

INTEGRITY IN SCHOLARSHIP

A REPORT TO CONCORDIA UNIVERSITY

By the
INDEPENDENT COMMITTEE OF INQUIRY
INTO
ACADEMIC AND SCIENTIFIC INTEGRITY

H. W. Arthurs, Chair
Roger A. Blais
Jon Thompson

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INDEX

<u>Section</u>	<u>Page</u>
1. Introduction	1
2. Context	3
2.1 Introduction	3
2.2 The production-driven research culture	4
2.3 Accountability procedures	10
2.4 The situation in the Faculty of Engineering and Computer Science	11
3. Policies and Practices: Concordia and the University Community	15
3.1 Introduction	15
3.2 Outside professional activities and the use of university resources	16
3.2.1 A perspective on "outside professional activity	16
3.2.2 Concordia's rules and policies relating to professional activities and the use of university resources	18
3.2.3 Practises relating to outside professional activities and the use of university resources	19
3.2.4 University policy on contract research	20
3.2.5 Summary	21
3.3 Professional responsibilities: Scientific and Academic Integrity	21
3.3.1 Honesty and integrity in research	21
3.3.2 Concordia's policies and procedures relating to scientific and academic integrity	22
3.4 Financial and other central control systems	23
3.5 Moving forward at Concordia	25
3.6 Creating a positive environment for responsible and ethical behaviour	30
3.6.1 Introduction	30
3.6.2 The granting councils	31
3.6.3 Government contracting policies	33
3.6.4 Learned societies, scholarly journals and academic presses	34
3.6.5 The CAUT and AUCC	35
3.6.6 Local campus cultures	35
4. The Administrative Inquiries into Dr. Fabrikant's Allegations	36
4.1 The first allegations	36
4.2 The second allegations	37
4.3 The inquiries and their consequences	39

5. Contractual Issues	40
5.1 Background	40
5.2 The contracts	41
5.2.1 The seat vibration contract	41
5.2.2 The liquid tanker stability contract	41
5.2.3 The expert systems contract	43
5.2.4 Other contracts	43
5.3 Conflicts of Interest	44
5.3.1 The seat vibration contract	44
5.3.2 The liquid tanker stability contract	45
5.3.3 The expert system contract	46
5.4 Other contractual irregularities	48
5.4.1 Payments to Prof. T.S.Sankar	48
5.4.2 The computer purchase	49
5.4.3 Non-compliance with University contracting policies	52
5.4.4 Excessive, unregulated consulting and contracting	53

6. Allegations of scholarly misconduct	55
6.1 The allegations	55
6.2 The background	56
6.3 Dr. Fabrikant's scholarly activities	58
6.4 Allegations against Prof. S. Sankar	62
6.4.1 The liquid tanker stability contract	62
6.4.2 Extortion of co-authorship	63
6.5 Allegations against Prof. T.S. Sankar	64
6.5.1 "Other" publications	64
6.5.2 Co-authorship with Dr. Fabrikant	64
6.6 Allegations against Prof. M.N.S.Swamy	66
6.6.1 "Other" publications	66
6.6.2 Co-authorship with Dr. Thulasiraman	67
6.6.3 Co-authorship with Dr. Fabrikant	68
7. Conclusions	69

APPENDICES

Appendix A	The Independent Committee's Mandate from the Board of Governors of Concordia University
Appendix B	The Independent Committee's Procedural Protocol
Appendix C	Synopsis of Professional Activity - Prof. S. Sankar
Appendix D	Authorship and Duplication

1. INTRODUCTION

The Independent Committee of Inquiry was appointed by the Board of Governors of Concordia University in September, 1993. Our mandate, set out in full in Appendix A, was to investigate the policies, practices and procedures by which Concordia has sought to maintain standards of academic and scientific integrity, and especially to evaluate such practices and procedures by reference to those prevailing at other Canadian universities. Within that general mandate, we were also asked to investigate certain specific allegations of conflict of interest and breaches of scientific and academic integrity, made by Dr. V.I.Fabrikant against several of his colleagues.

We conducted our inquiry in accordance with a procedural protocol, Appendix B to this report, which we adopted following initial consultations with a broad spectrum of campus groups. The protocol was widely circulated, and our activities were given prominent coverage in campus media. Everyone who wished to provide views or information to us has been given an opportunity to do so, either orally or in writing. A number of people have been interviewed in confidence, and several on more than one occasion.

Our work has been greatly facilitated by the cooperation of members of the University administration, by the willingness of many of Concordia's students, staff and faculty to speak frankly and constructively about the difficult matters we were asked to investigate, and by advice and background information provided by various members of Canada's research community. To all of these individuals, we are most grateful. We also wish to acknowledge specifically the great assistance we received from Me Bérengère Gaudet, Secretary General of the University, and from Me Bram Freedman, its Legal Counsel, both of whom were seconded to assist us. Me Gaudet and Me Freedman, and their staffs, supported our efforts with skill, discretion, integrity and efficiency. They were not, however, privy to any information provided to us in

confidence, nor did they assist in drafting this report.

A final word of introduction. Our inquiry did not materialize out of thin air. It resulted from a series of events which culminated in a tragedy with few, if any, parallels in the history of academic disputation - Dr. Fabrikant's acts of violence against members of the Concordia community.

Dr. Fabrikant was thwarted in his search for a tenured professorship. First, he gathered evidence with which to blackmail his way into an appointment; then he attempted to force the University to appoint him; then he tried to destroy the reputation of those he thought responsible for his rejection; and finally, in despair and anger, he killed four innocent bystanders in cold blood, and gravely wounded a fifth.

There is no basis whatsoever for speculation that this chain of tragic events could have been broken, that a vengeful murderer might have been mollified or neutralized, by a timely public finding of malfeasance against those whom he accused. In that sense, the shootings have nothing to do with our inquiry. Nonetheless, they cast their shadow over our work. It is obviously difficult to think about Dr. Fabrikant's allegations without being reminded of their provenance and their shocking sequel. As a result, some people were reluctant to discuss the allegations at all; others tended to recollect and interpret them in light of what happened after they were made; and no doubt others have speculated on what might or might not have happened if this or that situation had been handled differently.

For all of these reasons, we wish to make one point unequivocally clear at the outset. Our report is critical of the conduct of some individuals and of some aspects of the University's practices and procedures. To a limited extent, therefore, our criticisms can be read as bearing out certain of Dr. Fabrikant's allegations. But we

do not intend or accept that these criticisms should be read as diminishing Dr. Fabrikant's responsibility for the tragedy, or as assigning such responsibility to the University or to any of its individual members.

2. CONTEXT

2.1. Introduction

Our report comments negatively upon the development of certain values, attitudes and behaviours within Concordia's research community, specifically in the Faculty of Engineering and Computer Science (but perhaps not exclusively: we have no information on other faculties). It appears to us that, in some quarters, ever-higher activity levels, ever-growing output, bigger and bigger grants and contracts, more and more equipment and facilities, higher and higher graduate enrolments, have become ends in themselves. Worse yet, they have become ends which are sometimes used to justify means which are highly questionable. As a result, practices have developed relating to the acquisition and deployment of funding, equipment and personnel - the factors of research "production", as they seem to be regarded - which are inconsistent not only with high standards of academic behaviour, but also with explicit University policies and with generally accepted standards of honesty and integrity. And, frankly, they are unworthy of the distinguished individuals who have become involved in such practices.

These are serious problems, which the University will have to address, but they are not unique to Concordia. They have their origins not in the intrinsic wickedness of any of the persons involved nor in particular defects of the University's administrative structures. Rather, they are the almost inescapable pathology of the surrounding research culture, of systems of scholarly assessment, research funding and industry-university-

government cooperation which have developed in Canada over the past 25 years, and ultimately of developments in scholarship which, if not universal, are certainly widespread.

2.2 The production-driven research culture

Research, especially in the physical sciences and engineering, has become both highly specialized and very expensive. It is impossible to conduct such research without considerable funding for staff, equipment, infrastructure and materials. However, access to such funding, in a highly competitive environment, depends upon a demonstrated capacity to "produce" results. "Production", as the past experience of the automotive industry demonstrates, can come to be measured primarily in terms of the quantity of units of output, rather than their quality, and to be maximized for its own sake, without regard to the externalities - the social, economic, cultural and environmental consequences - which it generates. The analogy may be strained, but the implication is apt: too often university honours, research grants and industrial contracts are awarded on the basis of numbers of publications, rather than on their quality and significance.

Obviously, this does not mean that the work of all prolific scholars - including those at Concordia - is without significance or merit. We mean to suggest only that there are strong pressures to be prolific, that those pressures may in turn lead to the adoption of strategies for being as prolific as possible, and that some of these strategies may promote undesirable behaviour.

The problem is compounded by ambiguities and contradictions in public policies used to stimulate research within the universities, and to promote cooperation amongst universities, industry and government. It is vitally important for Canada that research of both types should flourish. However, as we shall explain, it would appear that in some respects insufficient attention has been

devoted to the modalities of cooperative research which crosses sectoral boundaries.

For example, our investigation revealed undesirable practices which resulted directly from a federal policy, adopted in the late 1970s, of giving priority to private sector suppliers of research services. Whatever its merits, this policy in effect treated university researchers only as contractors of last resort and forced them to compete by incorporating private companies through which they could hold themselves out as private sector bidders. This was apparently done with the acquiescence of government officials, and sometimes with the knowledge and consent of their university, but the effect was to promote schizophrenic attitudes - and conflicts of interest - amongst some academic researchers.

"Applied" researchers who persevered within their university laboratories might be denied access to contractual arrangements which would provide much-needed funds for their research. Consequently their future research prospects would be limited. However, if they were prepared to engage in entrepreneurial strategies to gain external contracts, whether with government or private industry, they could not only maximize their "production", but could generate positive benefits which ultimately would reinforce their academic research. At a minimum, these benefits might take the form of data, which could be used to feed future academic research; often they were of a more tangible nature: jobs for graduate students, equipment, facilities, travel funds, etc. In either case, such benefits - and the enhanced level of academic research they made possible - could then be used to legitimate their entrepreneurial activities not only in their own eyes but also in the eyes of their academic colleagues.

The need for legitimation is important for many reasons. First, the "benefits" generated by entrepreneurial or contract research sometimes include non-trivial amounts of personal remuneration for

the principal researcher and others. This creates financial distinctions within the professoriat which derive not from academic merit or seniority but from successful entrepreneurship. Plausible justification for these distinctions is necessary in order to forestall collegial resentment and to fend off demands for regulation.

Second, externally-generated benefits which help a researcher to enhance his or her purely academic research record also produce a multiplier effect in the form of promotions in rank, academic honours and invitations to conferences. These additional rewards, incidentally, make the researcher a more credible bidder for further external contracts as well as for funding from government and the granting councils.

Third, since time and energy are always finite commodities, the researcher is driven to make a series of difficult choices: should she or he invest her or his personal time and energy in an academic project or in an external contract? Assuming the same research questions can be handled in either mode, there are often material advantages to the latter choice and that is the one likely to be adopted. Further, in extreme cases, if the researcher responds to repeated opportunities to engage in paid contract research or consulting, this may lead to a long-term decline in the researcher's academic contributions.

Nor is the allocation of the researcher's time or energy purely an issue of personal choice. It may have a significant impact on the University and the department: it may involve evasion of rules restricting outside work or the use of university personnel and facilities; it may involve the off-loading of teaching and administrative activities to others; perhaps most importantly, if widespread, it may lead to an erosion of the university research culture.

Fourth, if individuals and institutions fail to adopt a critical perspective on their activities, there is a risk that the careers and characters of those who live within a production-driven research culture may be subtly transformed. Excellent scholars, for example, may be transmuted into excellent research managers. They can become preoccupied with maintaining a high-volume research production facility and its personnel, generating and managing its cash-flow, and balancing several rather different, sometimes competing, value systems, intellectual priorities, personnel and accounting practices, and lifestyles. The more conscientiously and effectively they perform all the roles they inhabit, the more they will have to develop better managerial skills. But the better the managers they become, the more they are likely to adopt managerial - rather than academic - values and attitudes. A balance is needed; thoughtful people in well-regulated institutions, will find it; those lacking a capacity for self-criticism or guidance from their colleagues and their university will not.

Finally, there is a risk that a production-driven research culture will tempt people to engage not only in undesirable modalities of research but in actual falsification and fraud. Several recent and highly publicized instances of scientific fraud have attracted the attention of the scholarly community, and measures to prevent it are now under discussion within universities, granting agencies, and the editorial boards of scientific journals in Canada and abroad. We are pleased to report that, despite Dr. Fabrikant's allegations, we discovered no such fraud at Concordia, at least in the sense of deliberate falsification of results.

Misappropriation of credit for work done and unwarranted claims of authorship may also result more frequently in the context of a production-oriented research culture. When it is, and when it is not, appropriate to credit someone as an author or co-author is often a question of judgment, and norms vary over time, and amongst academic traditions and disciplines. However, there are always

outer limits, and wherever these are located, the ambitious research manager is constantly tempted to transgress them. By inflating his or her record of authorship, the research manager enhances the chances of attracting further grants or contracts. Such grants or contracts also enure to the benefit of the research team, whose vulnerable members - students, junior researchers, contractual personnel - are subtly or unsubtly coerced into agreeing to add the manager's name as an author or co-author despite the absence of any intellectual contribution sufficient to justify a claim of authorship. Sometimes, the research manager inappropriately lends his or her name as co-author to an article to enhance the chance of its being accepted for publication, which in turn benefits the true author, often a doctoral or post-doctoral student, and the team as a whole.

Finally, of all the dangers inherent in a production-driven research culture, none is more insidious than the tendency to succumb to rationalization and self-delusion. Extremely intelligent, highly motivated, entrepreneurial individuals thrive in this environment. It is all too easy for them to persuade themselves they are doing no wrong: norms are vague; policing mechanisms are primitive; peer judgments calibrate scholarly achievements, not moral virtue; financial auditors and envious colleagues are not peers and have no right to judge; and thus ultimately, tragically, the noble ends of scholarship come to justify distinctly ignoble means.

The issue of production-driven research is a challenge not just for Concordia, but for the entire Canadian research community. And it is not a challenge which will be met merely by pronouncing statements of principle or enacting codes of conduct. Nothing less than a change in the culture and context of research will suffice. Public and private sector providers of research funds must reexamine the underlying assumptions and visible consequences of their funding strategies. Collegial and administrative committees

concerned with resource allocation, hiring, promotion, tenure, merit pay and honours must revisit the premises upon which they assess and reward scholarly accomplishment. Academic unions must reconsider their willingness to defend professorial autonomy when it is used not to advance academic freedom but rather for self--aggrandizement.

In optimal circumstances, achieving such a culture change would be a difficult and lengthy task. It is particularly so now. It is hard to criticize production-driven research when entrepreneurship dominates political and economic discourse. It is hard to be negative about contracting and consulting when university researchers are expected to contribute to the nation's ability to compete globally, achieve equity, and sustain its environment. It is hard to resist the temptation to use almost any means to fund research when the granting councils have experienced such a decline in funding, relative to need. And it is hard to say "no" to paid outside employment when individual faculty members face static or declining incomes and, for the first time, diminished prospects of job security.

In other words, a culture change is not something which is going to happen soon, not in Canada, so long as other dominant scholarly communities persist with their present practices, and not anywhere until the academic community as a whole comes to the conclusion that change is in its own interest, and in the interest of the project of free intellectual inquiry to which it has been historically committed.

Thus, for the foreseeable future, Concordia, like all Canadian universities, is likely to have to deal with conduct of the type we have criticized. Concordia is therefore going to have to rely - much more than it would prefer to do - on accountability procedures, to ensure that the abuses inherent in such a culture do not occur.

2.3 Accountability procedures

The aims of accountability procedures can be shortly stated: to ensure that university faculty members devote themselves primarily to the tasks for which they are paid and to which, by their very acceptance of a university position, they are committed - the teaching of students and the disinterested pursuit and dissemination of knowledge; to ensure that proper standards of honesty and integrity prevail in all research undertaken by university scholars and those working under their direction; and to ensure that the university is properly compensated for the use of its facilities and personnel.

These are not aims with which any university constituency should disagree, but practical implementation may present difficulties. Accountability procedures must be created with due respect for the legal rights and institutional responsibilities of various bodies within the university, but they must be adopted promptly, with the clear and unequivocal support of all concerned. They must be sufficiently broad in their language to accommodate a variety of academic sub-cultures, but sufficiently uniform to ensure that local practices do not subvert their intention. All relevant information must be reported and general compliance must be achieved, but care must be taken to avoid picayune rules, undue administrative costs, or excessive burdens for busy scholars. Above all, there must be consistent adherence to the rules over a long period of time: there can be no exemptions for privileged persons, and no tolerance of local deviance which, in the end, will bring the whole system into disrepute.

At this time, in our opinion, Concordia does not have accountability procedures which meet these tests. Nor, in our opinion, have the systems which do exist always been adhered to either by researchers or by administrative officials.

We will cite chapter and verse below, but by way of understanding the context, it must be appreciated that over the past twenty years or so, the research environment at Concordia has been extremely volatile. Research activity has been expanding rapidly; graduate enrolments have soared; quality has been improving; industrial and government contracts have been proliferating; recognition of the University's specialized strengths - including those in engineering - has been growing. And all of this has been happening during a period when the general financial situation of universities in Quebec and across Canada has been deteriorating.

In such a context, it is not surprising that accountability procedures have failed to keep pace with the research activity which they were meant to regulate. Nor is it surprising that in the absence of strong institutional structures to ensure accountability, Concordia was unable to rely upon informal understandings and habitual ways of doing things, as older institutions might. Concordia's short history, the recent rapid expansion of research and contracting activity, the reluctance to constrain some of the University's most distinguished and active researchers who are active contributors to its growing reputation, the reluctance to divert funds from doing research to policing it: all of these conspired to inhibit the development of informal systems of accountability at Concordia.

But now the time has come to confront the task, especially in the Faculty of Engineering and Computer science.

2.4 The situation in the Faculty of Engineering and Computer Science

Since its foundation, Concordia's Faculty of Engineering and Computer Science has had to address the important challenge of establishing an appropriate direction for its programs of research and teaching, within the context of an academic field which has

been redefining its relationship to other disciplines and to the needs of a changing profession. In some respects, the Faculty has been highly successful; in others less so.

On the one hand - by any objective measure - the Faculty has gone through a prolonged period of expansion, and expansion has been accompanied by diversification and a considerable enhancement of quality and reputation. It now has 115 full-time faculty members, 2000 undergraduate students, and 725 graduate students. Research grants and contracts currently amount to about \$6.5 million and represent, respectively, 42% and 60% of the totals for the whole University.

On the other hand - measured subjectively by the experience of many of its staff, professorial and student members - the atmosphere within the Faculty has not been a positive one. In a series of confidential interviews, we heard complaints about hiring practices, about the management of funds, personnel, facilities and equipment, about intellectual and financial exploitation of vulnerable foreign graduate students, about the questionable use of research grants and the handling of contracts, and about many other matters.

The ethos of governance within the Faculty was perceived by many of those who spoke to us as arbitrary, patronage-based, and worse. Collegial structures were weak; authority was exercised by the Dean personally or through subordinates; a small group of faculty members enjoyed favourable arrangements while others were routinely denied support; and the favoured few, in turn, were allowed to pursue their own priorities with relative impunity, essentially free from accountability requirements.

However, the situation is complex. Some of the very people said to be responsible for the negative aspects of the Faculty's development can rightly be praised for their positive contributions

to teaching and research. Some of those whose scholarly ethics have been impugned are highly productive scholars who, over their careers, have won prizes, grants, the accolades of discerning peer reviewers and the appreciation of former students. Some of those complaining most loudly were not just victims, but beneficiaries, of the ethos they deplored: Dr. Fabrikant was an extreme example.

What is the relationship between general concerns about the ethos of the Faculty, and the specific allegations made by Dr. Fabrikant? Given the atmosphere within Engineering, authorship (and contracts) came to serve as a valued currency within the Faculty's political economy. Those with copious credits and large contracts generally enjoyed research funding, prestige and influence. Privileged access to resources in turn allowed them to sustain their publication output while other faculty members were denied the means of becoming more productive.

It is no wonder, then, that authorship continues to preoccupy some faculty members in Engineering. Just recently, the Department of Mechanical Engineering unanimously adopted a formal policy on authorship which, we were told, codified long-standing departmental practice. The departmental policy asserts:

The results of research funded by grants to a professor or a research center remain primarily the intellectual property of the research group and formally of the University.

When co-supervision is wanted such as for interdisciplinary research, one research supervisor may assume direct contact with the student and consult with the second, who through advice and suggestions gains the right to recognition through co-authorship. A supervisor may delegate some portion of direct contact with a student to an associate, such as a post-doctoral fellow as part of the latter's training, without extinguishing right to recognition.

Further, the policy provides:

The list of authors should include all of those, but only those, who contributed intellectually to the research reported.

However, it sets no lower limit to the extent of contribution; apparently, a trivial contribution may earn authorship.

This Departmental policy statement testifies to the deep structures of beliefs, values and power within Mechanical Engineering. Consequently, the following convergence of views becomes highly material: Dr. Fabrikant alleges that certain professors insisted on co-authorship regardless of how small their scientific contribution, while the Department itself formally and unanimously asserts that all professors have the "right" to co-authorship given any scientific contribution at all. Of course, this policy statement does not enable us to point to any particular inappropriate claim of authorial credit; but it does explain why someone might be tempted, and think themselves entitled, to claim authorship in circumstances where it would not be claimed in other academic cultures.

These issues became particularly salient in the mid-1980s, when the Faculty began to emphasize not only professional training and research, but also closer liaison with industry through pre-competitive research and the development of generic technologies. This development at Concordia was part of a broad shift in attitude and activity in faculties of engineering; it sits within the context of a debate over the future of engineering education and research which has been joined by the Canadian Academy of Engineering and other bodies. It is clear that if Engineering at Concordia is to become more explicitly involved with the profession and with industry, it will need to be much more thoughtful and explicit about the policies needed to achieve and maintain a proper balance between the academy and the profession, between basic and applied research, between significant engineering science and relatively routine testing and consulting, and between constructive engagement with industry and less legitimate forms of involvement.

3. POLICIES AND PRACTICES: CONCORDIA AND THE UNIVERSITY COMMUNITY

3.1 Introduction

Concordia's Board of Governors has mandated us to:

(a) ... determine what rules, procedures and practices are currently in force or in use at Concordia University with respect to scientific and academic integrity, particularly as regards research in the field of engineering, and

(b) ... then determine whether these rules, procedures and practices conform to those generally in force or in use at other Canadian universities.

It is convenient to combine these two tasks so that we can make comparisons where appropriate.

The relevant rules and procedures in force or in use have four main provenances: the collective agreement between the University and the Concordia University Faculty Association (CUFA); the policies contained in the Contract Research Handbook of the Office of Research Services (ORS); the accounting procedures of the University's Treasury; and a miscellany of university, faculty and departmental policies and practices. In addition, of course, Concordia and all of its members are bound by the general law of the land, and are expected to behave in accordance with norms which are well understood and generally adhered to in all academic communities. For present purposes, these norms address outside professional activities, the use of university resources, conflicts of interest, scientific and academic integrity, and financial accountability.

3.2 Outside professional activities and use of university resources

3.2.1 A perspective on "outside professional activity"

The behaviour of scholars in most disciplines within the Canadian university community, suggests that it must be acceptable for professors to undertake consulting work or to perform contract research, and to engage in such activities through their private companies. Indeed, in the perspective of recent policy initiatives designed to foster university-government-business partnerships, such arrangements can be seen to be praiseworthy, if not essential. However, at Concordia, as at other institutions, it is necessary that rules governing outside professional activities should be clearly set down and consistently observed, and that conflicts of interest should be avoided.

Outside professional activities may include "consulting" and "research". While the definitions are somewhat arbitrary, consulting usually involves the application of existing knowledge or expertise to the solution of a problem posed by an outside client; research is the mobilization of methodologies, personnel and resources to address complex problems selected by the researcher (though sometimes proposed by others) with the intention of developing new hypotheses, approaches, solutions, insights, interpretations, technologies or tools. Research, in turn, may be subdivided into "contract research", performed at the request of, or by agreement with, an outside private party or public agency, and "academic research" performed in response to the researcher's own sense of intellectual priorities and opportunities.

Ideally, university scholars should limit their "outside professional activities" to consulting. This would ensure that research - whether academic or contractual - will always be conducted within the university context, and in a manner consistent

with its norms, including high standards, openness and honesty, accessibility to peer review, and respect for human and animal subjects. In the case of contract research, where researchers may be under pressure to violate these norms, the university itself - rather than the individual researcher - ought to be party to any contractual arrangements.

This will not only help to protect the quality of the research, and to insulate the researcher from any pressures which might exist within the contractual setting, but it will also protect important institutional interests. The university will be able to vouch for the quality of the research; it will be able to ensure that its own rules and procedures are adhered to; it will be able to secure adequate compensation for the use of its facilities and personnel (including the researcher), and to recover its overhead costs. Further, if university is the contracting party, it will be able to gain greater access to government funds, program accreditation, and other rewards which are contingent on the institution's research productivity and reputation.

Like consulting, some contract research produces remuneration for the researcher. The availability of personal financial gain in both cases underlines the need to avoid any appearance that a university researcher is secretly or improperly exploiting his or her academic position. In the case of contractual research, all the terms are clearly agreed from the outset, and the appearance of impropriety is unlikely, so long as everything is done above board and in accordance with the contract. However, in the case of consulting, it is important to ensure that researchers do not trade on their university connections, use university facilities or personnel without consent and compensation, or allow outside activities to impinge on their university responsibilities. On the contrary, wherever possible, both consulting and contract research ought to complement and reinforce the university academic objectives and activities by providing those engaged in such

activities with knowledge, experience and professional relationships which ultimately benefits their students or stimulates academic research.

3.2.2 Concordia's rules and policies relating to outside professional activities and the use of university resources

The clearest rules and procedures in force - but not necessarily in use - deal with the "outside professional activities" of faculty members; with grants, contracts or fees associated with these activities; and with the use in support of outside professional activities of University resources and personnel, including the time and expertise of the professors concerned. The relevant language is found in articles 7, 24, 27 and 49 of the University's collective agreement with CUFA, and is similar to language found in collective agreements at comparable Canadian universities.

Article 24.01 limits the total time which a faculty member may spend on "paid or unpaid outside professional activities". 24.03(a) requires "prior written approval" from an administrative officer (the Dean for present purposes) in all such activities involving remuneration; an annual report is required.

Articles 49.03 and 24.03(b) require, respectively, written authorization from, and reimbursement of, the University for use of its resources. Article 49.02 requires express agreement by the University in regard to any grants or contracts in support of research activity which "engages" the institution. A special instance of such engagement is found in article 27.13, which requires disclosure to the University of any computer program for which copyright registration is being sought, and conclusion of an agreement between the individual faculty member(s) and the University setting out their respective rights in regard to the product, regardless of the extent to which the institution's

resources were used for its development.

Article 7.03 requires faculty members and administrators alike to "make every effort to avoid situations of conflict of interest."

3.2.3 Practices relating to outside professional activities and the use of university resources

By and large, the disclosure and prior-approval provisions of Article 24 have not been adhered to in the Faculty of Engineering and Computer Science or, until very recently, in other faculties. They do not seem to have been enforced by Deans nor are they voluntarily respected by faculty members. Adherence to the provisions of Articles 24 and 49 in regard to grant and contract activity and the use of University resources is sporadic.

Responsibility for this pattern of non-adherence extends beyond the Deans to the central administration. For example, in 1985 support staff alerted two Vice-Rectors to certain conduct which would create a precedent likely to have (and which ultimately did have) an adverse effect on the institution's interests. No action was taken to rectify the situation then or since, even though serving members of the senior administration, with responsibilities in this area, seem to be aware of it. The fact that rules and procedures are often ignored materially damages the University by depriving it of substantial funds to which it is entitled as payment for the use of its resources.

Our investigation shows that adherence to the conflict of interest provisions in article 7.03 has also been rather too casual, and we learned of an important instance where provisions of Article 27.13, concerning industrial property, have apparently not been respected. Details appear below.

Article 24.01 states the faculty members "may engage in paid or

unpaid outside professional activities" provided this does not either (a) "interfere with the performance of the member's assigned duties and responsibilities" or (b) amount to "more than one (1) day equivalent per week in any academic year" (defined as a twelve month period commencing on June 1). We have found that these rules are not always respected. The interpretation of the one-day-per-week rule apparently held by a few faculty members is so elastic as to trivialize their commitment to their regular duties and responsibilities. This interpretation - all the more disturbing in that it was promoted by very senior professors - would permit all evenings, weekends, vacation and holiday periods to be devoted to outside professional activities. Whether or not this pattern of behaviour would constitute a technical violation of Article 24.01 is not for us to say. We can say that it does not accord with the high standards of most professors, at Concordia and elsewhere, who have committed themselves to an academic career.

Having noted that certain provisions of the collective agreement have in effect fallen into disuse, we must also note that reinvigorating those provisions may present legal difficulties. Such difficulties, however, can easily be overcome given what we understand to be the shared commitment of the administration and the union to do so.

3.2.4 University policy on contract research

We turn next to the ORS Handbook which contains, among other things, a "Policy on Contract Research" signed by the Vice-Rector (Academic) and dated September 1, 1989. This three-page Policy elaborates some of the provisions of Articles 49.02, 49.03 and 24.03 in the collective agreement.

As with the provisions of the agreement, compliance with the provisions of the Handbook, in particular with the Vice-Rector's policy, has been sporadic, and essentially results from voluntary

action rather than administrative enforcement. In fact, administrative enforcement would not be easy. We have noted a lack of coordination between ORS and Treasury, with the result that Treasury seems willing to handle contracts which are not registered with ORS, in contravention of University policy. Further, we note that as matters now stand, if faculty members choose to process a research contract through Treasury, but through ORS, they can escape paying overheads. Indeed, anyone prepared to forego the assistance of Treasury altogether can apparently do so with impunity by the simple expedient of treating a given arrangement as a personal "consulting" contract, which will escape University procedures altogether.

3.2.5 Summary

Concordia's written policies and procedures concerning outside professional activities, and other matters discussed above, generally conform to policies and procedures in force elsewhere in Canada. What is fundamentally different at Concordia is the lack of respect for, and adherence to, reasonable rules and procedures on the part of many faculty members, and the degree of acquiescence in this behaviour by the administration. Other universities encounter problems from time to time, but usually these are few and far between, and when they are detected, steps are taken to rectify them.

3.3 Professional Responsibilities: Scientific and Academic Integrity

3.3.1 Honesty and integrity in research

The "objective" and "value-free" nature of scientific research and academic inquiry has been a matter of spirited debate for many years. However, no protagonist in this debate - so far as we are aware - argues in favour of practices which are deliberately

designed to defraud or exploit. On the contrary: honesty and integrity - so far as these are capable of being achieved - are considered to be a hallmark of all research worthy of the name.

3.3.2 Concordia's policies and procedures relating to scientific and academic integrity

The collective agreement, Articles 16.01 and 16.02, sets out in general terms the usual responsibilities of faculty members: teaching, research and scholarship, and service. However, Concordia appears to have no policies or procedures dealing specifically with professional ethics or standards of scientific and academic integrity which are to prevail in the carrying out of these important responsibilities. We know of no uncodified practice which actively promotes these ethics or standards on a University-wide basis. However, perhaps there are local faculty- or department-level policy documents which have not been brought to our attention, and almost certainly broad normative understandings do prevail within Concordia's research communities, as elsewhere.

We must also report that the Concordia-CUFA agreement and Concordia's policies seem to overlook issues which are being addressed at other Canadian universities. For example, it is quite common for collective agreements to contain articles dealing with professional ethics and responsibilities. Such articles typically contain elements of the CAUT policy statement on professional responsibilities and ethics, which helps to promote a degree of uniformity across Canada. In addition, some universities have codes of ethics promulgated by Senates, by administrative action or otherwise.

Finally, we certainly do not mean to indicate that all Concordia researchers exist in a moral limbo; we mean only to indicate that the University has not addressed these issues on a formal, institutional basis. The consequence of this failure, however, is

that it may turn out to be particularly difficult for the University to confront even fairly egregious conduct.

3.4 Financial and other central control systems

The creation and application of financial controls, equipment inventories, logs and periodic reports, and other arrangements for keeping track of the use of University resources and compliance with University policies are the responsibility of the administration. Obviously such arrangements should be user-friendly and cost-effective, on the one hand, and should elicit consistent and willing compliance from faculty, staff and students on the other.

There can be no doubt that Concordia has considerable work to do in terms of improving its administrative systems to the point where they can begin to cope with the complex challenges of a diverse, outward-facing, entrepreneurial university. To cite some examples: there is no systematic record kept - either at the Faculty level or centrally - of the use of facilities, equipment or support personnel for research funded by grants or contracts; there is no consolidated record of support for graduate students; the validity of questionable expenditures is not always adequately challenged; and there are inadequate financial records to permit ex post facto reconstruction of large flows of funds through the University's accounts.

Similar deficiencies hindered our investigation. The Treasury was unable to provide analytical support for our work or even to furnish certain information we required unless provided with extra resources to retrieve it manually; the ORS does not retain copies of reports on research contracts it administers, which hampered our ability to investigate allegations concerning authorship; the Archives could not produce complete files on various matters; the office of the Vice-Rector (Academic) claims to have been unable to

secure access to files which were needed to investigate Dr. Fabrikant's allegations; and so on.

We are pleased to report that the administration has now, of its own initiative but with our support, commissioned a detailed audit of certain accounts. Some of these involve substantial sums of money and have not previously been subjected to detailed scrutiny.

The failure of the existing systems contributed to, but did not wholly account for, the failure of the central administration to detect, or intervene to forestall or terminate, inappropriate behaviour in the Faculty of Engineering and Computer Science.

In principle, it is the responsibility of any university's central administration to see that all units within the university not only comply with formally-proclaimed rules and procedures, but also that they pursue their academic missions with both distinction and decency. That is the responsibility in principle. In practice many forces militate against central direction. Formally, de facto, and for good reasons, much administrative authority is devolved from the centre to faculties and departments and centres. Much authority normally possessed by management in other organizations is shared in universities with the faculty acting either in Senate and faculty councils as a collegium, or as a union engaged in collective bargaining and grievance processing. Within the central administration, senior officers of the university are almost all career academics rather than managers, with the result that there is relatively frequent turnover, sometimes with negative effects on the coherence and compatibility of the administrative team. The positive effects of limited terms for senior administrators may be somewhat offset by the negative effects of discontinuity - loss of institutional memory, momentum and focus. And unlimited terms pose their own problems: long-serving office-holders may become increasingly inattentive, inward-looking and remote from changing administrative and academic expectations.

For any of these reasons, local administrative and academic cultures may develop which come to operate on premises which differ radically from those to which the university as a whole would like to think it is committed. So long as those cultures appear to be flourishing, so long as they do not exhibit outward signs of pathology, they will be left undisturbed. Indeed, to the extent that they are producing positive results - growth, productivity, honours, revenue - they are almost certain to be immune from intervention: no central administrator will lightly interfere with successes which reflect well on the university.

All of these general observations may help knowledgeable observers to understand why - given some of our findings and others which may surface in parallel investigations - the deteriorating governance structures and administrative control systems within the Faculty of Engineering and Computer Science might have escaped central intervention, or even notice. However, we stop short of any comprehensive findings in this regard. We were not mandated to conduct a general inquiry into the affairs of that Faculty and, more importantly, its problems are being addressed elsewhere. We are impressed by the efforts being made by a new administrative team within Engineering, acting with the cooperation of the central administration, to produce a more positive situation.

Nonetheless, as to matters within our mandate, we have heard enough testimony from enough concerned and informed individuals to conclude that some of the dubious conduct we have identified went undetected because of poor administrative practices within the Faculty and the central administration.

3.5 Moving forward at Concordia

Quite apart from any difficulties or deficiencies at Concordia, it is particularly timely that the University should now be seriously considering issues of academic integrity and honesty. In recent

years, because of a series of well-publicized incidents (especially in the USA) concern has grown inside and outside academe that the traditional laissez faire approach to professional responsibilities and research ethics must be supplemented by more specific policies dealing with academic and scientific integrity or, negatively, with fraud and misconduct.

For several years, CAUT has been urging that policies dealing with these matters be adopted by each university community. It has developed a model. More recently, the three federal research granting councils have issued a joint policy on Integrity in Research and Scholarship setting forth guidelines which they expect all universities to adopt in the near future, in order for their faculty members to be eligible to continue to receive grants. The wording differs from the CAUT model, but the two contain the same elements: a definition of integrity (or misconduct) and a requirement that due process be accorded persons against whom allegations are made.

A number of Canadian universities have formally adopted such policies, by one means or another, while others are in the process of doing so. The policies adopted or under discussion at some twenty Canadian universities were collected and analyzed for us by Ms. Sheila Smail of the Office of the Secretary General at Concordia. Dr. Donald C. Savage, Executive Director of CAUT, has written a survey paper on fraud and misconduct in research which covers all aspects, from cases to policies. Copies of these documents can be obtained on request. Documents providing extensive discussions of definitions, procedures and other aspects of policy have been published recently by various organizations and agencies, including le Conseil superieur de l'éducation du Québec and the National Academy of Sciences of the USA.

Two related components of academic or scientific integrity involve financial concerns: the duties to avoid conflicts of interest, and

to ensure reimbursement for the use of institutional resources for pursuit of private interests. As we have noted, both generally and specifically in this report, professors or administrators can materially damage their university's financial interests and reputation by allowing their desire for personal gain or prestige to outweigh their responsibilities to their institution, their colleagues, their students and, on occasion, their discipline.

Another component of academic or scientific integrity which has recently received considerable attention is authorship. Some of the specific allegations we were asked to investigate involved this issue. Plagiarism has long been proscribed. Lately, however, several well-publicized scholarly scandals have prompted suggestions that co-authors should be held jointly responsible for the accuracy and procedural validity of their publication, as well as its originality. The long-standing practice whereby, even in the absence of substantive intellectual contribution, heads of departments, laboratories or other research groups were automatically listed as co-authors on work produced by members of the group, is no longer acceptable.

The issue of authorship has grown in importance recently in part because growth and specialization within the international research community have enhanced the possibility that inflated or misleading claims of authorship may lead to an unearned reputation for expertise and productivity, and thence to undeserved professional advancement. But there is more at stake than reputation and advancement. Co-authors may be asked to accept moral and legal responsibility for the scholarly misconduct of their collaborators because fraudulent results are not only embarrassing and vexatious, but sometimes dangerous, especially in fields such as medicine, engineering or agriculture.

In response to these concerns, some major research and professional organizations have taken steps to promote or enforce reasonable and

responsible codes of authorship. Two basic models have emerged so far. A group of leading international biomedical journals now requires that claims of co-authorship of any article accepted for publication meet defined criteria of intellectual contribution and responsibility; they also specify when a simple acknowledgement of assistance is appropriate. Another model, developed by the American Association of University Professors (AAUP), contemplates that every article contain a summary description of the contribution and responsibility of each co-author. The biomedical model contains additional requirements peculiar to that field, for example in regard to use of human subjects and their names, which would not be suitable in history or political science. But, otherwise, the basic authorship criteria used there could be adapted to other fields; the model proposed by AAUP is not field-specific.

While it is appropriate that authorship codes be developed by large collectivities, such as an international disciplinary group or national professional organization, as Ms. Smail's compilation indicates, several Canadian universities are implementing authorship codes. However, we believe that smaller units, such as individual university departments, should not be encouraged to legislate their own rules. An unfortunate example of how a highly principled initiative can result in a less-than-satisfactory outcome in this area is provided by the experience of the Department of Mechanical Engineering at Concordia, whose recently adopted authorship document we analyzed above.

At Concordia, positive developments have been initiated on several fronts to address deficiencies of policy and practice. CUFA has put forward a proposal in the current round of collective bargaining which, if adopted, would introduce into the collective agreement a policy on academic and scientific integrity, as suggested by CAUT and the granting councils. The administration has published for general discussion a draft comprehensive code of

ethics and has established a consultative committee, chaired by Prof. Fred Bird, to receive responses, formulate a revised draft, coordinate a further round of general discussion, and prepare a final version for approval by appropriate university bodies. The Faculty of Engineering and Computer Science held a workshop on February 22, 1994, for its faculty members and students, with invited speakers from outside the University, in order to promote greater awareness and understanding of these issues. To assist the University to reflect on these matters, our Committee held a day-long open meeting on issues of academic integrity and honesty. And Ms. Smail's study has now been made available to the Bird Committee to assist it in its tasks.

We have urged, and again urge, that the central administration, the Deans, the Executive of CUFA, the members of Senate and other concerned parties work together to rapidly agree upon and promptly and effectively implement a new code of academic and scientific integrity, and to take other steps to strengthen this dimension of the University's research culture.

It is of the greatest importance that Concordia should reach a prompt and productive conclusion to these initiatives. We understand that, following a further round of consultation in May, the Bird Committee will issue a report and draft code of academic and scientific integrity in June, 1994. It is therefore reasonable and responsible for the University to commit itself to a deadline of October, 1994, for adoption of some version of a code, by whatever means are deemed appropriate. Work should begin forthwith on necessary improvements to the University's administrative structures and financial systems.

To readers of this report from outside Concordia, we want to make a special plea. During these next months, Concordia will be going through a very difficult period. To some extent, its difficulties will be exacerbated by the things we have had to say in our report,

and perhaps by other more-or-less contemporaneous reports on other matters. But it is important to place all of these reports in perspective. We have been asked to investigate the conduct of a small group of individuals, and the adequacy of a limited number of policies and practices. This is not the sum of any university, and certainly not of Concordia. This is a fine university, with many able and highly conscientious faculty members and administrators, who are deeply committed to their students, their scholarship and their community. They can endure censure for a little while if they must; but they need and deserve public understanding and support.

3.6 Creating a positive environment for responsible and ethical behaviour

3.6.1 Introduction

We have mentioned the influences of the wider academic community and society at large on individual universities and the people who work and study in them. Consequently, national professional organizations, the AUCC and CAUT, learned societies, governments and government-sponsored agencies, such as the granting councils, must accept some responsibility for the present state of academic and scientific integrity in Canada's research culture as well as for its future evolution.

In order to better understand the wider context in which Concordia's concerns must be understood and addressed, we organized a half-day workshop on January 28, 1994. Representatives of a number of national bodies were invited to participate in discussions on policies and practices related to academic integrity, to explain the concerns of their groups in this area, and the steps being taken to address them. Senior academic administrators of Concordia, the deans, representatives of CUFA and Prof. Bird also participated. The discussions were lively and

constructive, and of considerable assistance to our committee and the Concordia community. We take this opportunity to express our thanks and appreciation to all those who were able to attend, despite adverse weather conditions.

In this section of the report, we suggest ways in which important institutional actors with influence on the development of Canadian research policies and practices might promote higher standards of academic honesty and integrity.

3.6.2 The Granting Councils

The three national granting councils have made an important contribution in adopting their recent document on Integrity in Research and Scholarship. However, it is possible that the experience of Concordia - and perhaps of other universities - might persuade them to revisit this policy in several respects.

First, the granting policies adopted by the three Councils should be reviewed in order to ensure that they do not themselves contribute to, or encourage, undesirable practices. For example, unrealistic requirements for private sector partnerships may tempt grant applicants to adopt spurious arrangements involving their own companies, or to enter into unwise or deceptive arrangements with other private sector firms. Or, to take another example, if peer reviewers place undue emphasis on productivity as the test for operating or project grants, they may be subtly promoting recourse to illicit claims of authorship.

Second, the present Tri-Council document, admirable as a statement of principles and responsibilities, does not seem quite so well designed in terms of its procedures - especially those which are to be used to address misconduct in research.

The Councils "hold institutions responsible for investigating

allegations of misconduct". This approach may present some practical difficulties. From the institutions's perspective, an individual under investigation may be one of its most distinguished and prolific scholars; the allegations may be greeted with initial scepticism; it may be difficult to find individuals at the institution who are willing or able to conduct an investigation; investigations which may lead to disciplinary action may become entangled in ongoing union-management relations; and the institutional consequences of adverse findings may be so extreme as to influence the initial decision to investigate, the manner of the investigation, and any sanctions imposed.

All of this suggests that it might be desirable to regard the obligation to investigate as one which ought to be shared between the institution and some outside agency, possibly the relevant granting council. The sharing of the obligation to investigate may be justified from three perspectives. First, in some cases, the policies of the granting councils may have helped to create the conditions which led to misconduct and, in some cases, their faulty peer review processes may have failed to detect improper conduct. Second, the granting councils are disbursing public funds, and ought to be seen to be accountable for their use. Third, the direct participation of the granting councils may contribute to better individual investigations, and ultimately to the development of a larger national consensus supporting proper norms of behaviour.

All of these considerations seem to point in the direction of greater direct involvement of the granting councils, with a view to assisting the institution to meet its obligations, notwithstanding various internal constraints. We do not propose the creation of a national investigative staff or machinery. However, the granting councils' involvement might take the form of their nominating one member of an investigating panel, at least in cases where allegations cross a defined threshold of materiality and

plausibility. This is not to say that the costs of investigation should necessarily be displaced from the institution to the councils, although it might not be regarded as inappropriate to impose a very small "tax" on all grants to create a fund within the councils' budgets which would help to guarantee one of the indispensable preconditions of all research: integrity.

3.6.3 Government contracting policies

We were not mandated to tell governments how to conduct their procurement policies or to promote higher levels of research and development. However, our investigation has shown that without meaning to do so, governments may inadvertently create conditions in which university researchers are placed in a conflict of interest vis-à-vis their institution. Policies which disqualify or disadvantage universities as bidders on government contracts in effect may drive university-based researchers and consultants to conceal their affiliation behind corporate facades. Policies which condition support for research on the participation of private sector partners may tempt individuals to create spurious or disadvantageous arrangements with private sector firms. Policies which treat overheads differentially as between institutional and other contractors may lead government procurement agencies to favour arrangements which cost the least in the short run, but may not produce the best long-run outcomes.

The problem here, we believe, is a left-hand, right-hand problem. Operational ministries which contract for research or consulting services work within a different frame of reference from those responsible for funding higher education or research. Their differing perspectives must be reconciled and coordinated.

As we have indicated above, we fully support partnerships amongst government, universities and the private sector, and we are eager to encourage universities and their researchers to contribute to

Canada's industrial, economic and social development. But we are concerned that arrangements in this area should be characterized by honesty, a fundamental attribute of good government, good business practice, and good research.

3.6.4 Learned societies scholarly journals and academic presses

As mentioned above, our learned societies, scholarly journals and academic presses can play a leadership role in promoting academic integrity.

Such organizations are in a position to particularize and contextualize the broad principles enunciated by the granting councils. They ought to have an interest in pursuing this task, because misconduct by individual scholars within a discipline can reflect badly on all of its members, and because publication of fraudulent research - even of research claimed to be fraudulent - can be expensive and damaging for those who edit and publish scholarly books and journals. Moreover, the development of discipline-specific, national norms would have the advantage of saving individual faculties and departments much of the time and trouble involved in developing their own codes. And finally, the availability of national discipline-specific standards would assist academic units in maintaining high standards despite the distorting effects of idiosyncratic personalities or departmental politics.

These organizations are "gatekeepers": they control the means by which scholars publish their research. Relatively simple and inexpensive measures, such as requiring signed "integrity" or compliance statements prior to accepting books or articles for publication, or conference papers for delivery, could do much to reduce the incidence of misconduct, or at least to deny offenders the defences of ignorance or of good faith misunderstanding.

3.6.5 The CAUT and AUCC

While standards of integrity can be developed on a national, discipline-specific basis, sanctions for misconduct must be dealt with in the context of local employment relationships. We have already noted the considerable contribution of CAUT in the development of language suitable for inclusion in local collective agreements or other documents which define the duties and responsibilities of faculty members. We believe that AUCC ought to encourage its member institutions to address these issues as well. This would have three positive consequences: university administrations would respond collectively to the recent tri-council statement; they would be encouraged to react constructively to local faculty associations which table the language developed by CAUT; and they would develop a common strategy to address the academic honesty and integrity of groups other than faculty members.

3.6.6 Local campus cultures

No normative structures, no enforcement mechanisms, can prevail easily over deeply-rooted departmental cultures, local value systems and the day-to-day practices which they shape and support. If people in a given department are prepared to wink at - even encourage - unethical behaviour, it will take a very long time and a very intensive and unpleasant effort for such practices to be weeded out. Put the other way around, the existence of positive role models and a healthy and articulate appreciation of ethical responsibilities is the best way of ensuring that proper values and attitudes are adopted by successive generations of students, staff and faculty members.

Here lies the greatest challenge for senior administrators and departmental chairs, for union officers and respected collegial figures, for rank-and-file members of academic units or laboratory

teams or student study groups: leadership.

We have no specific advice to give to those to whom these remarks are addressed, but we believe that most of them share a commitment to academic behaviour which meets the highest standards of integrity and honesty and - if supported and encouraged - can find the most suitable means to translate this commitment into daily practice.

4. THE ADMINISTRATIVE INQUIRIES INTO DR. FABRIKANT'S ALLEGATIONS

4.1 The first allegations

In early 1992, Dr. Fabrikant had begun to disseminate allegations concerning the academic and scientific integrity of his colleagues. These allegations were distributed widely throughout the university, and by electronic mail, across the continent. However, they were not formally investigated until Dr. Fabrikant wrote a letter to the Board of Governors, dated February 14, 1992, stating:

I have evidence that the Director of CONCAVE Center Dr. S. Sankar is in the position of conflict of interestIn 1985, S. Sankar obtained a contract from Transport Canada for his private company S&S Inc. in the amount of \$225,000. Additional money were [sic] allocated in 1988-1989 and 1989-1990. Part of it was subcontracted to his brother T.S.Sankar. None have made any technical contribution to the work. The work was done by other members of CONCAVE and graduate students paid by the university.

Dr. Fabrikant added that he had proof of further conflicts of interest. He also claimed that Prof. S. Sankar had made no "technical contribution" to certain published papers of which he purported to be the co-author.

The Board referred these allegations to the Rector, Dr. Kenniff who, by memo dated Feb. 19, 1992, asked the Vice Rector (Academic), Dr. Sheinin, to investigate the charges. Dr. Sheinin defined her

task very narrowly; she conducted her investigation with circumspection so extreme as to be self-defeating. Her report indicates that she read documents "relevant to the contract" which was the subject of the allegations - but not, apparently, the contract itself; she did not speak to several individuals she ought to have spoken to, including people at Transport Canada and in the University's own Office of Research Services; she failed to search out, or at any rate to obtain, the actual contract and other relevant documents; she did not comprehend the significance of documents she did read; she seems to have either been misled by Prof. S. Sankar or to have misunderstood him; she did not extend her investigation or her report to other conflicts of interest; and she dealt with the issues of authorship by reference to general principles rather than specific facts.

Dr. Sheinin rendered her report on March 17, 1992. She ended this brief document with a conclusion which - in light of the deficiencies of her investigation - was at once candid and misleading:

I have assumed that each Concordia faculty member ... acted in accordance with the policies and practices of Concordia University....The activities of all Concordia faculty members...were and are, as far as I can determine, entirely within the current ethos. [Emphasis added]

Citing this report, Dr. Kenniff assured the Board that Dr. Fabrikant's allegations were without foundation.

4.2 The second allegations

In a letter dated April 26, 1992, Dr. Fabrikant renewed and extended his original allegations, this time providing extensive documentation (much of which had been circulating at Concordia and elsewhere for months). His expanded and documented allegations addressed three topics:

1. conflict of interest, alleged bribery and professional misconduct in connection with a "Study on Liquid Tanker Stability" undertaken for Transport Canada by Prof. S.Sankar's company, Seshadri Sankar Inc., as prime contractor, and Concordia University as subcontractor, with Prof. T.S.Sankar, his brother, as principal researcher;
2. conflict of interest in connection with a contract for the "Study of a Vehicle Dynamics Expert System" undertaken by CIE-TECH, another company owned by Prof. S. Sankar; and
3. illicit claims of authorship by Prof. S. Sankar, Prof. T.S.Sankar, and Prof. (then Dean) M.N.S. Swamy.

Dr. Kenniff asked Dr. Sheinin whether, in her view, "this letter raises new facts which were not the subject of your inquiry and which might justify further investigation?" Dr. Sheinin read the documents submitted by Dr. Fabrikant; she spoke to counsel; she met with Dr. Fabrikant at his insistence; apparently, she did nothing else. Nonetheless, on May 13, 1992, she concluded:

Dr. Fabrikant's April 26, 1992 letter contains no new information nor does it raise any new facts which would justify further investigation. His allegations have been investigated and I have made a report to the Board of Governors indicating Dr. Fabrikant's allegations were unfounded.

Perhaps Dr. Sheinin meant that the information provided on April 26 was not new because it had been previously circulated by Dr. Fabrikant; perhaps she meant that his documentation contained no "new facts" relating to the subject matter of her first report; perhaps she discounted the allegations because Dr. Fabrikant was erratic, threatening and irresponsible; perhaps her report has to be interpreted in light of ongoing difficulties in communication between her and the Rector. At this date, we cannot tell what she

had in mind. However, it is obvious, on the face of her report and on the basis of information we have obtained, that notwithstanding the extensive documentation provided, Dr. Sheinin made an even more superficial investigation of the second set of allegations than she had of the first.

Dr. Kenniff wrote Dr. Fabrikant on May 14, 1992, stating that, on the basis of Dr. Sheinin's second report, "no further action will be taken at this time". When he wrote that letter, in effect, no proper investigation had ever been made of either the first or the second set of allegations. Dr. Sheinin ought to have realized that her report might expose herself, Dr. Kenniff, the Board and the University to justifiable criticism. And, for his part, Dr. Kenniff ought to have realized that the report he had received from Dr. Sheinin and forwarded to the Board was not based on a proper inquiry.

Dr. Fabrikant then pursued his complaints in other forums. He complained to NSERC and to two agencies of the Government of Québec, MESS (Ministère de l'Enseignement supérieur et de la Science) and FCAR (Fonds pour la formation de chercheurs et l'aide à la Recherche) , each of which received an extended and documented version of his allegations. The Québec authorities made informal enquiries, received a response from the University, and did not pursue the matter further. NSERC, on July 17, 1992, formally asked Concordia to provide a response. The murders committed shortly thereafter by Dr. Fabrikant understandably preempted immediate consideration of NSERC's enquiry; it will now, we presume, be responded to on the basis of facts disclosed by our investigation.

4.3 The inquiries and their consequences

The two administrative investigations were clearly and seriously deficient. Making due allowance for the fact that we are viewing the matter with the wisdom of hindsight, and without having to deal

with the disturbing presence of Dr. Fabrikant, we are still unable to understand why they should have been as inadequate as they were. Equally, we are unable to understand why their obvious inadequacies were not immediately challenged and corrected.

But they were not. As a consequence, some dubious activities, which we discuss below, remained undiscovered from the spring of 1992 to the present. Some of these activities had already come to rest in 1992; some have been ongoing; but all of them might well have been discovered in 1992 had the two inquiries been conducted with due diligence.

5. CONTRACTUAL ISSUES

5.1 Background

Profs. T.S.Sankar and S. Sankar are both members of the Department of Mechanical Engineering. Dr. T.S.Sankar was, until January 1987, the Chair of that Department, while Prof. S. Sankar has been Director of the Concordia Computer Aided Vehicle Engineering Research Centre - Concave - from its inception in 1986 down to the present. In their respective administrative capacities, and as scholars, they were both involved with Dr. Fabrikant, and provided initial funding for his employment from their research grants. In due course, they came to be perceived by Dr. Fabrikant as responsible - along with others - for frustrating his career at Concordia.

Dr. Fabrikant's allegations concerning the contractual activities of Prof. S. Sankar, and to a lesser extent, of Prof. T.S. Sankar, were set out in his two letters to the Concordia Board of Governors, in his complaint to NSERC, and in other communications. As noted in chapter 4 of our report, these allegations revolved around three themes: the absence of any actual intellectual contribution by Profs. S. Sankar and T.S. Sankar to the work

performed under these contracts; the contractual relationships between Transport Canada and Prof. S. Sankar and his companies; and conflicts of interest prejudicial to Concordia involving Dr. S. Sankar.

We deal with the question of intellectual contributions in chapter 6 of our report. Dr. Fabrikant's allegations concerning the contractual relationships between Transport Canada and Prof. S. Sankar have been investigated and rejected by Transport Canada. While we have no independent means to verify Transport Canada's findings, we have no reason to doubt them, and do not propose to deal with these allegations further. Accordingly, this section of our report will focus on the question of conflicts of interest, and on other matters which came to our attention during our review of the Transport Canada contracts and other contracts.

5.2 The Contracts

5.2.1 The Seat Vibration contract

In 1984, Transport Canada awarded a research contract relating to "Seat Vibrations" to Concordia. Prof. R. Bhat was the principal researcher on this contract; Prof. S. Sankar served as one of the members of the research team, and was paid at a per diem rate. Towards the end of the contract, it appears, Prof. Bhat went on sabbatical leave, and Prof. Sankar took a lead role in bringing the contract to a successful conclusion.

5.2.2 The Liquid Tanker Stability contract

In mid-1985, some months after the Seat Vibrations contract was initiated, Prof. S. Sankar sought financial support from Transport Canada for a proposed research project at Concordia on "Liquid Tanker Stability". However, Prof. Sankar was told that he would have to respond to a competitive contract proposal (an RFP) in

order to secure the funding, and that under the rules of competition, preference would be given to private sector bidders over universities and other non-profit institutions. He then incorporated Seshadri Sankar Inc., of which he was (and is) the sole beneficial shareholder. The company entered the competition, and won a contract ultimately worth \$288,064. This contract provided for payments at a per diem rate to Prof. S. Sankar individually, for payments to various consultants and subcontractors, and for a fixed profit of 5% to be paid to Seshadri Sankar Inc.

Prior to bidding on the contract, Prof S. Sankar, had apparently mentioned to then-Dean M.N.S.Swamy of the Faculty of Engineering that he was going to compete for it as a private entrepreneur. However, he neither received Dean Swamy's formal approval, nor vetted this arrangement in advance with the Office of Research Services (ORS), as he should have done, given that Concordia had been identified to Transport Canada as a subcontractor. Some weeks after he won the contract, ORS learned of this from another source, and took the initiative to become involved.

As specified in its contract with Transport Canada, Seshadri Sankar Inc. entered into a subcontract with Concordia. The subcontract provided: that research services would be rendered by Prof. T.S.Sankar, as principal investigator, and by Profs. Bhat and Vatistas; that each would be paid at an agreed per diem rate; that Concordia was to provide computing services to a value of \$37,000; and that Concordia would be paid overhead charges amounting to 30% of the labour charges under the subcontract. The total value of the sub- contract was set at \$73,670. Appropriate approvals were given by various university officials. The subcontract was extended several times, the agreed sums were paid, and it was finally completed in March 1990.

5.2.3 The Expert System contract

While the Liquid Tanker Stability Contract was winding down, in early 1990, Prof. S. Sankar negotiated a new and much larger contract with Transport Canada for the development of an "Expert System" software package built on research undertaken at Concave by Dr. Sankar, his colleagues and their students over the previous five years, as well as on the expertise acquired through performance of the first two contracts.

Because of Prof. S. Sankar's scientific reputation, his success under the previous contracts, and - as it believed - the opportunity to reinforce Concave as a national centre of excellence, Transport Canada negotiated this contract with Prof. Sankar directly, without seeking competitive bids. However, Prof. Sankar chose to take the contract through his own newly-incorporated company, CIE-TECH. CIE-TECH occupied rented premises, owned some computing equipment, and employed its own small staff - mostly individuals who had recently studied or worked at Concave. We have no way of knowing whether, in addition, Concordia personnel or facilities were used in connection with this contract, although any such use has been categorically denied.

The contract had a total value of \$444,121 and provided, for per diem payments to Prof. S.Sankar and other individuals, for reimbursement of certain costs, and for a fixed profit of 7.9% for CIE-TECH. Prof. Sankar did not advise anyone at Concordia, either before or after the fact, that he was seeking, had obtained or was carrying out this contract.

5.2.4 Other contracts

Between 1985 and 1994, Prof. S. Sankar entered into a large number of industrial contracts on behalf of Concave. These contracts, listed in Appendix C, were for sums ranging from \$500 to \$240,000;

their aggregate value was in the region of \$1 million. Many of the smaller contracts did not provide for payments to Prof. Sankar, but apparently were important for him, his concave colleagues and students, because they provided access to problems, data and settings for research and training. Some, at least, appear to have involved testing and the performance of other relatively routine services for industrial firms; these were justified on the basis of building up contacts and good will from which Concave would derive benefit in the long term. Several contracts provided for payments to Dr. Sankar for a considerable number of days of what we earlier referred to as "outside professional activities".

Many of the larger contracts were processed through ORS in accordance with University policy; some were not. Prof. Sankar does not appear to have been in the habit of securing advance clearance for these contracts, and on a number of occasions he failed to comply with established university accounting and reporting procedures.

5.3 Conflicts of interest

It is generally understood that persons with responsibility towards others must avoid real or potential conflicts between their own interests and those of the persons who rely upon them. This principle is enshrined in the Code Civil du Québec where it is expressed as part of the obligations owed by mandatories (art. 2138). It is affirmed as an obligation of faculty members in the collective agreement between Concordia and CUFA (art. 7.03).

5.3.1 The seat vibration contract

The Seat Vibration contract with Transport Canada was entered into directly by the University and, so far as we can see, involved no conflict of interest.

5.3.2 The liquid tanker stability contract

The Liquid Tanker Stability contract was problematic in several respects. First, Prof. S. Sankar made his own decision to compete through the medium of his company, possibly without full disclosure, and certainly without advance permission of the University. Since the University itself had been invited to bid on the RFP, his decision to compete as a private contractor, instead of as Concordia's principal researcher, can be viewed as a conflict of interest. Second, the decision to nominate his brother, Prof. T.S. Sankar, as principal researcher under the subcontract can be viewed as a conflict, a suggestion which becomes more credible in view of the fact that his work was not incorporated into the final report.

However, each of these decisions can be defended. The decision to take the Transport Canada contract through Seshadri Sankar Inc., we were told, was prompted by advice from Transport Canada and the rules of competition. Prof. T.S.Sankar did have relevant credentials to qualify him to perform the work specified in the subcontract; the omission of his work from the final report may have resulted from a shift in methodology during the course of the contract; and his participation was acquiesced in by the University, which signed off the relevant contractual documents.

While we do not find each of these explanations totally persuasive, we make no finding of conflict of interest in connection with Prof. S. Sankar's decision to take the Liquid Tanker Stability contract through his own company, rather than through the University, or to use his brother as principal researcher.

Having reached this conclusion largely because of the University's acquiescence, we do point out that in several important respects the University's interests were compromised: it received overhead only on the subcontract of \$73,000 and not on the overall contract

of \$288,064; the efforts of at least one research student - as we will show below - were used to generate a private profit for Prof. S. Sankar; and Prof. S. Sankar spent time and effort on this private contract which were well in excess of any limit which might be reasonable for someone who was the director of a major university research centre.

There is some ambiguity as well in regard to conflicts of interests arising out of the "other contracts" referred to above. All of those contracts which we have been able to document were disclosed to the University either before or after the fact, either in their entirety or in part. However, Prof. S. Sankar acted in a manner not far removed from a conflict of interest: as Director of Concave, he apparently felt he could choose what had to be reported to whom, how and when; he did not consult his dean before taking on contracts on behalf of Concave that would involving outside professional work by himself; he did not seek the University's consent prior to negotiating terms which affected the University's interests; and he did not follow proper financial reporting procedures. In other words, although in a position of trust vis--à-vis the University, first as a professor and latterly as Director of Concave, he created the risk and appearance of possible conflicts, even though it cannot be demonstrated that the University suffered any specific loss as a consequence.

5.3.3 The expert system contract

In respect of the Expert System contract, there can be little doubt that Prof. S. Sankar was in conflict of interest with regard to his obligations as Director of Concave. When Concave was established it was mandated to develop "computer software packages for vehicle system analysis, design and testing"; its research program included "development of user friendly software for vehicle design with Computer Graphics Enhancement". These were precisely the activities which were the subject of the Expert Systems contract.

As Director, Prof. Sankar had a particular obligation to advance Concave's financial, reputational and other interests. He ought therefore to have seized the opportunity to bring the Expert Systems contract to Concave. Instead, without prior consultation or subsequent disclosure, he chose to appropriate the benefits of the contract for himself and his company.

There is more at stake here than a failure to observe formal requirements of disclosure. From 1985, with the commencement of the Liquid Tanker Stability contract, Prof. S. Sankar had made strenuous efforts to identify Concave with all of the projects in which he was involved: presentations made in connection with the Liquid Tanker Stability contract were credited to Concave, as was the final report; likewise, presentations made in connection with the Expert Systems contract cited Concave as the place where developmental work had been done.

From one perspective, these efforts on behalf of Concave were successful. In 1986, Concave was selected as a participant in Québec's Actions Structurantes program, which provided funds for the building of research teams and the enhancement of faculty complements in specified areas of research. The Ontario government, and particularly the Québec government, had provided encouragement and support for various projects at Concave. And most important in the present context, it is clear that Transport Canada and other contracting parties made no distinction between Concave, its Director, and Prof. Seshadri Sankar acting as a consultant or through his companies. Indeed, in entering into the Expert System contract with CIE-TECH, Transport Canada seems to have believed it was reinforcing Concave as a centre of excellence.

Thus, Prof. Sankar's efforts undoubtedly enhanced the reputation of Concave and its parent department, faculty and University. But at the same time, Prof. Sankar gained a degree of credibility which was greater than that which he might have enjoyed as a sole

researcher, with no "research centre" at his disposal to enable him to undertake more ambitious work. We can only speculate as to whether various grants and contracts would have come to Prof. Sankar in the absence of Concave, and without the prestigious title of Director. But we do know that he valued both of these sufficiently to make generous - if not overstated - claims on behalf of Concave's research strengths. Obviously, he did so because in the end he thought he himself would benefit.

And he did benefit: by receiving per diem fees under a number of contracts; by his companies receiving a modest fixed profit under the Liquid Tanker Stability and Expert System contracts; and latterly by receiving royalties derived from the marketing of the software package developed by CIE-TECH under the Expert System contract. Considerable sums of money are involved.

5.4 Other contractual irregularities

During our review of contractual matters, we identified a number of additional irregularities which we consider significant.

5.4.1 Payments to Prof. T.S. Sankar

As principal researcher under the subcontract between Seshadri Sankar Inc. and the University, Prof. T.S. Sankar would normally be entitled to receive a stipend or payment for his services, at the rate fixed in the subcontract. Whether to avoid the appearance of a conflict of interest, given that the subcontract was with his brother's company, or for other reasons, Prof. T.S. Sankar initially directed Treasury that his stipend should be credited to his personal research account, rather than paid to him directly by way of personal remuneration. Apparently an informal understanding to this effect was reached between himself and the Associate Vice--Rector (Research).

Initially, payments were made in this fashion. However, after some time, Prof. T.S.Sankar cancelled the arrangement, and directed that money previously credited to his personal research account should be paid directly to him. Subsequently, he also arranged that payments intended for Prof. Bhat, another of the researchers on the subcontract, should be paid to him since Prof. Bhat had gone on leave and had not performed his share of the work under the subcontract. Given what we have learned of the services actually rendered by Prof. T.S. Sankar, we are in some doubt as to how much he actually was entitled to. However, the full amount remaining to be claimed under the sub-contract was invoiced to Seshadri Sankar Inc. as a charge for services, was approved, and was paid to Prof. T.S.Sankar personally.

We take no exception to Prof T.S. Sankar being paid for services rendered. But we are concerned that he initially agreed to a different arrangement and then countermanded it when the administrator with whom it was made was no longer in office. Our confidence in the propriety of what happened was not improved by the fact that we were given ambiguous, and sometimes inconsistent, accounts of these arrangements.

5.4.2 The computer purchase

As mentioned, the subcontract between Seshadri Sankar Inc. and Concordia provided that Concordia would render computing services with a budgeted value of \$37,000. Between December 1985 and April 1987, Prof. T.S.Sankar submitted to Treasury a series of invoices totalling \$30,500 for computing services; Treasury in turn invoiced Seshadri Sankar Inc., which paid these invoices and then received reimbursement from Transport Canada, under the principal contract.

However, as the subcontract was being wound up, in March 1990, Treasury discovered that a charge of \$30,500 had been made in January 1988 against the subcontract for the purchase of computer

equipment, an ineligible expense. Treasury further noted that there was no evidence that computer services had in fact been rendered by the concave computing facility, which was the ostensible supplier, to support the claim of \$30,500 for computing services which had already been paid by Seshadri Sankar Inc.

The following events then occurred: Prof. S. Sankar, as Director of Concave, generated invoices to Prof. T.S. Sankar for computing services rendered between 1985 and 1987; Prof. T.S.Sankar processed these invoices through Treasury to support the earlier claim; the subcontract account was now properly supported; \$30,500 was paid into a Concave account (also known as a "Seshadri Sankar discretionary" account) ; and the equipment charge was deleted from the subcontract account and transferred to that Concave "discretionary" account. In addition, a new invoice for \$6500 was generated by Concave to cover computer services from April 1987 to March 1990; it was submitted to and paid by Seshadri Sankar Inc., and it found its way back through the subcontract account to the Concave "discretionary" account.

While these transactions regularized the University's records, they were questionable from several points of view.

First, during the period from December 1985 to March 1990, the University would not have been able to demonstrate to an auditor that it had rendered the computer services which it had billed to Seshadri Sankar Inc., and for which Transport Canada ultimately paid. During the period from January 1988 to March 1990, the University was on record as charging for computer equipment, which under the subcontract it was not entitled to buy. During the period January 1988 to March 1990, the University would have been shown as having expended in connection with this contract a total of \$61,000 (\$30,500 for services + \$30,500 for equipment) which not only exceeded the amount of \$37,000 budgeted for computing services, but approached the whole value of the subcontract.

Second, Treasury intervened in March 1990 to catch the initial irregularities, thus enabling the University to avert their potentially embarrassing consequences, but what ensued brings credit neither to the University nor to Prof. S. Sankar. Responding to Treasury's intervention, Prof. S.Sankar, as Director of Concave, generated invoices ex post facto which were processed through his brother Prof. T.S.Sankar, in order that they could be paid by Prof. S.Sankar, as owner of Seshadri Sankar Inc., so that the funds could ultimately be channelled into a personal "discretionary" account and used by himself, as Director of Concave, to purchase equipment for his research centre. At a minimum, this demonstrates that there is always a risk of apparent impropriety inherent in a situation in which a university administrator is in business on his own behalf and engaged in dealings with the university.

If this cautionary tale ended here, it would be relatively innocuous. However, we are obliged to add one more chapter. Apparently, Prof. T.S.Sankar did not in fact require computing services in order to perform the subcontract, or at least services of the magnitude ultimately invoiced to Seshadri Sankar Inc. and charged back to Transport Canada. We say "apparently" because, as we have discovered, no procedure existed at the relevant time (or today) for recording - or reliably estimating - the hours or dollar value of computer use actually required.

While neither of the Profs. Sankar profited personally as a result, and while the contract and subcontract were performed to the satisfaction of the contracting parties, in effect Prof. S. Sankar found a clever way to contribute to the purchase of a computer for Concave, as a byproduct of his private contractual arrangement. Perhaps Prof. Sankar thinks his achievement merits praise; after all, in times of financial stringency, he made a significant addition to Concave's resources. But, regrettably, we cannot offer praise: University accounting rules have been bent if not broken;

a dubious paper trail has been created; Transport Canada has apparently paid for services not received; and the Director of Concave seems to have been dealing with the principal of Seshadri Sankar Inc. with no sense that this was in any way untoward.

5.4.3 Non-compliance with University contracting policies

When Prof. Bhat secured the Seat Vibrations contract in 1984, the University was directly involved and its interests were explicitly protected through various approvals procedures. Perhaps in 1985 those procedures were not carefully defined; perhaps Prof. S. Sankar did not know about them when he sought his first contract, the Liquid Tanker Stability contract. However, over the years, as he became involved in a number of significant contracts in his capacity as Director of Concave, Prof. Sankar must surely have learned of the University's requirements concerning contract approvals, overheads, etc. Indeed, on many occasions, he complied with such requirements, at least in part.

By 1990, when the Expert Systems contract was negotiated, Prof. Sankar obviously could not claim confusion or ignorance. Very clear procedures were in place, as the result of the policy established by Dr. Sheinin in 1989, of which Dr. Sankar, as Director of a research centre, must surely have had knowledge. This policy is now contained in the Contract Research Handbook:

A contract to perform research on University premises (in whole or in part) using University facilities and/or services and/or University personnel is an agreement between the University and an outside agency to deliver a "product" in accordance with contract terms. The contract revenue is University revenue in return for University services rendered to the outside party to the contract.

The Expert System contract involved University personnel: Prof. S. Sankar himself. If for some reason he believed that the policy was

not applicable in the particular circumstances of the Expert System contract, at the very least, because he was Director of Concave, he ought to have made disclosure and received clearance to proceed as he did.

Prof. Sankar was not only Director of Concave. He was a faculty member, and as such was bound by the collective agreement. Under the agreement, a faculty member who has produced a computer program and who intends to seek copyright protection for it must inform the University and declare whether the program involved the use of University personnel or facilities. We do not know whether copyright was claimed by Prof. S. Sankar in respect of any computer programs developed by Concave or under the contracts mentioned above or otherwise. However, the fact that his company is licensing software developed under the Expert System contract suggests that this might be the case. He has not provided any notice to the University, and accordingly, under the collective agreement, any rights which the University might have in connection with such software are preserved.

5.4.4 Excessive unregulated consulting and contracting

The collective agreement between Concordia and CUFA provides:

[Faculty members] may engage in paid or unpaid outside professional activities under the following conditions:

a) such activities shall not interfere with the performance of [their] assigned duties and responsibilities;

b) a [faculty member] shall not devote more than one (1) day per week to such activities in any academic year

In Appendix C, we provide the basis of the following observations:

1. During the period August 1984 to March 1994 (approx. 494 weeks) Prof. S. Sankar engaged in outside professional work for at least 1104 days, for an estimated 959 of which he was paid.

2. During the period August 1984 to March 1990 (approx. 284 weeks) Prof. S. Sankar engaged in outside professional work for at least 700 days, for an estimated 650 of which he was paid.
3. During individual "academic years" - the period of measurement set out in the agreement - it appears that Prof. S. Sankar worked a number of days of paid professional outside activities which was a multiple of the number of available weeks.

We hesitate to conclude that Prof. Sankar was in violation of the day-per-week rule in the collective agreement, not least because we have not been mandated to decide a number of difficult questions which arise: whether all work on contracts falls within the description of "outside professional work"; whether work on weekends and holidays should be subtracted from the total of days worked; whether unpaid outside work or outside work for which payment was taken in the form of contributions to a research account are to be subtracted from the total. However, we do not hesitate to say that this level of outside contractual activity is very hard to reconcile with "performance of ... assigned duties and responsibilities" by the Director of an important research unit who was also the holder of a large number of external research grants, over and above the contracts listed. In this regard, we note that as Director, Prof. Sankar received a small stipend and release time, in exchange for which he was supposed to attend to the affairs of Concave.

In addition, the agreement provides:

In the case of paid outside professional activities, the [faculty member] shall report annually to the Dean/Director on the nature and scope of the activities and shall obtain the prior written approval from the Dean/Director...

Prof. S. Sankar spent very large amounts of time - 432 days in one

period of 4.5 years and 240 days in another period of 3 years - on paid outside professional activities which were neither "reported annually" nor the subject of "prior written approval from the Dean/Director". This may well have been a violation of the collective agreement.

At the same time, we must acknowledge that during the relevant period, very little attempt was made in the Faculty of Engineering and Computer Science (and perhaps elsewhere) to enforce the agreement. The Dean's office does not appear to have asked faculty members to report what they were doing; and faculty members do not seem to have felt obliged to seek advance clearance or to provide annual reports, notwithstanding the agreement. To describe this arrangement as an "honour system" may be gilding the lily somewhat, but it will have to be taken into account in determining whether Prof. S. Sankar can or should be disciplined for this possible infraction.

Finally, we wish to record that we may well have understated the amount of time spent by Prof. S. Sankar on either paid or unpaid outside professional activity. We had only partial information on the amount of time he spent on his private companies; we have no information concerning occasional paid consulting work (as opposed to contract research) he may have done on his own; and we have had to work with University records which may be incomplete. Regrettably, Prof. S. Sankar's evasiveness on this and a number of related issues does not predispose us to give him the benefit of the doubt.

6. ALLEGATIONS OF SCHOLARLY MISCONDUCT

6.1 The allegations

In his letters to the Board of Governors and NSERC, Dr. Fabrikant made allegations of scholarly misconduct against Profs. T.S.

Sankar, M.N.S Swamy and S. Sankar. These included allegations that they had improperly acquired authorship credit for scientific articles, books or reports to which they had made no substantive contribution. Dr. Fabrikant claimed that this had occurred over a number of years and that, as a result, their lengthy lists of scholarly publications and presentations were misleading. He further claimed that a system of patronage, which sometimes involved extortion, was used by these professors to acquire authorship credit. The works in question were all jointly authored; some listed Dr. Fabrikant as co-author; the remainder listed other persons.

Dr. Fabrikant provided documents in support of his allegations, including handwritten drafts of scientific articles and what purported to be partial transcripts of clandestinely recorded interviews with the two of the three professors and several of their former students and associates. Dr. Fabrikant's allegations received wide publicity. He distributed them through an extensive electronic mail network; they were picked up by the press, especially following the shootings; and a Maclean's report of the allegations against Profs. Swamy and T.S. Sankar featured interviews with other scholars which seemed to give credence to the allegations.

Obviously, this has been a matter of great concern to those accused, as well as to their colleagues and their university. Accordingly, we made a very careful investigation of each allegation. We interviewed each of the three persons named by Dr. Fabrikant twice; we received their written responses together with supporting documents; and we interviewed members of the Faculty of Engineering and Computer Science and other persons, some of whom volunteered to come forward only with an assurance of confidentiality.

6.2 The background

In order to comprehend Dr. Fabrikant's allegations it is important to know something about him and those whom he accused, about the faculty culture in which they all worked, and about the peculiar customs which prevailed within that culture.

Dr. Fabrikant was employed at Concordia University from 1979 to 1992, initially as a research scholar but laterally with some conventional teaching responsibilities as well. He had a background in theoretical mechanics, including certain mathematical techniques used in that field, and had published a substantial number of articles in international journals of good quality over many years, both before and after coming to Concordia. For most of these articles he is listed as sole author.

Profs. T.S. Sankar, S. Sankar and Swamy are all senior professors of engineering. All three hold large NSERC grants, have won academic and other distinctions and awards, and have published extensively in a variety of reputable scientific publications, generally as co-authors. We note that multiple authorship is common practice in many fields of engineering and, by itself, has no negative connotations.

During Dr. Fabrikant's twelve years of employment at Concordia, each of the three senior professors whom he accused had supervised his work at some time or other. In the case of Prof. Swamy, who was Dean during the entire period, the relationship was mainly indirect. However, Dr. Fabrikant worked on contract in research positions under the direct supervision initially of Prof. T.S. Sankar and then of Prof. S. Sankar; their research grants and contracts provided funds for Dr. Fabrikant's salary, augmented somewhat by Faculty funds provided by Dean Swamy. Unlike post-doctoral fellows or research associates, who are commonly understood to be involved in advanced scholarly apprenticeships,

Dr. Fabrikant was accorded a high degree of autonomy, from the beginning. In recognition of his anomalous situation, in due course he was designated as a "Research Professor", treated as a trained and experienced researcher, and permitted to work on problems particularly suited to techniques with which he was already familiar, so long as they had some relevance to the research programs of his supervisors.

These employment arrangements gave rise to serious controversy, which it is not within our mandate to explore. Suffice it to say that Dr. Fabrikant describes himself as having been treated as a "scientific prostitute", although he seems to have been willing enough to be employed in that capacity and then to use embarrassing information gained during the dozen years of his employment to attempt to blackmail his former employers and the University into giving him a tenured professorship.

Whatever we might think of Dr. Fabrikant's conduct and character, however, we have already indicated in section 2.4 of our report that he was not the only one to asperse leading figures within the Faculty of Engineering or the scholarly ethos of the Faculty as a whole. We ourselves have drawn attention to what we have called a "production-driven research culture", a political economy in which authorship functions as a kind of currency. Thus, Dr. Fabrikant's allegations sit in a context which gives them more credibility than they might otherwise have. We next consider whether this credibility is enough to support his conclusions.

6.3 Dr. Fabrikant's scholarly activities

We heard testimony to the effect that in regard to graduate students and academic subordinates, Dr. Fabrikant was scrupulous and fair. He provided much assistance and did not demand co-authorship in return. Apparently, amongst Engineering graduate students, he was regarded as an exception in this regard.

However, Dr. Fabrikant was neither scrupulous nor fair in his dealings with his colleagues and patrons, particularly in matters of authorship. On the contrary, his personal standard of integrity, as recorded in scientific publications, was highly variable.

In 1971, Dr. Fabrikant published an article in a Russian language journal. The article presented an explicit solution to a certain type of linear, singular integral equation in two independent variables, which occurs in various continuous-field theories of physics and engineering. In this article, Dr. Fabrikant improved upon a method devised a decade earlier by another Russian-language author in connection with a geophysical problem. He gave due credit to the earlier author through an explicit reference. When Dr. Fabrikant used his own 1971 work in later Russian-language work, he made reference to it and used only the final result. This was appropriate and in accord with standard practice.

When Dr. Fabrikant subsequently came to Canada and obtained employment in the Department of Mechanical Engineering, his practices changed. In the context of the Department's laissez-faire academic culture described above, he seems to have embraced free-enterprise values rather enthusiastically, and to have become a resourceful trader in the local currency, co-authorship.

An early success was the conversion of his own Russian-language article of 1971 into the main substance of four co-authored, English-language articles. The "new" papers were warmly received by his co-authors at Concordia and passed the scrutiny of journal referees and editors. The four articles are quite extraordinarily similar to each other, and none of these articles refers to any of the others or to their common progenitor, the 1971 Russian article. They appear in journals published in four countries - the USA, Germany, France and Great Britain. A fifth co-authored article

which is a substantive but straightforward generalization of the earlier work does refer to one of the four articles upon which it is based - but only one; curiously, although the fifth article appears in a mathematics journal, the reference is to an article in an engineering journal.

In fairness to all concerned, we note that not all of the co-authored papers written during this period contain extensive repetitions of earlier works published in the Soviet Union. Indeed, some deal with quite different topics. This may explain why the crucial duplications were not detected.

In addition to his many journal articles, Dr. Fabrikant published a monograph in 1989. Much of its content is a reformulation of material from his journal articles over the preceding two decades, as is common practice in regard to monographs. However, the author claims to present "a new and elementary method" for solving "mixed boundary value problems, and their applications in engineering." The centre-piece of this "new" method is his 1971 result.

The book's bibliography is revealing. It does list the 1971 paper, the first such reference since the author came to Canada, but lists none of the co-authored papers from his Concordia period, even though their subject matter is not only germane to the book, but repeated in it. It also lists papers authored solely by Dr. Fabrikant during the periods 1970-1976 and 1985-1988, but nothing either authored or co-authored by him during the intervening years. This omission has the effect, presumably intentional, of concealing the duplications discussed above. It also relieves Dr. Fabrikant of the need to share the credit for the "new" method with his co-authors at Concordia.

From 1980 to 1985, Dr. Fabrikant worked principally with Prof. T.S. Sankar and almost all articles produced by him during this period were co-authored. From 1985-1990, Dr. Fabrikant and two other

"assistant research professors" in Mechanical Engineering, Dr. S. Rakheja and Dr. A.K.W. Ahmed, worked under the supervision of Prof. S. Sankar, with the support of Québec's Actions Structurantes program. These four individuals became the core scientific staff of Concave, with a mandate to investigate "Computer-aided vehicle systems design for transport industries in Québec".

Under the terms of the Actions Structurantes program, the three research positions could be converted to tenure-track professorial positions at the end of five years if certain performance criteria were met. One criterion was collaboration with private industry; another was the number of publications, with co-authored papers believed to count only half as much as single-authored papers (as the criteria were applied to each individual).

The Concave program and the individual participants were assessed twice during this period. Dr. Fabrikant produced single-authored papers almost exclusively, at a rate of production greater than that of the earlier period, 1980-1985. Indeed, his production was a large fraction of the total number of journal articles published by the Concave group. However, these articles were largely extensions of the research he had begun in the Soviet Union and few, if any, were directly relevant to the official mandate of the program under which he was being funded. Nor did Dr. Fabrikant contribute much to the major task of setting up the laboratory equipment at the new Concave facilities on rue St. Jacques or to Concave's many projects with local industries.

When the Actions Structurantes program was first assessed in 1988, individual and collective performances were found generally satisfactory or adequate. However, the total number of publications was found to have exceeded the agreed objectives for the Concordia program. Thus, although Dr. Fabrikant did not credit any of his colleagues, including Prof. S. Sankar, as co-author, he did "pay his way" in a related sense: his publications contributed

significantly to the collective output of the whole group, an important criterion for the sponsor, the Québec MESS.

6.4 Allegations against Prof. S. Sankar

6.4.1 The Liquid Tanker Stability project

Dr. Fabrikant alleged that the final report on the Liquid Tanker Stability contract was nothing more than a PhD thesis - specifically that of Dr. Ranganathan, who was being supervised by Drs. S. Sankar and Rakheja - co-authors of the final report submitted by Seshadri Sankar Inc.

We reviewed the final report, and can confirm that it indeed very closely resembles Dr. Ranganathan's thesis. Perhaps this is not surprising as it appears that Dr. Ranganathan remained at Concave as a post-doctoral student for some months after he received his doctorate, and that he prepared the report, integrating his own thesis research as a primary, though not exclusive, source. Dr. Ranganathan received payment neither from Seshadri Sankar Inc. nor from Transport Canada, nor was he paid as a member of the team which performed the subcontract on behalf of Concordia. On the contrary he seems to have been paid as a member of the Concave staff, out of university funds.

The conclusion we have reached is that not only did Dr. S. Sankar and Dr. Rakheja submit Dr. Ranganathan's work without attribution or credit, but they used someone paid by Concordia to perform work on a private contract. That Dr. Ranganathan, for his own reasons, willingly acquiesced in this arrangement does not diminish the impropriety.

6.4.2 Extortion of co-authorship

Dr. Fabrikant also alleged that Prof. S. Sankar tried to extort co-authorship from him, in the course of two discussions in 1988. Specifically, he alleged that Prof. Sankar threatened to terminate Dr. Fabrikant's employment under the Actions Structurantes program in 1989, a year before the normal period, unless he was listed as a co-author on some of Dr. Fabrikant's papers. The evidence proffered in support of this allegation consists of the partial transcript of Dr. Fabrikant's taped conversation with Prof. Sankar in March 1988, and a brief recollected summary of another conversation between them in December 1988. Neither the partial transcript nor the summary supports the allegation.

Prof. Sankar did express concern that Dr. Fabrikant's scientific production, though voluminous, was not relevant to Concave's mandate, and proposed to replace him as a member of the team. However, co-authorship is neither mentioned nor implied in the transcript, nor does it surface in the recollected conversation. Nor did Dr. Fabrikant, at any point, list Prof. S. Sankar as a co-author on any of his papers. Nor, for that matter, did he change the direction of his research. And far from being dismissed, he was in the end continued for the full term of his appointment under the Actions Structurantes program, and then given a tenure-track position in 1990, on the basis of a recommendation from the departmental personnel committee chaired by Prof. S. Sankar himself.

In terms of the local "political economy", to which we earlier referred, it seems that the more eclectic pattern of co-authorship under which Dr. Fabrikant published during the Actions Structurantes program of 1985-90 was accepted at par with the relatively uniform pattern of co-authorship which characterized his publications during the period 1980-85.

We conclude that Dr. Fabrikant's allegations regarding extortion of co-authorship by Prof. S. Sankar are unfounded.

6.5 Allegations against Prof. T.S. Sankar

In his correspondence with the Board of Governors and NSERC, Dr. Fabrikant alleged that Prof.T.S. Sankar had made no significant scientific contribution to either:

- (a) any of the 16 or so scientific articles for which the two of them are listed as co-authors, including those for which Prof. T.S. Sankar is listed as the senior (or principal) author; or
- (b) any of his other scientific articles, throughout his career.

6.5.1 "Other" publications

Dr. Fabrikant had no direct knowledge of the items in category (b) and indeed offered no evidence to substantiate these allegations. Accordingly, we reject them.

6.5.2 Co-authorship with Dr. Fabrikant

As to category (a), we have confined our attention to articles in refereed journals, and have reviewed in detail some, but not all, of the disputed articles. The sample chosen was sufficient to establish important facts which adequately illuminate the allegations. A detailed account of our review is contained in section 6.3 of our report, and in Appendix D. What follows are our conclusions:

- (1) The co-authored papers which we examined deal with problems related, albeit tenuously, to the ongoing research program of Prof. T.S.Sankar.

- (2) Prof. Sankar's relationship to the work must be evaluated in light of the fact that the joint papers were closely related in both topics and techniques to Dr. Fabrikant's prior publications in the Soviet Union.
- (3) While Prof. Sankar and Dr. Fabrikant did discuss details of all of the articles, Prof. Sankar could not have made a substantive scientific contribution in four (arguably five) instances where the joint work had been previously published by Dr. Fabrikant and was now being illicitly re-cycled as new work. We must therefore conclude that at least some of the discussions between Dr. Fabrikant and Prof. Sankar were a "sting" or entrapment perpetrated by the former.
- (4) As for the remaining co-authored articles, it may have been that Prof. Sankar made some general contribution. However, we are unable to conclude, from the evidence before us, that his contribution to their scientific content was substantive.
- (5) It was unethical for Dr. Fabrikant not to advise Prof. Sankar, or the journal editors, of the existence of his earlier work which was duplicated in some of the co-authored articles.
- (6) It was unethical of both Prof. Sankar and Dr. Fabrikant to have submitted four articles, virtually identical in substantive content, to different journals, with no reference to the existence of the others in any of them.

To sum up, in Engineering's political economy, with authorship as its currency, both Dr. Fabrikant, the accuser, and Prof. T.S.Sankar, the accused, benefitted improperly from those publications which virtually reproduced Dr. Fabrikant's earlier work. Dr. Fabrikant gained extended employment opportunities. Prof. Sankar increased his average annual rate of publications noticeably in the five-year period 1982-86, as compared to any previous five-year period; his collaboration with Dr. Fabrikant

materially influenced this rate. Further, as a result of the papers "co-authored" with Dr. Fabrikant, Prof. Sankar acquired a reputation as an expert in a field where he had, in fact, made no substantive contribution.

6.6 Allegations against Prof. M.N.S.Swamy

Dr. Fabrikant's allegations concerning Prof. Swamy's scientific misconduct can be examined in relation to three groups of publications:

- (a) "the majority" of Prof. Swamy's several hundred publications,
- (b) a book co-authored by Prof. Swamy and Dr. K. Thulasiraman, and
- (c) two articles in which Dr. Fabrikant, Prof. Swamy and others are listed as co-authors.

6.6.1 "Other" publications

Dr. Fabrikant had no direct knowledge of "the majority" of Prof. Swamy's publications. While it is understandable that disparaging rumours would circulate in light of the considerable conflict engendered during Prof. Swamy's deanship, there is no evidence to support the allegations that Prof. Swamy was not the author of most of the works on which his name appears. At most, it can be said that many individuals inside and outside the Faculty of Engineering and Computer Science are sceptical as to whether a dean, with many administrative responsibilities and a strong record of community activities, could contribute substantively to so many publications.

Prof. Swamy has said that he was able to be so productive because he had no undergraduate teaching duties, because he delegated much of the routine work of the Dean's office to Associate Deans, and because he conducted much of his collaborative research in the

evenings and on weekends. Another witness confirmed that this was indeed Prof. Swamy's work pattern. We are in no position to confirm or deny Prof. Swamy's explanation, and have no evidence on which to reach an adverse conclusion in relation to the bulk of his scholarly work.

6.6.1 Co-authorship with Dr. Thulasiraman

As to the co-authorship with Dr. Thulasiraman, Dr. Fabrikant alleges that in return for being listed as a co-author, indeed as first author, Prof. Swamy rewarded Dr. Thulasiraman with a faculty position. We have carefully investigated this allegation and find it to be false. Active scientific collaboration between the two authors, both in India and in Canada, extends back over two decades. Their initial training was different, but complementary, and their interests during the 1970s particularly coincided in the theory of networks and graphs, a branch of mathematics which has many applications to engineering, including electrical and computer engineering. Prior to collaborating on the book in question, Prof. Swamy and Dr. Thulasiraman had jointly published several articles, beginning in 1971. We reviewed with them the history of their co-authorship of the book, and their accounts tally in all important respects.

During the late 1970s and early 1980s, Dr. Thulasiraman had received offers from several universities in North America. In 1982, he was offered an appointment in the Concordia Department of Mechanical Engineering by Prof. (then Dean) Swamy, to work in the industrial engineering program where his expertise, which by then included combinatorial optimization, was relevant. Dr. Thulasiraman accepted the offer from Concordia on condition that he would not be expected to teach courses in areas such as mechanical design, traditional in mechanical engineering, and that he would be able to supervise graduate students in electrical or computer engineering. We understand that engineering departments elsewhere

have sometimes hired professors whose background is highly mathematical, so this arrangement does not excite suspicion. Two years later, Dr. Thulasiraman transferred to the Department of Electrical Engineering, where he was subsequently granted tenure and is presently the departmental Chair.

We conclude that there was nothing improper either in Prof. Swamy's claim of co-authorship of the book, or in his subsequent appointment of Dr. Thulasiraman to a faculty position.

6.6.3 Co-authorship with Dr. Fabrikant

We now must consider the two articles written jointly by Prof. Swamy, Dr. Fabrikant and others. Dr. Fabrikant was introduced to Prof. Swamy by Dr. L.M. Roytman, then a post-doctoral fellow working with Prof. Swamy. The three of them, as well as Prof. T.S. Sankar, participated in a number of discussions concerning mathematical problems, out of which the two articles in question arose.

However, as we indicate in Appendix D, these articles were derived from Dr. Fabrikant's 1971 paper which has been described above in connection with the allegations against Prof. T.S. Sankar. Thus, while we accept that Prof. Swamy offered substantive comments on these two papers, in fact he could not be deemed to-be an "author", because the papers themselves amounted to no more than a re-publication of already published work. Although a less passive collaborator than Prof. T.S. Sankar, it appears that Prof. Swamy was also a victim of Dr. Fabrikant's "sting".

To recapitulate our findings concerning allegations against Dr. Swamy:

- (a) There is no basis on which to impugn the claimed authorship of most of Prof. Swamy's work.

- (b) We are convinced that in fact he and Dr. Thulasiraman were the joint authors of the book which bears their names, and that Dr. Thulasiraman did not receive his appointment at Concordia as a result of a bargain concerning authorship or other illicit consideration.
- (c) Prof. Swamy was not in fact the co-author of the two articles which he published with Dr. Fabrikant and others.

7. CONCLUSIONS

To summarize, we have confirmed the validity of a number of Dr. Fabrikant's more specific allegations. However, it is important to reiterate that these allegations were not made pro bono publico. They were the desperate recourse and the ultimate revenge of a very intelligent man who thought he had a career within his grasp, only to see it snatched away. In his own eyes, he had what his tormentors did not: intelligence; and they had what he did not: power and reputation. If he could not gain what he considered his just desserts - a tenured professorship - he seems to have been determined to deprive them of what they valued most - their research careers and the honours and opportunities those careers had earned them. We take no pleasure in acknowledging that our report lends support to so malevolent a purpose and credibility to so unsavoury an individual.

Profs. S. Sankar, T.S.Sankar and Swamy are all highly regarded and prolific scholars, stalwarts of Concordia's research enterprise, and the recipients of many awards and citations for research as well as for teaching and community service. They are all judged annually by their peers and found deserving of large NSERC and FCAR grants - compelling evidence of their scholarly attainments. They all have lengthy service as administrators at Concordia over protracted periods, occupying positions of trust and respect. For these reasons, it is particularly disappointing that they should

have indulged themselves in the conduct in which they have variously engaged: conflicts of interest, other contractual irregularities, excessive outside professional work, and misappropriation of authorial credit.

We have tried to show how these individuals were deeply involved in what we referred to as a "production system of research", a "political economy" in which publications functioned as the unit of currency. This system, this political economy, had its roots in general social attitudes and values, in government contracting and granting policies, and in academic reward systems. But those roots found particularly rich nutrients in the Faculty of Engineering and Computer Science at Concordia, an aggressive faculty with weak collegial structures, in a young, underfinanced university with inadequate formal and informal control systems.

We have also indicated that Concordia did not, and still does not, have in place formal structures which are clearly adequate to prevent, monitor, regulate or sanction such conduct. In the paucity of its formal arrangements, it lags a little behind other Canadian universities; fortunately, it is now taking steps to remedy this deficiency. These formal arrangements must include a new code of behaviour which enjoys community support, and the sanctions which will make such a code effective. They must also include the updating of inadequate administrative systems and the resuscitation of existing accountability procedures which have become comatose.

But a new code, new sanctions, new systems and new procedures will change nothing unless there is support for change within the informal academic culture of the University and its faculties and departments. This is not simply because various collegial and union groups have legitimate and legal claims to be involved, but because new arrangements which do not enjoy such support are not going to be effective in shaping conduct.

Mobilization of support poses a particular challenge to a university with many different local cultures, and a diffuse responsibility structure. We have no wish to single out the Faculty of Engineering and Computer Science, which happens to have been the site of the controversy which we were asked to examine. However, the unhappy experience of that Faculty warns us that even highly productive faculty members can operate in unacceptable ways, which engender internal conflict and attract external censure.

Until local cultures begin to change, and the values predominating in them come to reflect and reinforce those embedded in university-wide codes, practices and procedures, Concordia will continue to confront difficulties of the sort we have had to explore. We are pleased to conclude this report with the hope and belief that Concordia is indeed committed, by both word and deed, to achieving high standards of scientific and academic honesty and integrity in the Faculty of Engineering and Computer Science, and across the University.

APPENDIX A

EXCERPT FROM THE MINUTES OF THE OPEN SESSION OF THE MEETING OF THE BOARD OF GOVERNORS OF CONCORDIA UNIVERSITY

Upon resolution duly moved and seconded (McIlwaine, Economides), it was CARRIED with one abstention (Habib):

WHEREAS, on 17 February 1993, the Board approved the establishment of an independent Committee of Inquiry to address issues regarding academic and scientific integrity in research and scholarly activity, and

WHEREAS, on the advice of Concordia's legal counsel, the Board agreed to postpone the work of this Committee until after the trial of Valery Fabrikant was completed, in order to eliminate any possibility that the inquiry might affect civil or criminal proceedings; and such proceedings concluded on 11 August 1993;

BE IT RESOLVED THAT, on the recommendation of the Executive Committee, the Board of Governors appoint Dr. Harry Arthurs, Dr. Roger A. Blais, and Dr. Jon H. Thompson, to constitute an independent Committee of Inquiry to address issues with respect to scientific and academic integrity at Concordia University;

AND THAT, on the recommendation of the Executive Committee, paragraphs 1(c) and 1(f), and paragraph 3, of the terms of reference which were approved in February 1993, be revised so as to read as follows:

1. a) In the first instance, the Committee shall determine what rules, procedures and practices are currently in force or in use at Concordia University with respect to scientific and academic integrity, particularly as regards research in the field of engineering.
- b) The Committee shall then determine whether these rules, procedures and practices conform to those generally in force or in use at other Canadian universities.
- c) Within the context of this policy review, the Committee shall examine those specific issues of scientific and academic integrity that were brought to the attention of the Board of Governors and the Natural Science and Engineering Research Council (NSERC) in 1992.

- d) The Committee shall commence to meet as soon as possible after its members have been appointed and shall complete its work within six months of its first meeting.
 - e) Subject to the rules of natural justice and such rules as the Board may determine, the Committee may establish its own rules of procedure. Any rules established by the Board or the Committee shall be communicated to all those making submissions or appearing before the Committee.
 - f) In its conclusions, the Committee shall formulate any general or specific recommendations of a policy nature which it deems appropriate and useful, within the terms of reference of the inquiry. It shall also report any findings resulting from the examination referred to in paragraph c) and make recommendations with respect to such findings.
2. The Committee shall be composed of three members from outside the Concordia University community. Membership shall be determined by the Board as soon as feasible, on the recommendation of the Executive Committee.
 3. Support for the Committee shall be provided through the Office of the Secretary General.

22 September 1993

APPENDIX B

PROCEDURAL PROTOCOL - REVIEW OF ALLEGATIONS

The Independent Committee has been mandated by the Board of Governors of Concordia University to investigate the allegations made by Dr. V. Fabrikant to the Natural Sciences and Engineering Research Council of Canada as well as to the Board of Governors. These allegations concern violations of academic and scientific integrity at Concordia and are available from the Committee's administrative offices.

The Independent Committee intends to proceed in the following manner:

1. The Committee will seek to review fully and fairly the allegations it has been appointed to investigate, to derive from its investigations information concerning possible improvements in the University's policies and procedures, and to respect the rights of all persons concerned with the inquiry.
2. The Committee is not a Board of Arbitration. It cannot make a determination of anyone's rights. It has no statutory powers and no authority to compel individuals to participate in the inquiry and accordingly relies upon the cooperation of everyone concerned to ensure that it is fully informed with regard to these allegations. Anyone who chooses to appear before the committee may be accompanied by an advisor from within the University community.
3. The University Administration has assured us of its full cooperation and has accepted that all members of the University are free to make submissions or offer evidence with respect to the allegations, or to decline to do so, without fear of reprisal. While the limit of its powers is not entirely clear, the Committee will make every effort to respect requests that information provided to it be treated as confidential.
4. The Committee will begin by reviewing the documentary record, and will seek further information from individuals whose input it feels is necessary.
5. In order to ensure fairness, persons against whom statements are made will be afforded an opportunity to respond to them. In the case of statements made in confidence, the person against whom they are made will be provided with the substance of such statements, without identification of their source.

6. Anyone who wishes to make submissions concerning the allegations should notify the Committee of their intention to do so by no later than November 12, 1993. Individuals who wish to make their submissions on a confidential basis should so indicate. Submissions should be made by no later than December 3 1993.
7. At any stage in its inquiry, the Committee in its discretion may request further information or clarification from individuals who have made submissions, from those mentioned in submissions, or from other persons, by way of either a written statement or a meeting with the Committee.
8. At some stage in its inquiry, the Committee may summarize its findings to date, and invite comment thereon from parties affected.

Submissions or requests for information should be addressed to The Independent Committee of Inquiry on Academic and Scientific Integrity c/o Room BC-123, Bishop Court, 1463 Bishop St., Montreal H3G 1M8. Telephone: 848-4813. Written communications marked "Confidential" will be forwarded directly, unopened, to the members of the Committee. Upon request, arrangements can be made for confidential meetings with the Committee.

APPENDIX C

PROF. S. SANKAR - SYNOPSIS OF CONTRACTUAL ACTIVITY

CONTRACT	PARTIES	START/ FINISH	DAYS WORKED/ PAID
Seat Vibration	Concordia/ Transport Canada	1984 - 1986	40/40
Liquid Tanker Stability	Seshadri Sankar Inc/ Transport Canada	1985 - 1990	432/432
Railway Vehicle Dampers	Concordia/ Via Rail	1987	10/0
Expert System for Liquid Tanker	Concordia/Remtec	1987	7/0
CAD for Snowmobiles	Concordia/Bombardier	1987 - 1989	132/132
Initial Validation of MEDYNA Software	Concordia/NRC	1988 - 1989	4/0
Ride Dynamics Model	Concordia/Defence Research Establish't	1985.- 1987	?
Analytical Model for M 113 APC	Concordia/Defence Research Establish't	1988 - 1991	63.25/ 63.25
Vehicle Suspension	Concordia/Bombardier	1989	5/0
Seat Design	Concordia/Les Autobus MCI	1989 - 1990	4/0
Seismic Qualification	Concordia/ Northern Telecom	1989 - 1991	2/0
Ride Quality Evaluation	Concordia/Defence Research Establish't	1989 - 1992	52/52
Vibration of Utility Vehicles	Concordia/ Hydro Quebec	1990	3/0
Vibration of Utility Vehicles	Concordia/ Hydro Quebec	1990	2/0
Vibration of Packaged Rectifier	Concordia/ Northern Telecom	1990	2/0
Armoured Truck Ride	Concordia/ Secur	1990	2/0

Vibration of Rear Suspension	Concordia/ Prevost Car	1990 - 1992	2/0
Expert System	CIE-TECH/ Transport Canada	1990 - 1994	240/240
Logging Trucks	Concordia/FERIC	1991	2/0
Euro-Chunnel Wagons	Concordia/Bombardier	1991 - 1992	20/0
Fibre-reinforced Composite Panels	Concordia/ FRE Composites Inc.	1991 - 1992	2/0
Hydro Utility Vehicles	Concordia/ Hydro Quebec	1991 - 1993	4/0
Ride Quality Evaluation M113 APC	Concordia/Defence Research Establish't	1991 - 1993	?
Seismic Evaluation Electronic Bread Board Chassis	Concordia/ Northern Telecom	1992 - 1993	10/0
Light Weight Trailer Design	Concordia/FERIC	1992 - 1994	50/0
Ride Evaluation Utility Vehicles	Concordia/ Hydro Quebec	1993	3/0
Tanker Design, Field Testing	Concordia/REMTEC	1993 - 1994	20/0

Notes

1. The total of days worked/paid is contentious.
2. Paid days for which payment was placed in a research account rather than taken as an honorarium may have been treated as unpaid days in some cases.
3. Paid days which were worked on weekends and holidays were included in the totals where known.
4. Information is not available in the case of several large contracts, as indicated.
5. Occasional paid consulting work, if any, is not included.
6. Days spent on private corporate matters, if any, are not included.

APPENDIX D

Authorship and Duplication

The report contains findings in regard to several papers which are, in substance, extensive duplications both of an earlier published work of V.I. Fabrikant which is unreferenced, and of each other, without mutual references. The purpose of this appendix is to provide the references in chronological order and summarize the technical details.

Within a relatively short period after being engaged by T.S. Sankar as a research assistant, Fabrikant produced a number of papers, co-authored with Sankar and, in some cases, others at Concordia. These include [5], [6], [7] and [8]. During the course of our inquiry, we reviewed these papers, as well as other papers authored or co-authored by Fabrikant. We were struck by the extraordinary similarity among the four, the more so in that none of the four contains a reference to any of the others. The editors of the different journals to which the articles were submitted were thus deprived of a fair opportunity to decide how much, if any, of this duplication they were prepared to publish. Further, although the methods used are not esoteric and each step could in principle be followed by an engineer with T.S. Sankar's training, they are nevertheless rather more sophisticated mathematically than anything in his previous work.

None of the four articles contains any reference to any previous work of Fabrikant or any other co-author. However, three of four the papers refer to work of one or more Soviet authors from two decades earlier, including N.A. Rostovtsev and V.I. Mossakovskii.

These observations led us to suspect that the four papers might well be very similar to something else. Tracing some of V.I. Fabrikant's work back through the 1970s, we found the article [4] in which the substantive content of each of the four co-authored articles already appears. By August 1992, when the fourth of these articles was submitted, if not earlier, T.S. Sankar could have made the same discovery, by the same method available to us. The progenitor article is in a journal which, although not re-published in translated form in the west - as is the case with a number of other Russian-language journals, such as the journal in which [1], [2] and [3] appear - is held in major Canadian scientific libraries. We obtained a copy from the UBC library.

The historical sequence runs as follows. Several Soviet authors in the 1950s considered a mathematical model which describes a type of static equilibrium situation arising in the study of elastic media. The model is a linear, singular, integral equation with two independent variables. Its kernel is a power of the inverse distance between source and field points, a minor extension of that which arises in classical potential theory, which accounts for a

simple type of non-homogeneity in the medium. Interpretations of the model can be given in other physical contexts.

V.I. Mossakovskii described an explicit solution procedure for this integral equation, in the case of a circular domain, in the paper [1]. N.A. Rostovtsev then obtained some abstract results for more general shapes and recast Mossakovskii's solution for the circular case in a different form [2]. The solution procedure starts by reducing the equation to its Fourier components, a standard device. Next the kernel is represented in terms of the hypergeometric function. It results that the double-integral equation factors into two single-integral equations of Abel type, which have explicit solutions. The final result is a formula for the Fourier components of the solution. A longer paper by Rostovtsev in 1964 extends these results in several respects [3].

In a short paper [4] which appeared in 1971, V.I. Fabrikant carried Rostovtsev's result a step further, obtaining a more explicit form for the solution itself. By reorganizing the Fourier expansion procedure and the order of integrations, he was able to express the solution to the integral equation in terms of the action of a certain linear operator, which he refers to as the "L-operator", together with the two Abel-type inversions mentioned above. Much later, in his 1989 book [10, page 28], Fabrikant says that he has not been able to prove the validity of the method with complete mathematical rigour, but in simple cases the result can be checked directly because closed form expressions are obtained.

The paper [5] has two parts. The first part contains some comments on a particular application of a well-known approximation method, where solvability of a linear approximation to a problem of interest can sometimes be used to generate approximate solutions to the original problem. Neither a general estimate of accuracy, nor detailed analysis in a significant example, is presented. The second part, in the form of a mathematical appendix, presents a detailed derivation of the solution to the linear approximation, the necessary first step in the use of the method in any particular instance. The linear approximating equation is an integral equation and its solution constitutes the substantive, ostensibly original part of the paper. The integral equation is identical to that in [4] and the appendix presents an exact, line-by-line duplication of the derivation in [4]. The only difference between this second, substantive part of [5], and [4], is that [4] includes also an illustrative example.

The substantive parts of [6], [7] and [8] are also identical to [4], once very thin veils are removed. In [6] the kernel of the integral equation is converted into the kernel of the equation in [4] by a trigonometric substitution, after which the derivation proceeds line-by-line as in [4]. Despite the reference to electrostatics instead of elasticity in the title, the examples in [6] are reducible to the one in [4]: a linear combination of a constant and a cosine function. In [7] the veil is even thinner: the limits of integration are different, but again the details follow [4]. In [8]

there is no veil at all. The length of each of [6], [7] and [8] exceeds that of [4], either because computational details left to the reader in [4] are included in these later, co-authored versions, or elementary consequences of the result are drawn.

The paper [9] does extend the result of [4] to slightly more general geometrical domains, from circles or spheres to surfaces of revolution. However, Fabrikant's inspiration, Rostovtsev, had already considered cases of this type. Further, after a few elementary preliminaries, the derivation of the solution in [9] proceeds, line-by-line, as in [4].

In summary we conclude that T.S. Sankar, M.N.S. Swamy and L.M. Roytman could not have been co-authors of any of the papers [5], [6], [7], [8], or [9] on which they are listed as such, in any real sense, because there was nothing substantive for them to have contributed beyond what Fabrikant (or Rostovtsev) had already worked out one (or two) decades earlier.

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