discouraged. As an illustration, Karen Messing, Professor of Biology at the University of Québec in Montreal, describes the difficulties she and her colleagues have encountered while doing research to document the occurrence and extent of chromosomal damage among workers, known to



Blair Thornley

has had contact during various phases of the research, have looked with suspicion on the fact that she and her colleagues work under contract with a trade union. Messing and her colleagues seem to be considered less than objective when they try to understand the actual work process and to involve the workers in the project, so that the workers themselves can identify and monitor some of the parameters that need to be examined.

With the publication of these articles and the availability of the two position papers, the CRG hopes to promote debate about the current direction of research in human genetics and to encourage activities and programs aimed at countering genetic discrimination. Δ

The position papers on genetic discrimination and on the Human Genome Initiative can be obtained from the CRG office. Please send \$3 for one position paper or \$5 for both position papers to:

CRG
186 South Street, 4th floor
Boston, MA 02111 USA

Please make checks or money orders payable, in US dollars only, to the Council for Responsible Genetics.

Ruth Hubbard edited this issue of *geneWATCH*. Dr. Hubbard is Professor of Biology at Harvard University and the chairperson of the Human Genetics Committee of the Council for Responsible Genetics. Her latest book, *The Politics of Women's Biology*, has just been published by Rutgers University Press.

geneWATCH

geneWATCH is published by the Council for Responsible Genetics (CRG), a non-profit tax-exempt national organization. The purpose of the CRG is to create a forum for discussing, evaluating, and distributing information about the social impacts of genetic engineering.

geneWATCH covers social issues in genetics and biotechnology. We welcome submissions of news items, interviews, letters, and articles. Please type manuscripts (double spaced) and send two copies to: Editors, **geneWATCH**, 186 South Street, 4th Floor, Boston, MA 02111.

geneWATCH is indexed in Alternative Press Index, PO Box 33109, Baltimore, MD 21218.

Business Address: 186 South Street, 4th Floor, Boston, MA 02111. (617) 423-0650.

Subscription Rates: Newsletter—\$12/6 issues for individuals and \$20/6 issues for institutions; CRG Associate—\$25/year individuals and \$100/year institutions. Associates receive **geneWATCH** and other CRG literature; the Associate fee less the cost of the Newsletter subscription is tax-deductible. Outside US—Add \$3 for Canada/Mexico subs; all others add \$6. Special rates for multiple copies available upon request.

Unless otherwise stated all material in this bulletin is copyright 1990 by the CRG. All rights reserved. Publication date of this issue is April 1990. ISSN 0740-9737.

geneWATCH Editorial Committee

Kostia Bergman, Nancy Connell,
Phyllis Freeman, Sheldon Krimsky,
and Seth Shulman

geneWATCH Managing Editor

Donna Cremans

Council for Responsible Genetics

Board of Directors

Chairperson

Sheldon Krimsky, PhD
Tufts University

Secretary

Terri Goldberg, MS

Treasurer

Colin Gracey, DMin
Northeastern University

Phillip Bereano, JD
University of Washington
Liebe Cavalleri, PhD

Sloan Kettering Institute / SUNY-Purchase

Ruth Hubbard, PhD

Harvard University

Jonathan King, PhD

Massachusetts Institute of Technology

Anthony Mazzocchi

Oil, Chemical, and Atomic Workers
Union

Claire Nader, PhD

Washington, DC

Stuart Newman, PhD

New York Medical College

Barbara Rosenberg, PhD

Sloan Kettering Institute / SUNY-Purchase

Susan Wright, PhD

University of Michigan

Executive Director

Nachama Wilker

ed much more quickly than our legal and social service systems can respond. As our abilities to label individuals on the basis of genetic information increases, particularly through the efforts of the Human Genome Initiative,¹ there will be an even more urgent need to address these problems.

uals labeled as being at increased risk of ill health in the future.² Even more revealing is the history of discrimination on the basis of perceived genetic hypersusceptibility to occupational diseases.³ For example, African Americans who are healthy but have what is called sickle cell trait have been denied certain jobs despite the

bled, there is disagreement among legislative experts over whether this bill would prohibit genetic discrimination.⁶

Screening individuals for genetic risk of late-onset diseases raises particularly difficult problems because such individuals may not be considered disabled at the time they are discriminated against and therefore may not be afforded protection under present or proposed federal and state laws protecting the rights of disabled individuals.⁷ Ironically, someone who is stigmatized for being at risk for future genetic illness may, due to his or her asymptomatic status, fall outside the protection of laws prohibiting discrimination on the basis of disability. A clearly worded federal law is needed to prohibit discrimination on the basis of such information and to protect the privacy of genetic information.

The need for laws to protect the privacy of genetic information can be illustrated by the secrecy with which employers may use medical information. There are few limits, for example, on employer discretion in deciding what pre-employment medical tests to perform on job applicants. Thus, once a sample of blood is taken from an applicant during the pre-employment physical, it can be tested for many conditions, including pregnancy, sickle cell trait, HIV antibodies, cholesterol, or drugs. Since employers do not have to give a reason for refusing to hire an applicant, many individuals never realize that they have been denied employment because of their medical status. Although it might be possible to challenge an employer's hiring policies which discriminate on the basis of medical status, it is very difficult to document such discriminatory practices.

Insurance Discrimination

Insurers also face strong economic incentives to identify individuals perceived to be at increased risk for ill health in the future. Historically, such inherent characteristics as race and sex were used to deny African Americans and women insurance

The use of predictive genetic diagnoses creates a new category of individuals who are not ill, but may develop a specific disease in the future: the healthy ill.

Employment Discrimination

The tragedies of race and sex discrimination illustrate the dangers of basing employment decisions on inborn characteristics. Like these, discrimination on the basis of genetics ignores the present abilities and health status of workers and substitutes questionable stereotypes about future performance.

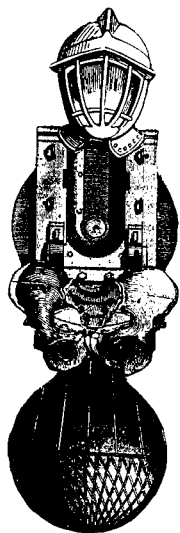
Basing employment decisions on genetic status opens the door to unfounded generalizations about employee performance and increases acceptance of the notion that employers need to exercise such discrimination in order to lower labor costs. Indeed, without countervailing equitable forces, employers face economic pressures to identify workers who are likely to remain healthy. Less absenteeism, reduced life and health insurance costs, and longer returns on investments in employee training all reduce the costs of labor. To the extent that employers believe that genetic information can help identify workers who have a "healthy constitution," they have strong economic incentives to screen applicants and workers.

Employer discrimination on the basis of antibodies to HIV and of previous cancer history, despite current ability to work, demonstrates that employers take health status into account when making employment decisions to the detriment of individ-

absence of scientific proof that any genetic characteristics are predictive of industrial diseases.⁴

Such policies victimize all workers. In the case of sickle cell trait, African Americans have been "protected" out of jobs involving exposures to certain industrial chemicals, while remaining workers continue to be at risk from these chemicals. Discrimination against individuals with particular genetic characteristics harms all workers by diverting attention from the need to improve and, if possible, eliminate workplace and environmental conditions that contribute to ill health for everyone. Moreover, such genetic discrimination masks the fundamental need for adequate leave policies and insurance coverage as well as for reasonable workplace accommodations for all workers who experience temporary or permanent disabilities, for whatever reasons.

Basing employment decisions on genetic status may run afoul of the patchwork of state and federal laws that protect the employment rights of individuals with disabilities. To date federal laws only cover workplaces receiving federal funds.⁵ No state or federal court has ever determined whether such laws apply to the employment rights of individuals discriminated against because of their genetic status. Although a bill is pending in Congress that would provide comprehensive protection to workers who are disa-



Joel Williams

tion should not be released to anyone without the informed consent of the screened person or her/his legal guardian.

• **Advocate nonbiased counselling about the option to refuse tests** and about the benefits and risks of doing so to every individual offered genetic testing. Appropriate consent and refusal forms must explicitly state that refusal to undergo genetic testing will not lead to termination of medical care or insurance, denial of services, or to other discriminatory practices. Δ

Notes

1. This position paper is intended to accompany the Council for Responsible Genetics' Position Paper on the Human Genome Initiative, which describes the Initiative in greater detail, evaluates its goals and methods, and its implications for expanding the number and range of predictive genetic tests.

2. A survey of corporate views about AIDS was published in the January 1988 issue of *Fortune Magazine*. It revealed that 39 percent of the Chief Executive Officers surveyed would not hire individuals who were HIV positive, while 38 percent were not sure whether they would hire such individuals. Reported in Mark A. Rothstein, *Medical Screening and the Employee Health Cost Crises*, (BNA Books 1989), 86. Job discrimination against recovered cancer patients is documented in Feldman, "Wellness and Work," in *Psychosocial Stress and Cancer*, ed. C. Cooper (1984), 173-200.

3. A brief history of employment discrimination on the basis of genetic traits is

anemia and may experience severe symptoms. Approximately one in five hundred African-American babies is born with sickle cell anemia, and about one in ten carries the sickle cell gene. Although no scientific evidence exists to show that African Americans with sickle cell trait experience increased morbidity or mortality, their identification through screening programs in the 1970s led to job and insurance discrimination against them.

For example, Charles Reinhart, Director of the DuPont Laboratory for Toxicology, reported in 1978 that DuPont gave pre-employment blood tests to African Americans to screen for sickle cell trait. He stated that at the Chambers Works plant, in Deepwater, New Jersey, individuals with sickle cell trait who had hemoglobin levels of less than 14 grams per 100 milliliters of blood (normal levels are usually given as 13 to 16 g per 100 mL) were restricted from work that involved handling nitro and amino compounds. Charles Reinhart, "Chemical Hypersusceptibility," *Journal of Occupational Medicine* (1978), 20:319-322.

5. Specifically, the Rehabilitation Act of 1973, as amended, protects individuals with disabilities who are otherwise qualified, from employment discrimination at the hands of the federal government, federal contractors or businesses receiving federal funds. 29 U.S.C. Secs. 701-795 (Supp. 1989).

6. The Americans with Disabilities Act, (Senate Bill No. 933, House Bill No. 2273) was passed by the Senate on September 7, 1989, but failed to make it through the House. The Act would bar discrimination on the basis of disability in employment, public services and public accommodations. The Act is expected to pass in Congress in 1990. One of the provisions that

ter a relapse of tuberculosis. The Court ruled that the Rehabilitation Act covers those who are able to work, but "are regarded as impaired and who, as a result, are substantially limited in a major life activity."

8. In the early 1900s, women had trouble getting insurance due to misconceptions about increased female mortality due to child birth hazards. See Note, Challenges to Sex-Based Mortality Tables in Insurance and Pensions, 6 *Women's Rights Law Reporter*, 59 (1979-1980) and Heen, Sex Discrimination in Pensions and Retirement Annuity Plans After *Arizona Governing Committee v. Norris*, 8 *Women's Rights Law Reporter*, 155 (1985):161. African Americans also experienced insurance discrimination. See M. James, *The Metropolitan Life: A Study in Business Growth* (1944), 338; G. Myrdal, *An American Dilemma: The Negro Problem and Modern Democracy* (1944), 316-317, 955, 1262-63, and M.S. Stuart, *An Economic Detour: A History of Insurance in the Lives of American Negroes* (1940).

9. The utility of such laws is explored by Neil A. Holtzman in *Proceed with Caution: Predicting Genetic Risks in the Recombinant DNA Era*, (Johns Hopkins University Press, 1989), 199-200.

10. The discussion of this survey has been cut since Paul Billings describes it on page 7 in this issue of *geneWATCH*. —ED.

11. According to a recent news report, the FBI is laying the groundwork for a computer information network that would contain genetic information on all violent offenders who have been incarcerated. The network would permit prosecutors to search DNA data banks to match evidence from rapes or murders against a list of DNA taken from convicted offenders. At least four states, California, Colorado, Nevada and Virginia, have drafted laws that would require that blood be taken from prisoners convicted of violent crimes so that their genetic profiles can be entered into such a DNA data bank. Rorie Sherman, "On the Horizon: A DNA Data Bank," *National Law Journal*, Dec. 18, 1989, p.25. Arkansas, Georgia, Louisiana, Maryland, Arizona, Florida, Michigan and Massachusetts also enacted or introduced legislation during 1989 concerning DNA identification systems. See Table 1, "DNA Identification Bills Before State Legislatures," *geneWATCH*, vol. 6, no. 1. See also the testimony of Professor Philip Bereano before the Subcommittee on Civil and Constitutional Rights, US Senate Judiciary Committee, March 1989. Copies of Professor Bereano's testimony are available from the CRG office.

Already companies that manage medical information for insurers track individuals identified as having specific genetic conditions.

presented in Ruth Hubbard and Mary Sue Henifin, "Genetic Screening of Prospective Parents and of Workers: Some Scientific and Social Issues" in *Biomedical Ethics Review*, eds. James Humber and Robert T. Almeder (Humana Press, 1984), 99-111.

4. Individuals who have one sickle cell gene (a condition called sickle cell trait) are free of symptoms and do not know that they have the gene, unless they have been tested for it. However, those who have two sickle cell genes have sickle cell

was targeted for deletion, but escaped amendment during 1989, would prohibit employers from using pre-employment physicals or inquiring about an applicant's disability status.

7. For example, in *School Board of Nassau Co. v. Arline*, 480 U.S. 273 (1987), the Supreme Court declined to decide whether the Rehabilitation Act would protect a person from employment discrimination who has no symptoms but whose medical tests indicate that a disease might develop in the future. 480 U.S. 282, n.7. In *Arline*, an elementary school teacher was fired af-

Union-initiated Research in Genetic Effects of Workplace Agents

by Karen Messing

Since 1978, our research group, initially involved in fungal genetics, has been doing research on genetic effects of workplace conditions, usually at the request of unions. This re-orientation has led us to change our ideas about research: how it is done, by whom, and what research results mean.

In 1976, the University of Québec signed an agreement with the two major Québec trade unions, the *Confédération des syndicats nationaux* (CSN), and the *Fédération des travailleurs du Québec* (FTQ), which provided that the University would respond to requests for educational and research services from the unions, and that such services would be regarded as belonging to the professors' job definition.^{1,2} Shortly thereafter, we received a request to determine the genetic risk in a refinery in which workers were exposed to radioactive dust. To our surprise, the workers' questions did not have simple answers, and we were forced to learn, experiment with, and eventually apply, state-of-the-art techniques. The activities initiated by this request became increasingly time-consuming, and have now taken over the laboratory. Due to the university-union agreement, we have been able to obtain university grants and re-

We received a request to determine the genetic risk in a refinery in which workers were exposed to radioactive dust. To our surprise, the workers' questions did not have simple answers.

leased-time to enable us to work on these projects.

A Refinery with Radioactive Dust

Our group, consisting of one university professor and two undergraduate volunteers, met first with the union executive. They described the manufacturing procedures, which we understood poorly, both because of our technical inadequacies and because no one had ever explained to the workers where their jobs fit into the refining process. We were able to gather that there were particular sites which were very dusty and that the dust was radioactive. It was not until two years later, when the union was finally able to negotiate our visit to the plant, that we could confirm that dust levels were extremely high, and this despite the fact that (coincidentally?) the preceding Saturday the factory had been swept for the first time in its 27 years of existence.

We also learned that there was a government report on contamination in a sister plant that listed various chemical pollutants. The union had been promised a copy several months before; it received it three years later, after our study was completed. We were told that radioactivity levels had been measured with a Geiger counter and found to be less than the legal limit. We could not understand why a Geiger counter measurement of environmental gamma radiation was relevant to the determination of risk to workers who breathed and ate

dust, thus incorporating alpha emitters permanently in their bones.

Therefore, our situation with regard to exposure data was as follows: we knew that there was some radioactive contamination in the dust, but in the absence of personal and appropriate environmental dosimetry we could not determine the level of contamination; we knew that there were contaminants other than radioactivity, but not which or how much. We had no access to the workplace and no familiarity with industrial hygiene techniques, nor any money with which to hire experienced personnel. Since our contact was exclusively with the union, which had no lever on the employer, it was impossible for us to get the kind of information the employer had. On the other hand, we were the only resource available to the union confronted by this problem.

The workers asked us to explain the consequences of exposure to radioactivity and we described cancer and reproductive effects. The workers could not tell us about the possible incidence of cancer; they knew that various workers had left the plant due to illness, but not what the illness was. However, of the four members of the executive who had had children, all had had at least one child with a congenital problem of some kind, from congenital heart defect to club foot. The wife of a fifth was pregnant with twins and subsequently gave birth to a child with a tracheo-esophageal fistula.

This first encounter with the executive was very upsetting. We were

Karen Messing is a professor in the Département des Sciences biologiques at the Université du Québec à Montréal. The author acknowledges valuable conversations with Donna Mergler, Ana Maria Seifert, and Abby Lippman as well as grants from the Institut de recherche en santé et en sécurité du travail du Québec (IRSST).

An earlier version of this article appeared in the Canadian journal Alternatives: Perspectives on Science, Technology and the Environment, Volume 15, Number 1.

send us the results. After a few months, workers received letters (in English, which they do not understand well) saying their tests were all negative. When we phoned, we were told that the letters resulted from a secretary's error, and that the tests had not yet been done. We asked the scientist to send a letter explaining the error, but this was never done. A

few months later, he called to say that he had still not completed the analysis, but would like permission to put a picture of one of the workers' chromosomes in a textbook, since he had never seen a chromosome so badly damaged. We never heard from him again, and the workers were badly confused by this incident, in which their needs and our credibility were not taken seriously. The questionnaire results were suggestive, since there appeared to be a very large number of congenital malformations, but not all workers had responded, so the sample might have been biased towards those with problems.

We therefore reported these very partial and tentative results to the union as evidence that a problem might exist, and suggested that a grant be sought for a complete study using trained personnel. In a fit of anger against the company, union representatives slapped our report on the bargaining table during negotiations. The company immediately contacted a prominent geneticist, who called us asking for our slides and wanting to know where we got our funding. Having in mind the kinds of differing interpretations of chromosomal aberrations with which the citizens of Love Canal had had to contend,^{7,8} we referred him to the union. He did not contact the union, but proposed, for \$100,000, to do a study for the company. Management then offered to settle with the union for \$50,000, to be put into renovations of the ventilating system of the plant, if the union would keep our report confidential and if we would not pursue our study. The union agreed.

Our reaction was mixed. We found \$50,000 for ventilation, which should

have been installed years before, small compensation if indeed children had been born with malformations because of the working conditions. On the other hand, we were glad that our report had served a purpose, since it is rare that a scientific

from several sources. As predicted, the behavior of human cells exposed in vivo to radiation is not at all the same as that of cells in culture. We have been supported to work on fundamental biological parameters of our test, effects of radiation on cells in

culture, and molecular characterization of mutant cells.

In addition, with my colleague, Donna

Mergler, a neurophysiologist, we have formed a group of eight PhDs and twenty other scientists which studies women's working conditions^{13,14} and reproductive outcome among hospital workers,¹⁵ working conditions and health effects among slaughterhouse workers and solvent-exposed workers.^{16,17,18} We can thus compare the response of colleagues to various types of research proposals. It has been interesting to contrast the treatment grant requests receive when they are about ways to improve genetic control of mosquitoes, or human cells in culture, with that afforded requests for funding to study genotoxic or neurotoxic effects of working conditions. It is, of course, difficult to separate the effects of granting agency policy, composition of specific peer groups, quality of the proposal, and prejudice against unions, when examining responses to various grant proposals. What is clear, is that there is no granting agency in Canada which has as a priority to fund research initiated by unions or other community groups in order to respond to needs defined by these groups. The closest approach to such a granting agency is Québec's Institut de recherche sur la santé et la sécurité du travail (see below), and it requires employer approval for all studies, even those in which no entrance into the workplace is involved. In general:

- We got a negative response if we said we were going to treat information from non-scientists as we would treat "hard" data. Our group now holds over \$500,000/year in grants from agencies outside our university, and none of it is for any study involving any type of questionnaire on

We learned quickly not to use the word "union," but even "worker" sufficed to induce a negative reaction.

study results in improved working conditions. As scientists, we were disappointed not to be able to publish or pursue the study. We were left with unanswered questions and do not know to this day whether there was a serious exposure to genotoxic agents at this plant. We also didn't understand why the company's geneticist continued to be well respected in scientific circles (e.g., president of a major scientific association) while frequently accepting money from management to be used as a bargaining chip, while we were regarded as untouchables because of our *non-lucrative* relationship with unions.

How scientific peers judge union-initiated studies

Since that time we have been involved in several studies. We had found the technique of looking for chromosomal aberrations to be too hard on the eyes of our laboratory



workers, and too susceptible of differing interpretations. We now use another method of measurement of genetic damage, in which we have more confidence. We have measured mutant frequencies in lymphocytes of hospital patients^{9,10} and of workers^{11,12} exposed to ionizing radiation, for which we have received grants

es, but also because a scientist who testifies for or works with a union automatically loses prestige among the very groups the union must impress: judges, juries and public opinion. In this way, scientists are also discou-

meaningful to workers in a context of extensive personnel cuts, but at first glance nonsensical to scientists trained in one agent-one lesion mutagenesis. However, it started me thinking about the many possible work-

Our experience is just one example of the pressure exercised on non-conforming scientists and especially those who "mix" other than middle-of-the-road politics with their scientific endeavours.

raged from doing studies relevant to workplace problems.

Compensations

A context which makes union-initiated research possible. Québec now has a research institute, the Institut de recherche en santé et en sécurité du travail, where funds are distributed for work in occupational health by a committee composed of four union representatives, four management representatives and five scientists. Through this organisation, several union-based or union-associated projects, including ours, have been funded. Through working on the various committees, some union people have become quite sophisticated about how science works, and what kinds of projects can be funded. Management and labour to some extent agree on the necessity of a practical approach and one that answers questions posed in the workplace. Thus, we have much more financial and institutional support than is usual for a progressive university group, and can be a bit less fearful of repression than some of our colleagues.

The opportunity to formulate interesting scientific hypotheses. In spite of our disconcerting and occasionally frightening experiences, we feel very good about doing union-initiated research. One benefit of listening to workers' formulations of problems is that one comes across new ideas. It was in an educational session with radiology technicians that I was asked whether stress on the job could influence the number of radiation-induced mutations. This question is quite

place influences on genotoxic effects, which has led to new hypotheses and several grants. Donna Mergler and Nicole Vezina were led by workers to examine the effects of cold exposure on menstrual problems, the first North American study in this area.¹⁷ Jean-Pierre Reveret, Donna Mergler and I were led by workers' questions to examine working conditions in women's employment "ghettos," which has started us on research on the biological justifications for such ghettos.^{13, 14} We have also been led to some interesting reflections on the methodology of dealing with complex effects of working conditions.²⁵

It is rare that scientists are in a position to affect the parameters they study. Our institutional and political context and the dedication of our group have put us in a privileged position. Our professional lives are greatly enriched by the new questions we can study, and we also take great pleasure in the feeling that we can help workers improve their working conditions. We are, however, distressed by our lack of community with other scientists, who are not necessarily reactionary or malignant, and we would like to encourage scientists to develop ways in which they can be freed to respond to community needs.

In Québec, the educational and medical systems are almost entirely supported by the government, therefore by taxes paid by workers. The university-union agreement, and the union-management funding agency, permit workers to recover a larger portion of their investment than is usually possible. We offer any help we can to others who would like to develop similar arrangements. Δ

Notes

1. Protocole d'entente UQAM-CSN-FITQ sur la formation syndicale. Université du Québec à Montréal, 1976.
2. D. Mergler, "Worker participation in occupational health research: Theory and practice," *Int. J. Health Serv.*, 17:151-167.
3. J. D. Erickson et al., "Vietnam veterans' risks for fathering babies with birth defects," *JAMA* 252 (7):903-912.
4. J. R. Goldsmith, G. Potashnik, and R. Israeli, "Reproductive outcomes in families of DBCP-exposed men," *Arch. Environ. Health* 39 (2):85-89.
5. J. R. Wilkins and T. H. Sinks, "Occupational exposures among fathers of children with Wilms' tumor," *J. Occup. Med.*, 26 (6):427-435.
6. R. St-Amand, "Taking action: An interview with Saskia Post," *Healthsharing*, (Summer, 1985):18-20.
7. G. B. Kolata, "Love Canal: False alarm caused by botched study," *Science*, 208 (1980):1239-1240.
8. L. Gibbs, *Love Canal: My Story* (New York: Grove Press, 1982).
9. K. Messing and W. E. C. Bradley, "In vivo mutant frequency rises among breast cancer patients after exposure to high doses of gamma radiation," *Mutat. Res.*, 152 (1985):107-112.
10. A. M. Seifert, W. E. C. Bradley, and K. Messing, "Exposure of nuclear medicine patients to ionizing radiation is associated with rises in HPRT- mutant frequency in peripheral lymphocytes," *Mutat. Res.*, 191 (1987):57-63.
11. K. Messing, A. M. Seifert, and W. E. C. Bradley, "In vivo mutant frequency of technicians professionally exposed to ionizing radiation," in *Monitoring of Occupational Genotoxicants*, ed. M. Sorsa and H. Norppa, (New York: Alan R. Liss, 1986).
12. K. Messing et al., "Mutant frequency of radiotherapy technicians reflects recent dose of ionizing radiation," *Health Physics*, 57 (1989): 537-544.
13. K. Messing, "Do men and women have different jobs because of their biological differences?" *Int. J. Health Serv.*, 12 (1):43-52.
14. D. Mergler et al., "The weaker sex? Men in women's working conditions report similar health symptoms," *J. Occup. Med.*, 29:417-421.
15. Report submitted to the Association professionnelle des paramédicaux, 1988. Université du Québec à Montréal.
16. D. Mergler, N. Vezina, and A. Beauvais, "Warts among workers in poultry slaughterhouses," *Scand. J. Work Environ. Health*, 8, supp.1 (1982):180-184.

(continued on page 14)

fective fetus," so as to open the "choice" of abortion. Yet there are many reports of women being pressured to abort a fetus determined to be disabled, by threatened denial of medical insurance, fear of malpractice

notion of the child as a commodity, subject to quality control, and have reinforced a view of women as baby producers, subject to scrutiny by medical and legal standards.

Thus far, there has been little or no

Genetic diagnosis is big business. The market for genetic tests and for tests for "predispositions" to genetic disease is predicted to reach \$950 million to \$1 billion by 1992.

suits and the social stigma of producing a child assumed to be a burden to society. The prenatal screening technologies, along with other reproductive technologies, have fostered the

public debate about genetic testing. Yet we need to move beyond awe-struck admiration of modern science. Genetic diagnosis is big business. The market for genetic tests and for tests

for "predispositions" to genetic disease is predicted to reach \$950 million to \$1 billion by 1992. We must critically assess the impulse behind the development of these diagnostics as well as their social and economic impact.

Nelkin and Tancredi's goal seems not to condemn the tests but rather to generate discussion about their development and use by exploring the social, cultural and institutional contexts in which they are applied. While they are motivated to write because they are concerned, the book does not incite or blame, and therefore will be useful in reaching a wide range of readers and stimulating debate. Δ

Biotechnology's Bitter Harvest: Herbicide-Tolerant Crops and the Threat to Sustainable Agriculture A Report of the Biotechnology Working Group. (March 1990, 73 pp., \$5)

Biotechnology's Bitter Harvest examines agricultural biotechnology's first major product—crops genetically modified to tolerate chemical weed-killers, or herbicides.

The report details the extent of current herbicide use and research. It discusses the human health, environmental, social, and economic effects of herbicides and herbicide-tolerant plants. It compares the promises with the realities of widespread use of herbicide-tolerant crops, exposing the

harmful effects for farmers, consumers, and the environment. The report outlines alternative methods of weed control. It concludes with recommendations to discourage the de-



velopment of herbicide-tolerant crops.

The authors are Rebecca Goldberg, Environmental Defense Fund; Jane Rissler, National Wildlife Foundation; Hope Shand, Rural Advance-

ment Fund International; and Chuck Hassebrook, Center for Rural Affairs. All are members of the Biotechnology Working Group. The BWG is composed of representatives of public interest organizations, including the CRG, who are working on biotechnology-related issues in the environmental, agricultural, consumer, labor, and public health fields. Δ

To purchase a copy of the report, send a check or money order for \$5 to:

CRG
186 South Street, 4th floor
Boston, MA 02111 USA
(617) 423-0650.

UNION-INITIATED RESEARCH

(continued from page 12)

size, strength and task demands," *Ergonomics*, 27(5):481-488.

22. H. F. Stich and M. P. Rosin, "Towards a more comprehensive evaluation of a genotoxic hazard in man," *Mutat. Res.*, 150 (1985):43-50.

23. J. Deverell, "Job threatened over studies of cancer links," *Toronto Star*, Oct. 22, 1986.

24. "NIOSH cuts back reproductive hazards study," *VDT News*, January / February 1985.

25. K. Messing, "Putting our two heads together: A mainly women's research group uses subjective perceptions to understand women's occupational health," in *Feminist organising in Canada: From academia to activism*, J. Wine and J. Ristock (Toronto: University of Toronto Press, in press).

17. D. Mergler and N. Vezina, "Dysmennorrhea and cold exposure," *J. Reprod. Med.*, 30(2):106-111.

18. S. De Grosbois and D. Mergler, "La santé mentale et l'exposition aux solvants organiques en milieu de travail," *Santé mentale au Québec*, X(2):99-113.

19. National Science and Engineering Council of Canada (NSERC), "Industry and university: Partners in R & D," Brochure describing grant program. (Ottawa: NSERC, 1985), 1.

20. A. Garg et al., "Biomechanical stresses as related to motion trajectory of lifting," *Human Factors*, 25(5):527-539.

21. E. J. Celentano, J. W. Nottrodt, and P. L. Saunders, "The relationship between

New Address for RAFI

In the last *geneWATCH* (Volume 6, Nos. 2-3), we listed the address of the Rural Advancement Fund International (RAFI). Shortly after that issue of *geneWATCH* went to the printer, we learned that RAFI had just moved. For those of you who want to order *The Laws of Life: Another Development and the New Biotechnologies* or the *RAFI Communique*, here is RAFI's new address and telephone number:

RAFI
PO Box 655
Pittsboro, NC 27312 USA
(919) 542-1396

RAFI's street address is 105 West Street, Pittsboro, NC 27312 USA.

RESOURCES

Books

•Hubbard, Ruth. 1990. *The Politics of Women's Biology*. Rutgers University Press. (229 pp., \$12.95 paper, \$35.00 cloth).

Publications

•*Facts on Reproductive Rights: A Resource Manual*. December, 1989. (Unnumbered, \$16.95, bulk rates available for multiple copies), a guide to legal, medical, and social aspects of reproductive issues from the NOW Legal Defense and Education Fund. Topics include US Supreme Court abortion cases, parental consent laws, and court-imposed medical treatment of pregnant women. Order from: Reproductive Rights Resource Manual, NOW Legal Defense and Education Fund, 99 Hudson Street, 12th floor, New York, NY 10013 USA.

•*Proceedings of the European Workshop on Law and Genetic Engineering* are now available in English. The "Law and Genetic Engineering" Workshop was held in Hamburg last December and included discussion on deliberate release of genetically engineered organisms and other reg-

ulatory matters concerning biotechnology. The Proceedings contain the European Commission's directives on environmental release and contained use, plus analyses from several European NGO's.

Available from: BBU Verlag GmbH, Prinz Albert Str. 43, D-5300 Bonn 1, Federal Republic of Germany. (no price listed)

Newsletters Recently Received

•*The Gene Exchange* is a quarterly newsletter about environmental biotechnology. It focuses on federal and state legislative initiatives on environmental release and lists applications for field tests pending with EPA and USDA. The publication is free. Order from: Biotechnology Policy Center, National Wildlife Federation, 1401 16th Street, NW, Washington, DC 20036. Phone (202) 797-6800.

•*Global Pesticide Monitor* is published by the Pesticide Action Network (PAN) North America Regional Center "to present information, analysis, resources and discussion on international aspects of pesticide reform." The first issue is devoted to peoples' movements challenging pes-

ticide production and misuse. Subscriptions for individuals and non-profit organizations are \$25; corporate or government subscriptions are \$50.

Contact: PAN North America, PO Box 610, San Francisco, CA 94101, (415) 541-9140.

Upcoming Events

•*Science and Health in the Third World: Is There A Role for Biotechnology?*, a lecture by Dr. Carlos Mor-el, Vice-President for Research of the Oswaldo Cruz Institute, Brazil's premier biomedical research institute, will take place Thursday, May 17, 1990, 7:00 PM, at Northeastern University, 360 Huntington Avenue, Boston, MA. The specific room will be announced later; call (617) 437-2262 for the room or other information.

This is the first of a series of eight Lowell Lectureships in Biotechnology to be held at Northeastern University over the next four years. The goal of these lectures is to provide the public with the opportunity to become more aware of biotechnology and its role in society.

Please note: Prices are in US dollars unless otherwise indicated.

Council for Responsible Genetics
186 South Street, 4th Floor
Boston, MA 02111

Please Note Our New Address:
COUNCIL FOR RESPONSIBLE GENETICS
19 GARDEN STREET
CAMBRIDGE, MA 02138
(617) 869-0070

Non-Profit Organization
U.S. Postage
PAID
Boston, MA
Permit No. 50542

Please check your mailing label.
Is it time to renew your *geneWATCH*
subscription? See page 15.