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The Social Shaping of RU486 in Canada:

A Preliminary Case Study and Sociotechnical Analysis

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Contents

Abstract

Because they occur in the contentious public arena that surrounds abortion, the development, introduction, and use of RU486, also known as "the abortion pill," provide a valuable opportunity for understanding how sociotechnical analysis can contribute to the study of communication phenomena. The essay presents a preliminary case study of RU486 in Canada, drawing on an earlier U.S. study performed by Adele Clarke and Therese Montini (1993), supplemented by Bruno Latour's actor network theory and Ruth Schwartz Cowan's framework for linking gender, technology and public policy. In identifying various heterogeneous actors, their rhetorical constructions of RU486 and each other, and their contingent alliances, the essay explores some theoretical issues arising from this case, the implications for developing a workable sociotechnical model and its value for understanding gender-related technologies, and makes some suggestions for linkage with current approaches to communication research in Canada.

Résumé

Parce qu'ils prennent place dans le débat public qui entoure l'avortement, le développement, l'introduction, et l'adoption de la pilule RU486, aussi connue sous le nom de pilule d'avortement, présentent une occasion valable de comprendre comment l'analyse socio-technique peut contribuer aux phénomènes de l'étude de la communication. Cet essai présente une étude de cas préliminaire de la RU486 au Canada, basée sur une étude américaine précédente par Adele Clarke et Therese Montini (1993), complétée par la théorie du résau d'acteurs par Bruno Latour et l'approche proposée par Ruth Schwartz Cowan qui fait le lien entre le genre, la technologie, et la politique publique. En identifient divers facteurs hétérogènes, leurs constructions rhétoriques de la RU486 et de l'un autre, ainsi que leurs alliances contingentes, cet essai expose quelques problèmes impliqués par cette approche, les implications dans le développement d'un modèle socio-technique réalisable et ses valeurs pour la compréhension des technologies reliés au genre, et présente quelques suggestions pour faire le lien avec des approches courantes dans la recherche sur la communication au Canada.

Introduction

Not surprisingly, the introduction of any new reproductive technology is accompanied by significant social negotiation, a flurry of claims-making and position-taking. Such controversies highlight the inseparability of scientific knowledge and social issues, the natural and the social world, nonhuman and human actors, a reality which is often hidden in more mundane technologies. Because the contestations of the technology are so apparent, reproductive technologies also provide an excellent vantage point to study the historical interests, representations, and actions of the actors who gather around them. The controversy surrounding the development, introduction, and use of RU486, the "abortion pill," in Canada provides such an opportunity for historical sociotechnical analysis. [1] By identifying the various heterogeneous actors, their rhetorical constructions of RU486 and each other, and their contingent alliances, we can see how RU486, as a communications technology, mediates and shapes the social interaction which attempts to define it. [2]

This essay emerges from the project linking Canadian communications theory and Science Technology and Society Studies (STS), based on the belief that this connection will produce a useful dialogue about how to understand the interworkings of technology and society (Crowley, 1994). The relatively new interdisciplinary field of STS which has emerged over the last twenty years from a variety of disciplines, including anthropology, sociology, history

and philosophy, is described by Stephen Cutcliffe (1989) as an articulation of science and technology that depicts them as complex, socially embedded enterprises in which cultural, political and economic values as well as technical expertise shape the directions of scientific research and technological innovation. In turn, of course, the products and even the conduct of science and technology affect cultural, political and economic values and through them society and its institutions (cited in Medhurst, Gonzalez & Peterson, 1990). Similar to the sociotechnical approach tradition in Canadian communications studies, this work has consisted mostly of empirical investigations into particular sites to illustrate the social contingency involved in the construction of scientific knowledge claims and technological artifacts. Often these sites are arenas of controversy where the development of a particular technology presents difficult ethical and political questions; however, it is equally possible to investigate more mundane arenas where the interplay between technology and society is less spectacular but comparably revealing. Borrowing whatever tools best fit the case, researchers employ ethnographic, historical and sociological methods in order to describe and explain existing conditions. By studying technology as both the content and the context for social change, researchers are able to see how relevant social groups negotiate interests and how certain social and technical networks achieve degrees of stability. While most of the work connecting these two areas has focused fairly narrowly on traditional communications technologies such as the computer and telephone,[3] my research on RU486

will look at the implications of a wider view of communications and technology, the beginnings of which are present in Canadian communication studies, and can be extended using STS theory.

The essay begins with a historical case study of RU486 in Canada, drawing on a similar U.S. study performed by Clarke and Montini (1993), who use STS theory and methodology to document the positions of various social actors as they attempt to negotiate the technology and stabilize it according to their own set of interests. To address the historical particularities of the Canadian situation, I have extended Clarke and Montini's STS-based model using Bruno Latour's actor network theory (ANT) [4] and Ruth Schwartz Cowan's discussions of gender, technology and public policy. The implications of these theorists for developing a useful sociotechnical model are discussed in the second chapter, including questions and issues arising from the RU486 case.

The essay concludes by suggesting some possible linkage between STS, as it expands the scope of technology to radically assume that all technologies are essentially social technologies, and that group of Canadian communication studies which is defined by the struggle to provide a perspective on technology as a social and cultural force. Cowan and STS theorists like Latour may provide communications scholars with new and productive ways of looking at communication technologies, and, in fact, further Harold Innis' original examination of less traditional communication

media such as clothing, etc., by analyzing all technologies as communication sites around which social interaction gathers, as mediators which shape and are shaped by social behavior. At the same time, STS methodology itself might be enhanced by a deeper appreciation of communication issues, specifically, an elaboration of how communications media provide a unique site for sociotechnical analysis.

Chapter 1: Preliminary Case Study and Sociotechnical Analysis

A Sociotechnical Model

Clarke and Montini's study of RU486 is a pragmatist philosophical exploration which employs the methodological tools of social worlds theory and arena analysis. It begins by identifying all of those individuals and groups prepared to act regarding RU486 and other related technologies and issues, referencing Pinch and Bijker's (1987) paradigmatic STS history of the bicycle. The authors argue that this framework, which demonstrates the multiple perspectives surrounding any technology, can be particularly useful in the case of an abortion technology, since abortion is often represented as an ambiguously defined polarized issue rather than a contestation between various perspectives. As do other STS-influenced approaches, their sociotechnical model positions, or situates, the various social actors surrounding RU486, based on their constructions of the technology, by "attempting empirically to view the world in the actors' own terms" (p. 45). Clarke and Montini borrow the notion of "local knowledges, situated knowledges," originally put forth by Mills (1940) and more recently revitalized by Haraway (1991), to describe the "understandings and knowledges of a particular phenomenon built up in a community of practice . . . over time . . . deriving from identities and commitments largely developed through prolonged interaction toward shared, yet continually emergent, goals" (p. 45). Technology is viewed in terms of these various

representations, as a socially constructed phenomenon which reflexively shapes social practice.

Clarke and Montini compare and contrast their approach and Latour's ANT. They note that "both are constructivist, relativist, and focused on relations among actors," including the nonhuman actors specified in Latour's work, but indicate that their analysis follows the perspective of various actors while ANT's "executive approach" focuses on the most powerful actor (p. 45). This legitimate criticism has been levelled at Latour and ANT before, particularly by feminist theorists, and will be discussed in the next chapter. Nevertheless, Clarke and Montini make the necessary adjustment by including the representations of all actors involved in constructing this technology, including potential actors (in this case, the users of RU486) whose lives will be implicated by the technology. The result is an analysis which acknowledges the quiet, the silent and the silenced, highlighting the questions of distribution of power, marginalized constituencies, and contestations de-emphasized in Latour's work.

To some extent, Clarke and Montini apply other principles of an STS model, including the strategy of using sociotechnical analysis to open up the "black box" of stable technologies. One of the premises of ANT is that technological artifacts take on the appearance of an objective reality only when the network of social action surrounding them achieves stability. This stability is always contingent, to some degree dependent on the negotiated predictable response of the actors who comprise the network. By portraying

the multiple perspectives of the various social actors involved in the RU486 controversy, Clarke and Montini reveal the sociotechnical network in which RU486 has been and is being constructed. Furthermore, they point to social actors who also use this strategy to destabilize the "givenness" of the technology, doing the theorist's work of challenging the expertise of scientific and clinical authority, as well as to those who accept its black box status and focus on manipulating the social environment surrounding its diffusion. Clarke and Montini's model works well for studying reproductive technology because it considers the rich historical context surrounding these highly contested sites where a wide diversity of actors meet to negotiate technological meaning.

To conceptualize the Canadian case of RU486 and this particular sociotechnical analysis, further applications of Latour's ANT extend Clarke and Montini's model. The social construction of technology model (SCOT) that influences their study essentially defines the relatively static positioning of constituencies concerned with a particular technology based on their construction or representation of it. ANT includes the consideration that it is not entirely what people think about a particular technology, but how they are influenced to act by it, directly or indirectly (Law, 1991). Because ANT pays closer attention to the changing positions and representations of actors over time, it recognizes the various translations of the technology's representation. It looks more closely at the interdefinitions of actors, the changing alliances between them, and the strategic responses of one social

actor to the progams of the others. Furthermore, it focuses not only on social actors' constructions of a particular technology, but also the public mobilization of those constructions to forward particular versions of the truth, highlighting Latour's (1987) adage that "science is politics by other means." The success of the technology is dependent on the ability of these constituencies to negotiate the technology's transition from development to diffusion phase, rather than on the efficacy of the pill itself. In relation to the Canadian case, RU486 is an especially provocative application of this sociotechnical strategy because its current historical position between development and diffusion phases raises questions about potential actors and the relevant social actors in each phase (see Appendix).

Additional theoretical and methodological concerns arise due to the particularities of the Canadian context, specifically, the role of the media in public interest politics. In Canada, RU486 enters the public discussion of other new reproductive technologies begun in a recent royal commission, and a history of such public discussions or forums aimed at determining public policy. Moreover, it comes at a time in Canadian history during which no criminal law exists concerning the legality or illegality of performing abortions. Constructing the sociotechnical network around RU486 becomes a means to examine how decisions are made about what to do with these technologies, how the network of actors and their public representations of the technology contribute to the policy and practice concerning its development or use. From a communications perspective, the case becomes

compelling because these actors are connected through their mediated representations or public negotiation of the technology. The Canadian discourse on RU486 illustrates, in a very public way, how the mixed questions of Bruno Latour, those which cannot be answered in traditional ways by scientists, sociologists and philosophers, begin to be answered in practice.

RU486 also raises the issues of how such policy questions might best be answered and by whom, a theme which runs through Ruth Schwartz Cowan's work on social policy and reproductive medical technology. More overtly political than Clarke and Montini, whose politics are limited to the consequences of the research act (feeding the RU486 controversy and empowering the actors by giving their representations a voice), Cowan's research looks for ways to decide these controversies using cues from feminist ethics and the historical examination of similar reproductive technologies. Since it is women who will be most implicated in the practices surrounding new reproductive technologies, it seems essential that a sociotechnical model which deals with these technologies be a feminist one that makes explicit the feminist concerns of women's reproductive control, access and empowerment. Cowan's work provides this necessary and useful perspective of how to understand the special issues surrounding technologies primarily used by women, problematizing the notion of policy.

The Canadian case of RU486 provides another testing ground for the application of these various sociotechnical strategies. The currency of the controversy makes actors and their actions visible so that we may view the

technology in the midst of its public negotiation, contextualized by the national negotiation of related technologies in the Royal Commission on New Reproductive Technologies (RCNRT). The pill's unusual position between development and diffusion phases, absent in general clinical practice but present in the mediated representations of various stakeholders, also raises productive methodological questions regarding the positioning of actors, knowledge and the theorist within the sociotechnical model.

The Reproductive Sciences and Abortion in Canada

As Clarke and Montini (1993) observe, the reproductive sciences have been the source of controversy for more than a century. They define four main issues around which most of the debates have evolved:

> the linkages of reproductive sciences to human sexuality and reproduction; the science's association with clinical quackery and hotly debated treatments (recently diethylstilbestrol, or DES; the Pill; the Dalkon shield IUD; and Depo Provera); the association of reproductive sciences with controversial social movements such as birth control, eugenics, population control and abortion rights; and last, the capacity of reproductive sciences (especially in tandem with genetic engineering) to create new life forms to populate 'brave new worlds.' (p. 43)

In a Canadian context, many of these issues are identified in the recent RCNRT. The commission's mandate is to "inquire into and report on current and potential medical and scientific developments related to new reproductive technologies, considering in particular their social, ethical, health, research, legal and economic implications and the public interest, recommending what policies and safeguards should be applied"

(Government Services Canada, 1992, p. 3). Abortion methods were not included in the definition of reproductive technologies and received little consideration in the report.

The reasons for excluding abortion technologies from the commission seem clearly influenced by the political context. The mandate was generated soon after the narrow defeat of Bill C-43, Justice Minister Kim Campbell's proposed legislation to reinstate abortion into the criminal code. In our telephone conversation, Privy Council Office representative Karen Logan drew my attention to this political context and indicated that, while commissioners would have been responsible for interpreting the mandate, abortion was definitely not explicitly included as a reproductive technology (personal communication, May 23, 1996). Commissioner Dr. Bartha Maria Knoppers said that even though abortion, including RU486, was mentioned by many participants in the commission, they did not interpret it as a reproductive technology. She felt that the the term, "reproductive technology," clearly excluded abortion, since it referred to "techniques for creating life" and noted that similar studies in other countries had never included it. Abortion was discussed by the commission in its implications for prenatal testing, a technology which was included in the mandate (despite its questionable status as a technology for creating life). Dr. Knoppers, a strong prochoice supporter, also commented that, in her view, abortion technologies were better kept off the table in an attempt to leave the situation as "open and free as possible," considering the uncertain political context (personal

communication, May 23, 1996). Although the commission did not recognize abortion as a reproductive technology, it is undeniably implicated in the larger historical development of other reproductive technologies.

The RCNRT divided submissions into seven groups based on the coherence among the guiding ethical principles that various actors identified in relation to how the commission should approach reproductive technologies (Kymlicka, 1993). The medical community was concerned with autonomy, beneficence, and justice. Family, religious, and pro-life groups felt the most important issues were respect for human life from the moment of conception and protection of the family as the proper environment for the child. Women's groups regarded respect for women's reproductive autonomy, non-discriminatory access to NRTs regardless of class, race, sexual orientation or disability and non-commercialization of reproductive services. Alternative and community health and social services cited respect for individual choice, cost-effective healthcare, and public participation and accountability of reproductive health care policy decisions. Three groups which do not appear in my study are cultural/ethnic groups (nondiscriminatory access), legal and human rights groups (informed consent and protection of the child's best interests), and groups and individuals representing people with disabilities (equality and autonomy). Many of these established constituencies are active in the negotiation of RU486, revealing attitudes similar to these in attempting to fix its meaning.

Social values and attitudes of Canadians toward reproductive

technologies were also explored in a national survey and ten focus groups conducted by the commission (RCNRT Staff, 1993). In this survey, abortion and issues surrounding it again figured prominently. For example, some respondents felt that extensive prenatal testing would increase the number of abortions, and that fetal tissue research was more acceptable if the fetus were likely to be miscarried or aborted regardless. Issues around the wider questions concerning reproductive technology also surfaced. Forty-two percent of respondents said that knowledge should not be used to alter the processes of human life such as birth, while 37 percent disagreed. The majority (60 percent) of respondents felt that doctors should not be responsible for ethical decisions about human life. The survey also indicated support for freedom to use available technology, which became more limited when specific technological procedures were suggested. Despite abortion's virtual exclusion from the RCNRT, its close relation to the concerns regarding other reproductive technologies is clear.

Cowan (1992; 1993) makes the connection between abortion and other reproductive technologies explict in her discussion of prenatal diagnosis. Because gene therapy is unavailable, the primary medical response to most information regarding genetic abnormalities is abortion. If a fetus is diagnosed with Down's syndrome, doctors cannot suggest repairing the damaged chromosome; they can only suggest terminating the pregnancy. If abortion were made illegal, which Cowan (1993) believes is highly unlikely, the development of prenatal diagnosis technology would likely be slowed or

halted. The ethical and social implications of certain new reproductive technologies and abortion are inseparable, a position furthered by feminist women's reproductive health advocates.

A collection of essays produced by the Women's Press in Toronto attempts to present a feminist perspective on the future of reproductive health technologies and their implications for women's health services. Their range of concern is all-encompassing:

> from safe and effective contraception to abortion, from birth and midwifery to well-woman and well-baby care, and from sexuality counselling to reproductive technology developed according to women's needs and priorities. (Van Wagner & Lee, 1989, p. 238)

Significant in this volume and elsewhere (McCormack, 1988) is the insistence that abortion technologies be included in the wider discussion of women's reproductive health and the policies and practices which surround it, a point lost on the RCNRT. Eichler (1989) also sees abortion as a critical dividing line in the debate regarding other reproductive technology. Policy issues raised by women's health groups concern access to new technology and information (Colodny, 1989), safety (Eichler, 1989), patient autonomy and self-determination (McCormack, 1988), and noncommercialization of reproductive services (Eichler, 1989), all of which are discussed in submissions to the RCNRT (Kymlicka, 1993). Another related concern is the existing role of the medical expert as gatekeeper, rather than facilitator, as the decision-maker both on whether to provide information on particular technologies and whether to apply them in a particular situation (Sherwin,

1989; McCormack 1988). McCormack cautions that certain technologies which intended to empower women by increasing their freedom could in fact become instruments of oppression or control, similar to the household technologies examined by Cowan (1983). RU486, as a means of abortion (a right clearly endorsed by these groups), becomes part of this wider network of concerns. Based on the abortion-related issues arising from the RCNRT, the implication of abortion in the development of other reproductive technologies such as prenatal diagnosis, and the insistence by feminist groups that abortion be seen in the wider context of reproductive services, abortion can be viewed as a large force shaping reproductive technology, as it is in turn shaped by it.

In spite of the RCNRT, the practice of abortion has been one of the most controversial aspects of reproductive science in Canada. McLaren and McLaren (1986) have studied the history of birth control and abortion in Canada from 1880-1980. During most of this time, abortion was illegal: the Criminal Code of Canada made it an offense to "offer, sell, advertise, publish an advertisement of or have for sale or disposal any medicine, drug or article intended or represented as a means of preventing conception or causing abortion" (p. 9). The government's early legislation is attributed to a 1892 motion aimed at preventing a supposed flood of "vile literature" advertising abortion methods and the corresponding drugs and instruments (p. 9). Other early actors in the controversy surrounding abortion were the users, primarily older married women who often employed self-administered folk

remedies, the few doctors who performed abortions after these methods failed, the majority of doctors who opposed abortions, feeling that their role was similar to priests in "fighting the evils of race suicide in all civilized countries" (p. 37) and the Roman Catholic priests who viewed it as morally wrong.

When government and medical attitudes were seen to restrict access to poor mothers, the socialist feminists became one of the first organized supporters of abortion and birth control choice, with the rest of the left adding their support in post-WWII politics (McLaren &McLaren, 1986). Initially, more mainstream women's rights movements focused on less controversial issues, feeling that a prochoice stance might jeopardize their support in other areas. Their involvement became more pronounced in the 1960's, along with newly established family planning groups such as Planned Parenthood of Toronto. In 1969, the 1892 law was amended to allow abortions to be performed in hospitals under certain conditions, partly due to lobbying by the Canadian Medical Association and the Canadian Bar Association. Nevertheless, the McLaren's study notes that, since the 1970's, religious organized antiabortion groups have become increasingly powerful in blocking access to abortion, partly because feminist interests have shifted elsewhere. In Canadian birth control and abortion history, "it becomes obvious that the doctors and priests, eugenicists and feminists, political and labour leaders who entered the discussion were more concerned by the broader issues of sexual, social and political power than by the issue of family

size" (p. 10). Abortion had developed into a far-reaching public battleground for actors with diverse interests and agendas.

Canada'a recent complex legal history regarding abortion is outlined by Tremayne-Lloyd and McKee (1994). Until January, 1988, abortion was a criminal offense in Canada, holding both the performing doctor and the woman responsible unless that abortion followed the established protocol, or the "therapeutic abortion committee" process (p. 2244). The Morgentaler decision of January 28, 1988, overturned the old law on the grounds that it violated section seven of the Canadian Charter of Rights and Freedoms, infringing on the pregnant woman's right to security of person. In the summer of 1989, before new legislation was introduced, the Supreme Court overturned an injunction from the Quebec Superior Court prohibiting Chantal Daigle to have an abortion against the wishes of the biological father, Jean-Guy Tremblay. The Quebec court's decision was based partly on the fact that the fetus was a human being which enjoyed a right to life under the Quebec Charter of Human Rights and Freedoms; the Supreme Court's reversal found no such right clearly stated in the charter since a human being could not be equated with fetus. The Conservatives' response to these challenges was an attempt to replace the old law with the ill-fated Bill C-43. Tremayne-Lloyd and McKee (1994) make the interesting observation that, under this most recent attempt at legislation, RU486 would not have been included as an abortion procedure, and therefore not illegal. In the absence of an abortion law, abortion is legal in Canada. As a new abortion technology,

RU486 enters these intricate actor networks which provide both the content and the context of its construction in Canada.

The Social Shaping of RU486

RU486 was synthesized in 1980 by scientists at the pharmaceutical company, Roussel Uclaf. According to researchers, it is an "antihormone" or "steroid inhibitor" whose chemical structure resembles progesterone, the hormone responsible for triggering decidualization, or the thickening of the uterine lining preparing the uterus for pregnancy ("Pill of choice," September 22, 1989). The researchers believe RU486 works by blocking the normal action of progesterone in pregnancy: it attaches itself to the progesterone receptors but inhibits rather than initiates the process of DNA transcription necessary for decidualization. When the level of progesterone drops, the lining and any embryo are expelled, ending the pregnancy.

The pill's developers claim that RU486 was discovered by accident when routine tests on possible glucocorticoid antagonists (aimed at speeding the healing of lesions and burns) uncovered a molecule which bound to the progesterone receptor with an affinity three times stronger than progesterone itself (Ullmann, Teutsch, & Philibert, 1990). According to his colleagues, Emile Etienne Baulieu, the scientist often singled out as the "inventor" of the pill, convinced Roussel to pursue the compound's potential in fertility control (Ullmann et. al., 1990). Baulieu had been involved in earlier research which had pointed to knowledge of progesterone receptors as a possible key to

new methods of fertility control and was anxious to explore his hypothesis. After preliminary animal testing, clinical trials of RU486 as an abortifacient began.

Early clinical testing in several countries (including the U.S.) yielded an 80 percent success rate (Ullman et al., 1990). In 1984, the drug was administered in conjunction with a prostaglandin to help expel the embryo and uterine lining, a procedure which eventually increased the efficacy rate to 96 percent (Ullman et al., 1990). About this time, development began on research projects involving other possible applications of the compound, including as a treatment for breast cancer, endometriosis, glaucoma, and Cushing's Syndrome. Roussel Uclaf was granted permission to market the drug as an abortifacient on September 23, 1988, but just one month later, on October 26, 1988, alleged pressure from Hoechst AG, Roussel Uclaf's German parent company, led it to suspend the marketing of the drug. Two days after this announcement, French Health Minister Claude Evin ordered the suspension lifted, calling the drug "the moral property of women, not just the property of the drug company" ("France tells company," October 29, 1988). RU486 was finally made available to French clinics in 1989. Since then, it has been tested and approved for use in Britain and France. In 1992, Scottish researchers (Glasier, Thong, Dewar, Mackie & Baird) published findings that the pill was an effective postcoital contraceptive or "morning-after pill" which would expel the uterine lining before implantation, an application many scientists believe is its most effective.

In current clinical practice, "the abortion pill," is actually three 200mg pills of RU486 which are followed 48 hours later by a prostaglandin (either injection, pessiary or oral). Depending on how it is framed, the treatment can take two to four medical visits. At a minimum, the procedure involves one visit in which the doctor diagnoses the pregnancy, assesses the elapsed time since fertilization, rules out contraindications, administers the RU486, and supplies the oral prostaglandin. The second visit assesses whether the abortion has been complete; if not, the woman must undergo a surgical abortion. In France, additional visits involve preliminary counselling followed by a week's reflection before the drug is administered, and the supervised administration of the prostaglandin. RU486 is currently used to perform abortions in the first seven to nine weeks of pregnancy. It is contraindicated for diabetes, liver or renal insufficiency, adrenal disease, clotting disorders, bronchial asthma, heart disease, hypertension, over age 35, heavy smoking, malnutrition, anaemia and ectopic pregnancy. Again, since it has yet to be tested in Canada as an abortifacient, the mobilizations of the Canadian actors surrounding RU486 have depended heavily on the claims made internationally regarding its efficiency and use. [5]

Reproductive and Other Science Groups

Emile Etienne Baulieu, the "inventor" of RU486, has become the international figurehead of the scientific controversy surrounding it. Not

unlike the career of Louis Pasteur (Latour, 1988b), much of Baulieu's work has been outside the confines of the laboratory, enrolling support for the testing and distribution of RU486. To "promote" RU486, Baulieu has lectured in Canada and been interviewed for various Canadian publications. Since 1990, he has taken several positions regarding the entry of the drug (which he prefers to call a "contragestive") into Canada. In a March 27, 1990 Medical Post interview with Ken Walker, Baulieu stated:

> Because of the success of trial conducted by Prof. [David] Baird, England will be one of the first countries to obtain RU-486. I think Canada won't be far behind England because of your links to that country. But the introduction will be more difficult in the U.S. where the problems are larger. (p. 21)

Later, once the negotiations began to transfer patent rights for the drug to the New York-based Population Council, Baulieu, in a speech sponsored by the Canadian Abortion Rights Action League in Toronto, predicted that Canadian doctors could easily apply to join the U.S. study, bringing RU486 into Canada for testing (Murray, May 14, 1991). More than two years later, when a preliminary agreement was reached with the Population Council and American clinical trials of the pill as an abortifacient were expected to begin, Baulieu was in Canada to deliver the seventeenth annual Daniel Perey Lecture sponsored by the Faculty of Sciences at McMaster University. He stated that, while Canadian centres would not be involved in conducting the trials, "the easing of the restrictions against it [RU486] in the U.S. bodes well for further study here (in Canada)" (Murray, October 26, 1993). Baulieu's perspective is a global one: RU486 versus national boundaries. He has argued

that if the drug is not available legally in some countries, it will be obtained illegally and that "worldwide clamor for access to the drug will overcome controversy concerning its use" ("Inventor of French," October 10, 1993). His statements regarding RU486 in Canada seem to be attempts to align Canada's actions with either of its historical (Britain) and cultural/geographical (U.S.) influences, depending on which scenario appears more favorable.

The only Canadian scientists allowed to conduct experiments and testing with RU486 have been those involved in the Breast Cancer Site Group, a part of the National Cancer Institute of Canada Clinical Trials. The announcement of these trials in December 1991 was viewed as a "coup" by Canadian researchers (Taylor, December 6, 1991) since similar requests to study the drug in the U.S. had been denied by Roussel. The director of the program, Dr. Elizabeth Eisenhauer, expressed relief that the drug's Canadian testing for other uses had not been "clouded" by antiabortion lobbying. However, Dr. Paul Van Look, a World Health Organization official speaking to the World Congress of OB/GYN in Montreal, claimed that political pressure had already slowed research of the drug for breast cancer (Adolph, September 29, 1994). While a 1994 published progress report of these Canadian trials indicated that it was too early to report any results from these phase II trials of intravenous and oral mifepristone (Pritchard, August 1, 1994), for these researchers simply obtaining RU486 was a victory. Their actions could have potential impact if RU486 is approved as a breast cancer treatment in Canada, since it could then also be prescribed by physicians for

other purposes, including as an abortifacient.

Pharmaceutical Companies

The Canadian subsidiary of Roussel (Hoechst-Roussel) is Hoechst-Roussel Canada Inc., formerly Roussel Canada. As it has in other countries, the firm has treated questions about the introduction of RU486 with guarded responses and strategic indecisiveness.[6] Even when it was perceived that the lack of an abortion law might make Canada a favorable market for the abortion pill, Dr. Jacques Gareau, Roussel's medical director, guardedly denied reports that RU486 might be introduced in Canada, at least "'not for the time being'" ("Firm may seek," October 2, 1988). After international pro-life threats of a Hoechst AG boycott, a campaign to remind the public of the company's Nazi war history, and a much-criticized Canadian abortion bill, Gareau issued a statement in 1990 indicating that the company had no plans to test the drug in Canada (Weber, March 21, 1990). In an attempt to extricate the company from the surrounding controversy, the statement continued to explain that the discovery of an abortifacient was by accident, its distribution now a "catch-22" situation (Weber, March 21, 1990). He wrote:

> 'We feel that this is an extremely emotional and controversial issue, and as a pharmaceutical research-based company, we have no part in the pro-life/pro-abortion debate.'

In 1991, Gareau reaffirmed the company's position. While the drug might be supplied to Canadian researchers, it would only be for other than

gynecological uses (Taylor, February 2, 1991). Roussel seemed determined to avoid the political implications of marketing RU486 in Canada.

The current Canadian situation is a comfortable stalemate for Roussel. Because of the uncertain abortion climate, the company will not apply for approval to Health Protection Branch of Health and Welfare until the Canadian Government invites it to do so. Hoechst-Roussel's president Donald Buxton claims that the lack of a Canadian law makes the government's position unclear: "'the government could move in any direction'" (Dunn, January 28, 1992). In turn, the Health Protection Branch awaits Roussel's application, the initiation of the standard process for selling new drugs. The company justifies this breach of protocol based on the extraordinary qualities of RU486:

> It's a product that raises a lot of controversy, particularly from pro-life groups who threaten Roussel Uclaf with horrible things, with boycotts, and call us criminals. Roussel does not want to be involved in the production or distribution of RU-486 in countries where there is conflict about abortion. ("Abortion pill won't," May 19, 1994)

Buxton has also used the lack of profitablity to justify why his company will not produce the pill in Canada. Given the low rate of Canadian abortions and the limited use of RU486 on early abortions, "the company could manufacture a 10-year supply in 20 minutes" (Landsberg, July 28, 1992). In the U.S., the company has tried to sidestep the controversy by donating the patent rights to the Population Council, a move that resulted in an intensified effort to boycott Hoechst AG products ("Human Life International," November 21, 1994). RU486 has been a political nightmare for

Roussel and Hoechst AG. They are reluctant actors in the network surrounding their own technology, unable to distance themselves from it. With little concern or interest in the technology's success or failure, their actions are geared towards establishing political and moral neutrality and effacing any intentionality. Nevertheless, because they control the distribution of the drug, they are perceived as powerful by other actors who attempt to enroll their support or discredit their actions.

Roussel is not the only pharmaceutical company implicated as an actor in the Canadian context. Prostaglandin producers like Searle (misopristol), would be forced to reconsider the specified uses of their drugs to include the new procedure. This action would likely put them in the same controversial position as Roussel. As Tremayne-Lloyd and McKee (1994) point out, "Searle was not asked for permission to use misopristol in combination with RU486 and considers this a misuse of their product" (p. 2243). As with Roussel, any association with RU486, regardless of intentionality, represents a threat to their operations.

The only North American pharmaceutical company that has seemed anxious to associate itself with RU486 is Apotex. The largest generic drug producer in Canada, Apotex has offered to market RU486. Apotex president and owner Barry Sherman chided Hoechst-Roussel for denying women access to RU486 and stated that his company would be willing to pay Roussel for the rights to market the drug in Canada and the United States (Thompson, July 29, 1992). Although the article indicated that Roussel

welcomed communication from Apotex, nothing has since appeared associating the two companies. With the exception of Apotex, pharmaceutical companies seem to view RU486 as a no-win situation, primarily because of the antiprogram initiated by powerful antiabortion groups.

Antiabortion Groups

As might be expected, antiabortion groups are against the testing and use of RU486, primarily because, as Clarke and Montini (1993) have suggested and pro-life leaders have conceded, it would significantly weaken their cause by moving abortion out of a clinic setting. A Campaign Life Coordinator explains, "At the Morgentaler clinic we can approach people going in and ask if we can help. We will lose that opportunity" (Livingstone, July 23, 1988). In Canada abortions are increasingly performed in free-standing clinics, which makes it easier for antiabortion groups to focus their efforts on those whom they know are receiving and performing abortions. The abortion pill would lower the profile of both providers and users, making them more elusive targets of protest.

Canadian antiabortion groups seem to hold similar positions to the groups discussed in Clarke and Montini's study: they see RU486 as a threat to women's health, a threat posed by exploitative pharmaceutical companies. Prolifers have focused on RU486 as a chemical abortifacient, describing it as a "human pesticide," "chemical warfare on the unborn," and the

"Thalidomide/Dalkon Shield of the '90s". An Alliance for Life information sheet, representative of the antiabortion position, groups it in with other chemical abortifacients including prostaglandins (American Life League, 1992). The pamphlet questions its safety for the pregnant woman, noting that all research reports have observed severe cramps, nausea, vomiting and blood loss, and stresses the uncertainty of its long term effects, comparing it to other "chemical time bombs" such as the Dalkon shield. The pamphlet states: "Too often and for too long, drug companies and scientists have experimented on women's bodies, showing a cavalier attitude to short and long-term effects on women's health." For the antiabortion groups, the villains are clearly the pharmaceutical companies.

In their criticism of the pharmaceutical companies (and the scientists who work for them), the antiabortion groups have appropriated the feminist rhetoric of the women's health movement (Clarke & Montini, 1993). In their view, women's health is being sacrificed in the interests of pharmaceutical companies and a male-dominated scientific establishment. To strengthen their antiabortion position, these antiabortion groups have formed an unacknowledged alliance with a group of actors whose primary intentions differ greatly from their own.

The antiabortion groups' efforts to keep RU486 out of Canada have targeted the manufacturers of the pill, Roussel Uclaf, and their parent company, Hoechst AG. A boycott against Hoechst-Roussel products was organized by Human Life International, an antiabortion group with twelve

chapters in the U.S. and Canada ("Human Life International," November 21, 1994). The group distributed wallet-sized cards listing all Hoechst AG products and possible substitutes. Various Canadian groups support the boycott, including the Winnipeg-based Alliance Action, Campaign Life Coalition and local ProLife chapters. Their ultimate goal is to have RU486 recalled worldwide. Other strategies have included distributing 150,000 postcards targeted at the federal health minister (Gold, June 12, 1994), and protesting outside the French consulate in several Canadian cities including Toronto, Montreal, Ottawa, and Vancouver to coincide with the date of Roussel Uclaf's annual meeting in Paris (Chow, June 22, 1993). Members of antiabortion organizations have also been active individually, writing letters to editors in response to editorials advocating the introduction of RU486 into Canada. In general, the actions of the antiabortion coalitions have been aggressive and almost unanimously unsupportive of the pill.

One exception to this antiprogram is an article in the ProLife News (Levathes, 1995) in which the pill is seen as an improvement over surgical abortion. The article suggests that the ordeal of a medical abortion where the woman is conscious of what is happening instills a terrifying sense of responsibility. The process is longer and more solitary and the explusion of the "baby" occurs at home, forcing a woman to view the aborted fetus as a result of her actions. The article closes: "The magic pill appears to have an unexpected power. It provides a dim mirror in which women may confront, for better or worse, the reality of what they are doing" (p. 15). Because it is

perceived as making the procedure more difficult, RU486 is seen as desirable.

Finally, two related concerns of antiabortion groups are fears that Canadian women will eventually cross the border into the U.S. to use the drug or that the drug will be used for abortions even if it has been approved only for other applications in Canada. The first concern has Canadian antiabortion groups closely allied with their American counterparts; the fate of the drug in either country will significantly affect the abortion landscape in both. Antiabortion groups seem to be guarded in expressing their second concern, likely for fear that they will be publicly viewed as targeting the "innocent" groups that might benefit from the drug. Since it is critical that they appear to be rational and nonreactionary, the strategic value of an explicit statement against these alternate uses would be limited. For the most part, these groups wage their battle against the pill as an abortifacient, without directly addressing its other possible applications. The strong coalition of antiabortion actors is countered most strenuously by the actions of feminist prochoice groups.

Feminist Prochoice Groups

By far the most active in this group is the Canadian Abortion Rights Action League (CARAL). In its literature, CARAL (1993) calls RU486 a "revolutionary drug," "breakthrough birth control technology," and a "promising development in the much-threatened area of women's reproductive choice." The same pamphlet discusses the benefits of RU486:

that it allows women more psychological control, privacy, access and is less physically invasive than surgical abortion. Among its allies, CARAL names the medical science community and the women's movement. It recognizes that certain feminists have spoken out against the drug, but states that "according to feminist supporters of RU486, these criticisms seem to be premised on a more general, ideological opposition to all hormone-related drugs and new reproductive technology" (CARAL, 1993). Other opponents of the pill, primarily antiabortion groups, are constructed as a well-organized lobby responsible for slowing research into the drug's other applications and for issuing death threats and promises of a world-wide boycott. In its submission to the RCNRT, CARAL (1990) argues that a discussion of RU486 should have been included in the commission's mandate and that its absence "may in part be due to political pressures against its testing in this country and its eventual use as an abortifacient." For CARAL, RU486 is a proven, safe and effective drug that is being denied to Canadian women for reasons other than its efficacy.

Much of CARAL's effort to bring the drug to Canada has focused on breaking the stalemate between Roussel and the Canadian government. It has initiated letter-writing campaigns to the pharmaceutical company and made continuous public appeals to the government. In 1988, it sponsored a poll performed by Environics Research which showed a majority of Canadians in favor of legalizing the pill ("48% want," October 15, 1992). The group hoped to use this as evidence in convincing Roussel of the positive

abortion climate in Canada, one of the company's necessary conditions for its introduction. It has also brought Baulieu, the inventor of the pill, to Canada for several speaking engagements and published its own literature supporting the pill. To CARAL, the abortion pill is one way to further its mandate to "ensure that no woman in Canada is denied access to safe legal abortion . . . and [to promote] the establishment of comprehensive contraceptive and abortion services" (ProChoice News, 1992, p. 2). For CARAL, RU486 means increased access and increased choice.

Family Planning, Population Control and Abortion Provider Organizations

Planned Parenthood of Canada has closely allied itself with CARAL in the RU486 controversy. It distributes CARAL's literature in response to informational requests and have alternately been critical of Roussel ("Abortion pill offered," February 28, 1994) and the federal government ("Pill fans flame," June 20, 1994) for their inaction. One of their early concerns had been about the movement of the pill across the border, first in the Canada to U.S. direction when it appeared that Canada's Supreme court ruling on abortion would mean that the drug would be available sooner in Canada. American Planned Parenthood president, Louise Tyrer, saw the potential for U.S. women to come to Canada seeking the drug in such large numbers that it might cause a backlash, leading to an embargo and eventually a large black market for the easily produced drug (Livingstone, July 23, 1988). Now, with testing having been approved in the U.S., Canadian executive director

Bonnie Johnson warns of the potential for "cross-border shopping" if the drug is not available in Canada (Gold, June 12, 1994). As an organization with branches in both countries, Planned Parenthood is very aware of RU486 as border issue.

Both CARAL and Planned Parenthood have attempted to enroll American allies. Both are active in the Reproductive Health Technologies Project, a Washington D.C. cooperative committed to create public support for the testing of RU486. When the negotiations between Roussel and the Population Council were in progress, former Deputy Minister of Health, Margaret Catley-Carson, was viewed as ideally positioned to include Canada in the testing and marketing plans ("Editorial," May 4, 1993). Meetings were scheduled between the American organization and Planned Parenthood Canada. Again, potential American developments in marketing the drug were seen as potential Canadian opportunities to do the same.

Another international actor in this group, the World Health Organization (WHO) has also had a distinctively Canadian voice. Rebecca Cook, a University of Toronto law professor, prepared a WHO report on women's health rights. Interestingly, Cook (1991) contributed a paper to the RCNRT outlining the international legal issues surrounding NRTs. Although abortion technologies were not included in the commission's mandate, Cook outlines the right to terminate an unwanted pregnancy and mentions the "contragestive" RU486 as an example of scientific progress (p. 7, 8). In the WHO report, Cook claims that Canada is denying women the

benefits of "scientific progress" by refusing them access to new technologies such as RU486 and attributes Canada's poor women's health record to late abortions caused by lack of access to abortion services (Priest, June 23, 1993). WHO's position, as indicated in the report, reads

> The state has a duty to make health services accessible, affordable, culturally appropriate and of high quality within available resources. . . [T]hey [women] should be encouraged and supported to take advantage of the many basic human rights and freedoms that empower them to realize their own health goals.

WHO's concerns for RU486 go beyond its potential as a reproductive technology or breast cancer treatment; for it, RU486 is a national obligation, a woman's right, and a means of empowerment.

The only dissenting Canadian voice in this group is the Fédération du Québec pour le planning des naissances (FQPN). The FQPN's (1994) policy statement concludes with: "La Fédération du Québec pour le planning des naissances se prononce contre la RU-486/PG, contre son introduction et son experimentation au Canada." What is significant about this statement is not only its absolute opposition to RU486, but its identification of the prostaglandin (PG) as an essential part of the abortive process. Using information from RU486: Myths, Misconceptions, and Morality (Raymond, Klein & Dumble, 1991), which has become the bible for various groups' resistance to the pill, they make it clear that RU486 as an abortifacient has itself alliances with many other chemicals ("un cocktail chimique"), including prostaglandin, combinations which have dangerous side effects (cramping, blood loss, extreme fatigue) and unknown long term effects (on

fertility, on the menstrual cycle, on the health of future embryos) (Centre de Santé des Femmes de Montréal & FQPN, n.d.). RU486 is an untested technology with unrecognized alliances to harmful chemicals.

Furthermore, the FQPN questions the benefits presented by the pill's champions, asserting that, compared to surgical abortion, the procedure requires more medical visits, gives more power to the medical system to dictate which abortion methods women can choose, and places the woman having the abortion in a state of physical and psychological isolation (FQPN, 1994; Bastien, 1994; Nolen, September 13, 1993). Most significantly, RU486/PG actually reduces choice because it threatens the availability of proven safe abortion methods such as aspiration/curetage under local anaesthetic, the only choice for women 35 years old or beyond the first 50 days of their pregnancy. The federation believes that, as it becomes easier to perform abortions medically, fewer doctors will acquire the training necessary to perform the surgical procedure (FQPN, 1994). Anne St-Cerny defends the FQPN's position, claiming the group is not simply antitechnology, as it has been defined by other groups: it advocates the use of fertility treatment and birth control pills (Nolen, September 13, 1993). For them, RU486/PG is a dangerous, unproven drug which limits women's choices.

With the exception of the FQPN, family planning, population control, and abortion service provider groups have generally acted to promote the introduction of RU486 as a way of increasing access to abortion. Both sides frame it as part of the larger issue of expanding women's rights to

reproductive freedom. From the same philosophical position, the FQPN claims that the drug has not yet been proven safe, might possibly increase medicalization, and may even inhibit access to reproductive services, while the other groups claim that it will increase access and reproductive freedom. Given the same set of "facts," using the same set of guiding principles, these groups' varying perspectives show the unpredictability of how a statement or a technology might be received and constructed.

These groups have also shown an awareness of RU486 as a border issue between Canada and the U.S. The hypothesized movement of the drug across the border in either direction is viewed as detrimental, leading to a loss of control over its diffusion (an embargo, a black market, cross-border shopping, etc.). At the same time, these groups have engaged in significant attempts to strengthen their cross-border affiliations in attempts to encourage the testing of the pill in Canada. Individual actors' transgression of borders is perceived as a threat, while the groups' organized attempt to dissolve borders is encouraged.

Healthcare Professionals

For the most part, support for RU486 from organized Canadian medical groups has been strong and unqualified. The most vocal of these groups has been the Society of Obstetricians and Gynecologists in Canada (SOGC). In its resolution regarding RU486, the Society points out that RU486 has been legally used in European countries, that it may have other important medical

applications, that it supports a woman's right to choose safe abortion services, that the use of such a medication constitutes a significant medical and public health gain, and that access to medical technology should not be dictated by political considerations (SOGC, September, 1992). The Society has asked the federal government to approve the use of the pill ("Abortion pill call," June 12, 1992), but has stopped short of asking them to invite Roussel to test the drug here. In a SOGC Journal article, Lloyd and McKee (1994) assert that, considering current abortion law, RU486 could be used in Canada "if only someone has the courage to initiate the 'new drug submission' process" (p. 2253). In a word that has echoed strongly through the media, the SOGC considers it "unethical" to refuse women access to RU486.

The Federation of Medical Women in Canada (FMWC) has supported the legal availability of RU486 in Canada both by unanimously endorsing the SOGC resolution and a similar resolution passed by the Medical Women's International Association (MWIA). The MWIA statement also focuses on the manufacturer to submit applications to the drug regulating bodies of governments in countries where RU486 is not available (FMWC, March 11, 1993). Dr. Lorena Kanke, a spokesperson for FMWC, says that it would be beneficial for women to have a choice of a medical or surgical abortion ("Women doctors," June 27, 1993). More cautious support has also been forwarded by the Canadian Medical Association, which recommended that the federal government evaluate RU486 ("Momentum builds,"1993; "Women doctors," June 27, 1993). While the organized medical support for

RU486 as a means to increase choice is clear, physicians have further reasons to support the use of the pill.

For doctors, the controversy over RU486 reaches beyond the right of a patient to certain treatment. As Clarke and Montini (1993) have maintained, one of the issues in the battle over RU486 is medical autonomy, or a doctor's right to prescribe appropriate treatment for his or her patient, the same historical struggle described by McLaren and McLaren (1986). With RU486, this means using the pill both as an abortifacient and as a means to treat other disease. After a Vancouver gynecologist was shot in his home (Levybody, November 18, 1994), a Medical Post editorial suggested that "RU486 would shield women and doctors from wackos" and allow abortion to be the private matter between patient and physician that the law dictates (Emson, January 31, 1995). RU486 interests physicians because it relates both to their autonomy and to their safety.

The silent actors in Clarke and Montini's study, fetal tissue transplant scientists, are brought to the forefront by the Canadian Medical Association Journal. In a survey of 600 College of Family Physicians of Canada and SOGC members, 88 percent said that the demand for fetal tissue should not hinder the availability of new abortion technology such as RU486 (Mullen, Williams & Lowy, 1994). The survey also showed the uncertain implications of RU486 and other new abortion technology on the supply of fetal tissue: 50 percent thought the new technologies would diminish the supply, 8 percent disagreed, and 42 percent were unsure. Physicians have recognized that, by

displacing the previous abortion methods and decreasing the amount of fetal material available for experimentation, RU486 could play a significant role in the development of other reproductive technologies.

At the frontlines, hospitals and health care clinics seem to have more complex reactions to RU486, or the possibility of medical abortions (Nolen, September 13, 1992). Dr. Marion Powell at the Women's College Hospital in Toronto eagerly awaits the testing of the pill in Canada as a way to increase women's options. In the middle of the road, The Women's Health Clinic in Winnipeg has no official stance on the pill, concerned about its safety pill, yet pragmatic about the increased difficulty surrounding surgical abortions. At the Centre de Santé des Femmes in Montréal, opposition to the pill has been voiced in joint publications with the FQPN. Where medicine is actually practiced, the views are varied. These actors with their own set of immediate priorities do not seem as interested as some others in using RU486 as a strategy, but rather as a practical tool for inducing abortion. For some it sounds like a promising practice; for others, it threatens the availability of existing practices.

Joining the collective medical actors that have emerged in the controversy are some key individual actors whose actions have influenced the construction of RU486. Any Canadian treatment of abortion should include at least some discussion of the most prominent figure in the fight to perform abortions in Canada, Dr. Henry Morgentaler. One might think that a doctor (in)famous for creating abortion service clinics across Canada might

feel threatened by a medical abortion process that could be offered in a physician's office. Just the opposite, Dr. Morgentaler is a strong advocate of the pill as a means to expand women's choices, adding the qualification that the procedure would not be for everyone, nor would it eliminate the need for surgical abortion (Gold, June 6, 1994). At the same time, Morgentaler uses the controversy over the pill as an opportunity to criticize the government's lack of "courage" to enter the abortion debate because of "biases and antichoice activity" (Gold, June 6, 1994). For Morgentaler, RU486 becomes another platform from which to further his interests as an abortion provider.

Another prominent individual actor is British Columbia's Dr. Ellen Wiebe, also a strong advocate of making RU486 available for testing and use in Canada. After failing to receive Roussel's permission to test RU486, Dr. Wiebe undertook a pilot study of abortions induced by the combination of methotrexate and mispristrol, both of which are available in Canada for other medical uses (Wiebe, May 1, 1994). In a study approved by the University of British Columbia ethics committee, she is testing the drug on 100 women. While both combinations appear to have about the same efficacy rate (95-96 percent), Wiebe claims that RU-486 "'works more quickly and completely'" (Wigod, February 18, 1994). For her, the most important issue is that women be given access to a non-surgical abortion alternative; RU486 is simply one way to provide that option. By providing an available alternative to RU486, which has already passed the obligatory passage point of Health and Welfare Canada, her actions could have significant implications for many of the

actors' positions around RU486.

A final individual actor worth noting briefly is an anonymous Toronto doctor who claims to have used the pill illegally to terminate her patients' pregnancies (Sanger, May 30, 1994). The doctor will not say how she obtained the drug, how many women have used it or why she chose to administer it illegally. One of her patients has come forward anonymously to say that she heard about the availability of the drug through friends in the "pro-abortion movement" (Sanger, May 30, 1994). This doctor's actions provide evidence that there may be yet more ways to bypass the obligatory passage points (permission from the government and the manufacturer) established in the RU486 actor network.

Medical groups and doctors have shown great interest in RU486 as an abortifacient. As a group, their support is as strong as it has been for other forms of reproductive technology in the last 25 years. While their interests are with the efficacy of the medication and its benefits to their patients, RU486 also offers them the promise of increased autonomy and safety as actors in the wider controversy over aborton services. At this point, their role as actors is limited by the fact that RU486 has not entered the practice of the medical social world.

However, as individual and collective actors, their interests, strategies, and actions may become more significant should the pill be introduced into Canada. At the diffusion phase in Canada, doctors will become the gatekeepers between the pill and its users. As Cowan (1992) has indicated,

medical service providers become key actors as the means by which medical information and technology enter into wider social practices. If RU486 becomes available in Canada, the relatively unqualified support it has received from the medical gatekeepers bodes well for its success. Many feminists are uncomfortable with the role physicians play and would like to see the position of gatekeeper transformed into facilitator, with the more passive "consenting" role of the user transformed into an active "choosing" role (Eichler, 1989). With Cowan, they argue for increased involvement of the power of women to shape reproductive technologies, both in the development and diffusion phase.

Women's Health Movement Groups

In Canada, women's health groups involved in the RU486 controversy have been less prominent than in the U.S. One significant reason is a lack of organized collectives with a national focus such as the American Women's Health Network (AWHN), the Boston Women's Health Book Collective (BWHBC), and the National Black Women's Health Project (NBWHP). The Canadian groups tend to be smaller and more local, focusing on the way these issues apply to individual women (Ford, 1992). Despite (or perhaps because of) this local orientation, these groups have had a significant impact on generating public discussion surrounding the medical, ethical, political and social implications of similar reproductive technologies, including the contingent organization of the Canadian Coalition for a Royal Commission

on New Reproductive Technologies, which was instrumental in convincing the government to create a national level public forum to which all Canadians might contribute (Eichler, 1989). Because of their actions in the wider arena of women's overall reproductive health and its relation to reproductive technology, groups which have collected in the interest of women's health, including some of the feminist prochoice groups discussed earlier, have been instrumental in setting the stage for the public discussion surrounding RU486 in Canada.

The Centre de Santé des Femmes de Montréal has allied itself very closely on a local level with the FQPN. As mentioned earlier, both groups actively denounce the pill and are against its testing in Canada. On an international level, both of these groups position themselves with the Feminist International Network of Resistance to Reproductive and Genetic Engineering (FINNRAGE). This international network produced the feminist critique, RU486: Misconceptions, Myths and Morals (Raymond et al., 1991). Annette MacDonald (August 20, 1992), president of Women for Women's health, also uses FINNRAGE's findings to caution against the use of the pill. One of the most important assertions of these local groups is that it is possible to be a prochoice feminist and not support RU486/PG as a new abortion technology.

The Toronto Women's Health Collective, which produces the magazine Healthsharing, supports RU486, though not nearly as enthusiastically as many in the debate (Nolen, September 13, 1993). It does

not believe that the pill will be the answer to abortion access in Canada. Taking a pragmatic position, they feel that it may encourage more doctors to perform abortions "'because it feels more like a normalized prescription practice.'" In keeping with the historical feminist position on similar technologies, the Health Collective contextualizes RU486 in terms of the wider question of reproductive services.

Although it does not fall directly into this category, another collective actor worth mentioning is the Canadian Advisory Council on the Status of Women (CACSW). While concerned with women's status in general, the Council does make recommendations on health issues. In the case of RU486, CACSW president Glenda Simms (November 6, 1992) submitted a letter to the Minister of Health, Benoit Bouchard, recommending that Health and Welfare Canada extend an invitation to Roussel to apply for Canadian trials of RU486. Noting the interest of the various medical groups, provincial governments and Canadian citizens, CACSW presents justification for their recommendation which is very similar to SOGC: the pill has been used successfully elsewhere; it may be a viable alternative to surgical abortion in a country where abortion is legal; it may be an effective morning after pill; it may eliminate anti-choice harassment at abortion clinics; and it may be used in other medical applications. CACSW suggests that the government might show Roussel the results of a Canadian poll indicating that 79 percent of Canadians surveyed believe that abortion is a medical decision that should rest with the woman in consultation with her physician as evidence of a

supportive abortion climate. The actions of these women's health groups seems to be targeted at increasing discussion of RU486, not necessarily at its wholesale acceptance or rejection.

The Government, Drug-Regulation Agencies, and Politicians

Governmental action in the RU486 controversy has differed widely from a federal to a provincial level. Nationally, RU486 has been virtually ignored with a "business as usual" attitude. The one action that the government could take, and has been urged to take, is to invite Roussel to apply to test the drug in Canada, a breach of protocol which requires the initiative to come from the drug company. For the past five years, federal health ministers through two Canadian governments -- first Conservative Jake Epp, and then Liberals Benoit Bouchard and Diane Marleau -- have refused to take this step. Their response to pressure from the pill's proponents is simply an unemotional deferral to established policy and a suggestion that they lobby the manufacturer (Gold, June 12, 1994). In the U.S., President Bill Clinton made such an extraordinary request to Roussel in the second day of his presidency, inviting them to begin testing in in the U.S. ("News summary," February 25, 1993).

The difference between the U.S. and Canada is the political value of taking a stand on abortion. In Canada, abortion has long been considered a taboo issue, too controversial to deal with (McLaren & McLaren, 1986). According to Tremayne-Lloyd and McKee (1994), Bill C-43, the conservatives'

attempt to recriminalize abortion, was opposed by both sides of the debate. Prochoice groups objected to giving the doctor complete control over the process and thought that many doctors would withdraw services if the bill were passed; antiabortion groups felt that it would result in unlimited access, or "abortion on demand." Kim Campbell, Justice Minister at the time,

> 'questioned whether any government would ever be successful in passing a national abortion law' and indicated that 'the government is not aware of any other way to write an abortion law that would be acceptable to both sides of the issue and also avoid violating the Charter rights of women.' (Tremayne-Lloyd & McKee, 1994, p. 2248)

In typical Canadian fashion, the response to such a dilemma was to have no legislation at all. Though this lack was initially perceived as possibly easing the way for the pill ("Firm may seek," October 2, 1988), such has not been the case. The politically valuable strategy of appearing neutral on the abortion issue could be reinforced by the government's stance on RU486. By declining to invite Roussel to test RU486 in Canada, the government does not appear to be seeking increased access to abortion; by following established practice, it does not appear to be preventing access.

Because the defeat of the attempt at federal legislation left the matter for the provinces to decide, it is not surprising that provincial politicians have been most active in their constructions of RU486. Their unofficial leader is Ontario's Minister of Health, Frances Lankin. Her prochoice NDP government established the Task Group of Abortion Service Providers, which prepared a report on Access to Abortion Services in Ontario (December, 1992). The report presented use of antiprogestin drugs like RU486

as one method of improving access to abortion (p. 25). It recommended that:

> 43. The Ontario Medical Association, and other professional associations encourage Roussel Uclaf to submit an application to the Canadian government for the testing and approval of RU486
>
> 44. The provincial government, through the Ministry of Health, urge the federal government to expedite testing and approval of antiprogestin drugs in Canada once application is made.
>
> 45. The Ministry of Health guarantee that antiprogestins and the requisite counselling and services will be available free of charge when approved.

Claiming to speak for provincial health ministers (although it is unclear when and how this support was given), Lankin called on Health Minister Benoit Bouchard to contact Roussel and convince the company of the positive Canadian social and political climate (Harper, July 22, 1992). Unlike requests made by other proponents of the pill, this suggestion would not contradict policy since it would simply mean providing assurance to Roussel should they decide to apply for testing, rather than inviting them to begin testing. Lankin's initial position, that 'they [the federal government] wouldn't shorten the testing period or license without testing, and I agree with them completely on that,'" seemed to be contradicted by recommendation 44, which called for the government to expedite the testing and approval process ("Lankin backs," July 23, 1992). Ironically, while the introduction and use of RU486 as an abortion procedure has been a provincial issue politically, its introduction and use remain under federal jurisdiction.

The Alberta New Democrats (1992) have also established a policy on

RU486 which urges the federal government to speed its approval. They suggest that "in the event that the manufacturer fails to respond to such an appeal, the Government of Canada be urged to invoke the 'use it or lose it' provisions of the Canadian patent law, so that another drug company can act in the best interests of women and science." They propose that the Canadian government follow the French example in which the government threatened to take away the patent rights for RU486 if it were not returned to the market.

While the federal government attempts to remain neutral, federal NDP member Dawn Black, critic for the status of Women, and Jim Karpoff, health critic, have used RU486 as a platform for criticism of its policies and practice. In calling for the distribution of the pill as a means to increase abortion access, Black blames both the Liberals and the Conservatives before them for increasing the need for abortion by cutting funds for family planning education ("NDP backs," June 7, 1993). Karpoff claimed that a significant barrier to the pill's introduction into Canada was the "disarray" of the health department (Harper, July 22, 1992). In both examples, the pill becomes a political weapon for criticizing the government's performance. Continuing with Canadian tradition of abortion politics, socialist groups seem most vocal about RU486 as an minority or women's rights issue.

Canadian Newspapers

One prominent group of actors mentioned but not explored in Clarke

and Montini's 1993 study is the news media. Clarke and Montini point out, among other things, that RU486 sells papers. In Canada, at least twenty editorials alone, not including news stories, appeared in five major Canadian newspapers between January, 1992 and September, 1995. [7] Most of these editorials have assumed a "voice of reason" tone in support of introducing the pill into Canada, often criticizing the federal government and Roussel for failing to act, as well as the vocal minority of antiabortion activists whose actions are perceived as infringing on a woman's right to choose. For example, a May 23, 1994, Toronto Star editorial closes with this indictment: "Unfortunately, the government and the drug manufacturer are putting a higher premium on the ability of the antiabortion lobby to make waves than they are on women's health care" ("Abortion pill"). Part of this rhetoric is an attempt to strip away the political constructions of the pill and view it simply as a "technique" which "should not on its own make abortions 'easier' or less morally difficult" (Sheppard, July 22, 1992). Opponents' views of the pill appeared exclusively in guest editorials and columns. Of those twenty editorials, four (three of which were different versions of the same article) presented reservations about introducing the pill, all drawing information from Raymond et al. (1991). In general, the press has been in favor of introducing RU486 into Canada, often using the democratic ideology of freedom and choice, platforms dear to their profession.

Users and Consumers

Because the pill is not available in Canada, users and consumers of RU486 remain only a potential social group in the controversy. The only Canadian woman who has come forward to claim to have used the abortion pill felt that it was preferable to a surgical abortion (Sanger, May 30, 1994). The 28-year old woman, who had previously undergone a surgical abortion, said "'it doesn't inconvenience one's body to anywhere near the same degree . . . and psychologically too -- a medical intervention with an anaesthetic, on a table with medical implements invading your body is much more traumatic'" (Sanger, May 30, 1994). For her, the pill was both a psychological and physical improvement over surgical abortion.

Canadian polls have been conducted on the general public, including potential consumers of RU486, and their results indicate a growing number of Canadians believe the pill should be legalized in Canada. In 1988, 55 percent believed the pill should be illegal, 35 percent believed it should be legal, and nine percent were undecided. In a poll released October 15, 1992, the same question yielded the following response: 45 percent believed it should be illegal, and 48 percent believed it should be legal. Support for the pill appeared highest in British Columbia and Ontario (both with NDP governments) and lowest in Atlantic Canada. Of the women that were surveyed, 45 percent said the pill should be legal as compared to 52 percent of men ("48% want," October 15, 1992).

However, the question is not only how women themselves act in

constructing the technology, but also how others' constructions or interdefinitions of women as users and consumers define the technology. While the actions of women as potential users have not been apparent, all of the other actors have mobilized constructions of them to advance their views. For example, antiabortionists construct potential users as actors who need to be protected from the exploitation of pharmaceutical companies, drug companies construct them as problematic consumers because of the controversy surrounding their ability to reproduce, and prochoice groups construct them as embracers of a new technology that will meet their needs as consumers. As a potential constituency around a "potential" technology, the actions of Canadian women as users and consumers of RU486 remain an unknown that could have a significant impact on the controversy surrounding the technology's development and diffusion.

Conclusion

Because it enters the highly charged and visible political area surrounding reproductive technology and abortion in Canada, RU486 presents an opportunity to explore the relationship among society, science and technology. Clarke and Montini's STS-based model allows us to map out the significant heterogeneous actors which occupy the sociotechnical space surrounding RU486. These actors can be characterized according to their various constructions of RU486, which itself emerges as a multi-faceted nonhuman actor rather than a singularly defined object. One of the

advantages of their approach over the ANT approach is its ability to deal with questions of distribution by including the actions of all actors rather than those presumed most powerful.

Methods used in Latour's ANT can also enrich Clarke and Montini's approach by clarifying how actors' representations become forms of action, from the self-effacing role of Roussel and the federal government, to the unambiguous mobilizations of antiabortion and prochoice groups. Some of these collective and individual actors attempt to stabilize the technology according to their particular perspective, using representations of the technology and other actors and negotiating alliances and meaning with other actors, while others, such as fetal tissue researchers and users, appear only as they are implicated, directly or indirectly in its development and diffusion. At the same time, ANT highlights RU486 as a nonhuman actor, responsible for creating and shaping the links between human actors as well as nonhuman actors, including the prostaglandin with which it is administered and the methotrexate and misopristol combination used in its place. ANT focuses on how actors attempt to settle these controversies and develop contingently stable networks around them.

Cowan's work on gender and reproductive technology effectively supplements Clarke and Montini's STS-based model. It makes explicit the connection between abortion technology and other reproductive technology, and raises pertinent questions about the role of women in shaping technological artifacts, as well as how those artifacts serve to shape women's

experience. Her work intensifies the focus on the gender-sensitivity of reproductive techologies and begins to examine the decision-making process surrounding them.

The Canadian historical context for RU486 presents a useful opportunity to problematize the methodological concerns surrounding the distinction between the developmental and diffusional phases of a particular technology and how they might be accommodated within the sociotechnical model (see Appendix). Because the pill has not yet entered clinical practice in Canada, it occupies an ambiguous position between these two stages, a sort of virtual sociotechnological space. While it is clear that representations of RU486 have become enmeshed in wider social relations, its physical absence challenges the traditional notion of diffusion. This absence also raises the question of potential constituencies into the sociotechnical model: those concerned with how RU486 might potentially be used, its potential users, and even the pill itself as a potential actor. The distinction between development and diffusion is blurred further when one recognizes that all public information regarding the pill might be considered scientific or internal (in the absence of clinical use) despite the fact that the pill and its scientific knowledge claims have already been the focus of much public discussion and social negotiation. Finally, the public discussion surrounding the pill's potential use also raises questions for the sociotechnical model in relation to the study of new technologies and the possibility of the theorist taking a more active role, as Cowan does, in suggesting how policies surrounding their use

should be decided and by whom. While the particular historical position of transitional technologies precludes the tidy explanation possible in examining closed controversies, it allows for a productive description of the messiness of sociotechnical relations, and an opportunity to focus on these special theoretical and methodological concerns.

Chapter 2: Theoretical and Methodological Issues

Bowden (1995) outlines the two most common conceptions of "method" as they occur in STS writing. The first has to do with data collection and analysis, where importance is placed on studying a particular science and technology topic by selecting appropriately from a variety of methodological tools. The second conception deals with methods of explaining the data collected. This chapter focuses primarily on the second conception, discussing more theoretically those tools which have been practically applied in chapter one with the clear understanding that the method of explanation often determines what collected data will be deemed admissible or relevant. While the immediate context is the RU486 sociotechnical network and the study of reproductive technology, I am also interested in viewing these in terms of a transdisciplinary discourse applicable to the wider issues of sociotechnical analysis.

In order to understand the methodological concerns of the sociotechnical network involving RU486, this chapter begins with a brief discussion of Latour's philosophical work, moving to its methodological articulation in actor network theory (ANT). Some possible limitations and useful additions regarding the application of this theory, particularly those relevant to studying reproductive technology, are addressed using the work of other STS authors like Fujimura and Starr, whose work also appeared in Clark and Montini's study. To focus the discussion more explicitly on

reproductive technology, I introduce Cowan's research on gender and technology, including the implications for policy surrounding these types of technologies. Finally, I return to the theoretical issues arising from the case study of RU486 in light of this discussion of ANT, its possible critiques and extensions.

Setting the stage

Latour is one of the few STS theorists who devotes a significant amount of his writing to an explicit discussion of the philosophical and theoretical basis for the sociotechnical approach, laying the foundations for empirical research projects such as mine. He is realistic enough to understand that "empirical studies would never do more than scratch the surface of beliefs about science," beliefs which hold that there is something objective in science which escapes social explanation (Latour 1988b, p. 153). His philosophical discussion fits into the framework of two broad arenas of analytic inquiry with a gradual shift in focus from science to technology. The first is epistemological and concerns the status of scientific knowledge: what can we know and how do we know it? The second has to do with the character of society and social relations: what is it that holds us all together or perhaps, better put, what is the nature and function of the social link? The answers to these questions form the basis of Latour's ANT, a methodological approach which attempts to describe sociotechnical innovation by handling data in a symmetrical way and providing possiblities for reducing that data to

more empirically comparable variables.

Latour's early work focuses on deconstructing the distinction between the two epistemological orders of knowledge: what we can know about the "objective" world (the realm of the natural sciences) and what we can know about the "subjective" world (the realm of the social sciences). Latour asserts that we must assume an "agnostic" position toward science (Latour and Woolgar, 1979), which cannot be studied with reverence for the content of its truth claims as though they represent some transcendental order of pure and exact knowledge that can be contrasted with the challengable and contingent claims of the social sciences. Based on his empirical research of "science in action" and similar work performed by his peers, Latour (1991a) comes to this conclusion:

> The whole edifice of epistemology, clichés of scientific method about what it is to be a scientist, the paraphernalia of Science was constructed out of science-made, out of science-past, never out of science in the making, science now. (p. 7)

"Science-made" is that which has achieved unproblematic truth or "black box" status. It is what we usually think of when we consider science in a conventional way, those incontrovertable and often taken for granted facts about the natural world that scientific experimental method has accumulated. This black box is, however, only the final product that is shipped outside the scientific community and presented as objective knowledge: truth discovered, tested and verified. It is when we look at the process of making the box, at what scientists *really* do rather than what they

profess to do, that the contingencies, negotiations, and controversies of its constitution become visible.

Latour claims that natural scientists do not work on "nature," nor are their methods "objective" because they deal with transcendental or transparent objects. Scientists work with other scientists, instruments, representations, and a great deal of heterogeneous material. They work with "nature" only in that they mobilize resources coming from nonhumans in order to act on their colleagues, to interest and convince them of the validity of their truth claims (Latour, 1991a). They are also engaged in processes of representation and create various inscriptions (models, photographs, slides, reports) which they add to their resources, texts that other scientists must interpret and evaluate. As Lynch and Woolgar (1991) point out, these documentary resources are "more than simply representations of natural order;" they are a rich repository of "social actions" (p. 5). In science in the making, statements or propositions do not acquire the status of scientific fact because they *are* true; they become true with successful moves to stabilize the controversy around them (Latour, 1981). "Nature" is not revealed, but constructed, composed and decided upon in the networks built by various trials of strength and weakness, as the scientist who struggles to mobilize heterogeneous allies that support his claim does battle with colleagues who seek to deflect and modify it. Though I will elaborate later on Latour's specific formulation (ANT) of how networks of power, knowledge and truth are produced in the laboratory setting and elsewhere, the general claim is that

it is only when consensus is reached, after people have been convinced, that you have science-made which appears to be "natural" or "objective."

Latour's epistemological deconstruction of science serves as the basis for his discussion of the social link, or the question of heterogeneity. It is here that the tables turn on the social sciences. If science cannot be understood on a purely "scientific" level but must also be understood in terms of the social and subjective processes which permeate it, then the converse should also apply. Social theory cannot be undertaken only in regard to social or subjective relationships ("subjects"), but must also consider the presence of things-in-themselves ("objects") and their reciprocal association to human beings. While the significance of science and scientific production dominates the discussion of the initial epistemological reconceptualization, the shift in focus toward a theoretical reworking of the social link involves a greater emphasis on the role of technology and technological production. Latour explains how social links are composed of the heterogeneous associations between humans and nonhumans and how such links might be conceptualized.

Latour (1993) believes that, in order to see what constitutes the social link, we cannot begin with bi-polar relations, since these are purifications which arrive on the scene later, but rather with the "seamless web" of humans and nonhumans, subjects and objects who interact with each other in relations of power (not the centralized power of Society or Nature which is diffused, but networks where power is an effect rather than a cause): as social

representation and natural representation become inextricably associated. Law (1991) concurs with Latour in his discussion of the concept of a sociotechnical order, where he pronounces that "to the extent that society is held together at all, this is achieved by heterogeneous means" (p. 6). Instead of focusing on the "nature" of various disciplines and the differences between the natural and the social sciences, Latour finds it more useful to look at the way both construct their knowledge claims within networks of practice and circumstance.

The theoretical articulation that recognizes this heterogeneity is the principle of symmetry, previously used in the sociological of science and technology to treat various bi-polar relations such as truth/falsity or rational/irrational in the same terms. Latour (1987) extends this symmetrical treatment to an ontology of humans and nonhumans. Latour and Callon (1992) explain:

> Our general symmetry principle is thus not to alternate between natural realism and social realism but to obtain nature and society as twin results of another activity [network building] that is more interesting for us. (p. 348)

In actor networks, there is no a priori distinction between nature and society, behavior and agency, people and things. Humans and nonhumans are equivalent objects of analysis whose roles and capabilities are attributable only as they occur within sociotechnical networks. Symmetry means looking at how agencies are distributed between human and nonhuman actants through mutually defining association, at how nature and society are

coproduced, rather than how one determines the production of the other. With his epistemological deconstruction and concept of heterogeneity, Latour lays the philosophical groundwork for a sociotechnical model which studies the connection between society and technology, human and nonhuman actors.

Understanding Actor Network Theory (ANT)

The methodological result of Latour's philosophical stance is actor network theory (ANT), which focuses on how the negotiation of scientific controversies moves from the laboratory to wider society. Even though most of Latour's work concentrates on empirical analysis of laboratories, Schaffer (1991) notes that his methodological practices move outside "their original setting of production . . . [and] help extend the sociological understanding from the lab to other sites of knowledge and power" (p. 190). ANT provides a new perspective on how power (society) is created and how relations of domination are established and maintained. Since most of my discussion until now has been of a general nature, I would like to move to a more concrete description of how Latour's conceptualization of the social link might be applied methodologically to describe a specific sociotechnical network and then make some related comments about what sites are suitable for this type of analysis, what kind of data is deemed admissible, and, finally, how to speak symmetrically about the various kinds of data.

In his article "Technology is Society Made Durable," Latour explains in

detail the nature of the human and nonhuman links in terms of technological innovation (1991b). He begins with the simple example of a European hotel manger who wishes guests to leave their hotel keys. The manger gradually achieves the compliance he desires first by asking guests orally to return keys, then by placing a sign in the rooms and finally by enlisting the help of an innovator who suggests attaching a large weight to the key. If someone forgets the initial request or cannot understand the language of the sign, the statement loses its force. With the third innovation however, the heavy object loads the statement and elicits a more predictable result from all guests; the statement becomes realized. In achieving domination, heterogeneous alliances have been made between hotel managers, innovators and large metal weights.

This example illustrates that the force of a statement ("anything that is thrown, sent, or delegated by an enunciator," not necessarily a linguistic construct but possibly an object, institution, etc.) is not enough to predict its path through a context since it is reflexively dependent on what successive receivers do with that statement (Latour, 1991b). Put another way, the program of a particular actant is dependent on its ability to respond to the antiprogram of its receivers. Successive programs become established which counter an increasing number of antiprograms, enlisting more and more allies, until the path of the statement becomes increasingly predictable and a level of dominance, compliance, or predictablility is achieved. This gives an impression of reality in the form of a correspondence to intention and result.

Most guests leave their keys as requested, and it appears that they do so of their own accord.

However, something has happened in the meantime. The final statement is very different from the initial order to be obeyed: "it has been *translated* not *transmitted*" (1991b, 105). What started as the request to leave keys at the desk has been displaced, so that guests are now forced to leave their cumbersome keys without thinking. Keys become specific objects: "European hotel keys" and guests become a collective of "key-returning subjects." As the statement becomes mobilized, text and context coproduce each other with successive translations until this network of actants becomes stabilized in a form of disciplinary power à la Foucault. Power or dominance, therefore, cannot be thought of as being a possession of any of the actants involved, only of the network itself.

In order to uncover what constitutes the final statement or reality we must reconstruct both the chain of speakers and their statements and the transformation of speakers and their statements; since neither is directly revealed in the final 'black-box" product, but exist as a foundational network (Latour, 1991b). Latour (1991b, Latour, Mauguin & Teil, 1992) suggests that this might be thought of graphically in terms of an association/substitution relation, a linguistic syntagm/paradigm relation, or even more simply as an and/or relation where the first element of the relation occupies the horizontal axis and the second, the vertical. The mobilization of any particular program can be traced as it travels along these axes, so that while

the statement remains intact the graph is horizontal and where the statement undergoes a translation the graph moves vertically to reflect a different text/context, program/antiprogram constitution. The changes of all actants, guests and keys, human and nonhuman included, are interwoven in recording this gradual transformation. It is important to stress that success depends on constantly maintaining the full succession of accumulated elements, since the appearance of reality is dependent on this accumulation (1991b, 109). In other words, take away the oral and written instructions and guests will end up carrying the key-weight combination with no notion of what the manager's intentions were. These visual depictions can be used to describe the accounts given by various actors and then as points of comparison between actors' accounts.

Power in this model is seen a decentralized phenomenon which does not diffuse from a central source but as a result of negotiations and associations among actants, both nonhuman and human, technical and social. We cannot speak of power residing in statements crossing a social context since what they are or will become depends on this context. Likewise, it is impossible to explain the success of a program (technology) in terms of the power of stable interested social groups who resist or accept statements (constructions) since these groups are deeply changed and often constituted as a result of the innovation. Similarly, we can make no distinction between the power composed through various relations. The weighted key is just as attached to the ring as the manager is to his keys, or the forgetful guests to

their keys. The physical, emotional or financial nature of the links does not matter; all links are relative and can be compared only on the basis of strength or weakness. Take away any of the links and the network is destabilized relative to the strength or weakness of the link.

This simplified example serves as a model for the type of heterogeneous network composition which Latour first uncovered in his deconstruction of science, a formulation which he believes characterizes all social links and power relations. The network does not contain only humans or nonhumans, but whatever resists trials and makes it strong. It is no different for a scientists who depends on petri dishes and colleagues, and the manager who depends on metal weights and innovators.

The most appropriate sites for ANT are areas of technological innovation, usually surrounded by controversy, where the coproduction of science, technology and society is clearly exposed. It is in these cases, where maintaining the traditional lines between nature and society is no longer a productive strategy to explain what is happening, that the symmetrical treatment of Latour's sociotechnical networks is crucial. ANT attempts to capture the microanalytical negotiation involved in establishing monopolies of power or strong sociotechnical networks. Unlike systems theory, which presents a contained or closed unit, network theory allows for the movement from local explanation or microanalysis to global explanation or macroanalysis. The network can be extended: "it does not represent a fixed point in time and space but a specific exploration of sociotechnical space"

(Latour, Mauguin & Teil, 1992, p. 34). Latour breaks down the distinction between these concepts as separate forms of analysis as he details in the same study how it is that "micro-actors" simultaneously become "macro-actors" by successfully mobilizing their claims, enlisting allies and translating others' interests into their own. These actors do not work within a confined space of the laboratory, but seek to extend their action outward, mustering whatever resources they can. Cases of technological innovation are also productive sites because, as Scott (1992) points out, they offer an excellent opportunity to observe actors pursuing their interests from remote locations. Technology is at the same time a means to extend power relations and a material representation of those power relations.

The data which can be used in constructing the network is limited to "observables," or empirical data. Latour (1992) explains:

> [T]he only observables are the traces left by objects, arguments, skills and tokens circulating through the collective. We never see either social relations or things. We may only document the circulation of network-tracing tokens, statements and skills. (p. 251)

This differs from social realism and natural realism, which begin with an unobservable or assumed state of society or nature, rather than viewing these states as consequences of negotiation within networks. Latour (1987) locates these observables in actors' scientific and lay accounts of their practice, in which they are constantly defining each other. The accounts are read non-ironically without a priori assumptions about what is important or negligible. One method of comparing them is to formulate sociotechnical

graphs described above which depict the number of actants and the predictability of their behavior in a specific situation. Scott (1992) and Carlson & Gorman (1992) point out that, as more accounts are included, the network appears to gain a higher degree of instability and, in macro-controversies, sometimes becomes too complex to reduce to the horizontal/vertical axes of program/antiprogram.

ANT's radical ontology requires a symmetrical vocabulary which does not differentiate between human and nonhuman capacities.[8] For example, because of the distinctly human qualities and intentionality associated with the term "actor," "actant" is used to indicate "whatever acts or shifts actions, action itself being defined by a list of performances through trials," effacing any perceived ontological difference (Akrich & Latour, 1992, p. 259). While ANT attempts to use this undifferentiating term, Latour (1992) has indicated that the difficulties of such usage are significant because of our deep-seated belief in the divide between human and nonhuman. Close attention to language is crucial to Latour and his colleagues: changing the language of analysis is not just a matter of substituting one word for another; it is an attempt to confront modernist sensibilities about the representation of things and people.

Latour (1991a) is convinced that the STS program of integrating nonhuman and human actors in social theory will become the "centrepiece of the social sciences" and the site for their rejuvenation. During the last two

centuries masses of nonhumans have entered our daily lives and, with them, many questions that cannot be answered by a political philosophy which distinguishes between the social and the natural. For example, do we turn to natural scientists or sociologists to answer questions such as these: "Are we authorized to do with human embryos what we do with cow embryos, that is, freeze them, implant them, manipulate them?"; or perhaps, "What is a safe level of radiation from nuclear tests in the Nevada desert?" (1991a, p. 4). These questions seem to populate an uncharted space for social theory while at the same time they serve as some of our fiercest battlegrounds. A theory which does not distinguish between human and nonhuman actors is essential for attempting to deal with political and ethical problems in which neither science nor technology can provide clear-cut answers. According to Latour, if our world is a confused melting pot of many forces, then it must be studied as such.

Considering Relativism

One of the most frequent criticisms of STS approaches like Latour's stems from what is considered its depoliticizing relativism or epistemological scepticism (Russell, 1986). The fear seems to be that "unless our empirical knowledge claims are ultimately grounded in absolutely certain basic beliefs there would be no good reason for endorsing one empirical claim over another" (Tibbetts, 1986, p. 47). However, if we reconsider the transcendent notion of cognitive justification and translate it into a matter of social

coherence or a network-based model like Latour's, the notions of epistemic certainty become quite dispensible. Just because they no longer denote a privileged epistemic viewpoint, "basic beliefs" do not disappear. What changes is how they came to acquire their legitimacy since, as Latour illustrates, "relative to scientist's selection criteria and negotiations some claims come to be seen as (contingently) basic" (Tibbetts, 1986, p. 48). It is not that there are no basic beliefs, it is just that these beliefs must be seen to rely upon a foundation of contingent claims which together allow for the strength of the network and its apparent reality.

John Law (1991) also explores the question of relativism from two perspectives: rules of method and the question of ethical and political commitment. He argues that, in denying the primacy of scientific method, Latour is not suggesting that all knowledge claims or methods for producing them are equal. The universal method is replaced by local conventions about how to go about producing good knowledge, not an "anything goes" attitude. To be a relativist is not to deny that one is "constrained and enabled by theories or practices about what should count as a satisfactory argument," which means that Latour does not undermine his relativist position by asserting the truth claim of his own discourse (Law, 1991, p. 5). Latour (1988a) does not agree with the "possibility of creating knowledge out of nothing," as Hacking (1988) suggests, but rather emphasizes the notion that all knowledge is constructed (through translation, transformation or transport) out of pre-existing material, in practice or theory, in some areas of

society.

As Lynch and Woolgar (1990) point out, "criticism involves competition between representations, not between a representation and an 'actual object'" (p. 13). Latour's relativism does not mean that he has no convictions, for this is obviously not the case. He merely acknowledges and assumes his position among negotiators whose beliefs and methods for establishing truth compete with his own but in the end are not likely to be all that idiosyncratic from his (Latour, 1991a). Just as methodological commitment is possible in the context of epistemological relativism, Law argues that it is equally possible (though not necessary) for a theorist to maintain political and ethical commitment. To recognize what he calls "multivocality," or multiple perspectives, is not to display a commitment to immorality and opportunism. The lack of universal standards does not mean that locally we cease to distinguish truth from power, persuasion from force, right from wrong. Lynch and Woolgar (1991) argue that the very nature of Latour's methodological approach is critical, if only by innuendo. Because he refuses to acknowledge the epistemological distinction between representation and object, Latour implicitly criticizes modernist discourse which relies on this distinction.

What seems to be happening to the question of critique in Latour's work is a shift in focus from an explicit discussion of how we, as researchers, can place truths in some sort of heirarchy, to a description of how these truths achieve heirarchical status as they are constituted in society. It focuses

on the heterogeneous "engineers," the people (and nonhuman actants) out there who are involved in the negotiating, shaping and building of networks which create our world. Nevertheless, this does not mean that the researcher must maintain a "neutral" position, which is of course impossible, but rather he or she retains the ability to take part in these negotiations of truth since his or her discourse is one force among the many inescapably enmeshed within the very relations which he or she describes. Latour (1991b) believes that "forbidding oneself to exit a network does not entail forbidding oneself to judge" (p. 128). What becomes possible is an immanent critique (based on the degree of convergence and divergence in actors' accounts of themselves and others) which refuses to transcend the network in which it is constituted. Latour asserts: "If the capability of making judgements gives up its vain appeals to transcendence it loses none of its acuity" (p. 130). For Latour, relativism entails positioning one's own truth claims, as well as having them positioned amongst other competing claims.

A more legitimate problem of ANT's extreme relativism is its inability to distinguish which actors' accounts to include in constructing sociotechnical networks and how to assess their value. Scott (1992) and Carlson & Gorman (1992) point out that, as more accounts are included, the network appears to gain a higher degree of instability and, in macro-controversies, sometimes becomes too complex to reduce to the horizontal/vertical axes of program/antiprogram. Furthermore, Scott notes that the reliance on texts involves problems of coding by the observer and the

assumption that texts serve to record rather than affect action, which is in fact counter to what Latour himself has proposed. He suggests that Latour focus on the various accounts of one actor rather than the intersection of several actors. Another possibility would be to create multiple networks based on various readings of actors' accounts, perhaps constructed by various researchers.

A final criticism related to that of relativism is the assertion that, in abandoning epistemological certainty, Latour's empirical research abandons explanation in favor of description, privileges the "how" over the "why" (Shapin, 1988). Latour (1991b) argues that by displaying a sociotechnical network, by "defining trajectories by actants' association and substitution, defining actants by all the trajectories in which they enter, by following translations and, finally by varying the observer's point of view," the explanation will emerge once the description is "saturated" (p. 129). The "how" and the "why" are not distinct operations but co-evolve with text and context, so that, if it is not possible to answer why, it is only because more description is needed to fill out the composition of the network. When it is possible to speak in terms of effects and causes, it is because a stable network is already in place.

Adding to ANT

Latour's model has been used and enhanced by many gender studies scholars working within STS, including some of those who influenced

Clarke and Montini's study. Their contributions are useful in extending network analysis to the case of reproductive technologies, particularly in connection with new reproductive technologies such as RU486. Generally, these theorists find Latour's model deficient in two important ways. First, it fails adequately to integrate the existing sociotechnical relations which have an impact on the development of a new technology. Second, its focus on the most powerful actors does not accommodate questions regarding distribution of power and resources. These inclusions are critical in reproductive technologies which enter into a complex existing historical, social and political context where women, as users of the technology, often remain a silent or potential constituency.

The existing context into which new technologies enter has undeniable consequences on the development or diffusion of that technology. Fujimura (1991) contends that the philosophical exercise of challenging the science/society dichotomy by deconstructing the boundaries between inside/outside the laboratory does not eliminate the existing consequences of their construction. Unlike ANT, which presents science/society as outcomes or consequences of social action, Fujimura recognizes them simultaneously as constitutive of social action. Latour (1987; 1988a; 1988b) does not deny that the outcomes are constructed out of previously existing material, that the "context of science is another science," but he does not seem to account for the power of these existing structures to influence the networks he describes.

Scott (1991) believes Latour also fails to account for influences beyond

the laboratory, such as political and economic climates and that he privileges the laboratory over society, giving it greater power to shape outcomes. Latour's allegedly Machiavellian approach neglects the unplanned, unwanted and strategically accidental. By focusing only on the actors, he misses some of the relevant factors because the actors are either unaware of them or unable to reach or engage these macro issues. She uses an example similar to Latour's chronicle of the pasteurization process, the Australian Animal Health Laboratory, to show how interest cannot be accounted for entirely in terms of intentional enrollment and reproducing the laboratory in wider society. A group of scientists had a solution: a laboratory to control the outbreak of contagious diseases. Their next step was to construct the problem and convince relevant parties that the solution was necessary. In this case, the risk of an outbreak could not be substantiated, and farmers were afraid that the disease might escape the confines of the laboratory. In other words, they believed in the prospect of the laboratory reproducing itself, successful enrollment according to Latour, who attributed Pasteur's triumph to his ability to persuade people that what happened in the laboratory could happen outside it. However, for these scientists, the same process of dissolving the inside/outside barrier resulted in failure. While the laboratory is a source of political power, it is not the only source of power, and attention must be paid to the context created by more traditional political sources and circumstance.

Along with others who fall under the STS rubric, Latour is widely criticized for failing to incorporate notions of distribution or power

differential in his studies. Russell (1986) claims that STS approaches like Latour's are fundamentally inadequate because they cannot account for historical options that have been lost in conception (for various reasons including the lack of resources), or voices that were never heard and will consequently be overlooked in an account of technological controversy. Law (1991) calls this a "sampling problem," in that the sites Latour has chosen to study have tended to be characterized by big men, major projects or important organizations. Since Latour's anthropological method follows actors through their networks and does not encourage any critical distance from their point of view, it follows that, if certain distributions (gender, race) are of no consequence to the actor, they become invisible. Furthermore, the powerful actors come to situations with certain attitudes, resources, and strategies: they expect to succeed and go about actively manipulating their environment as managers. As Leigh Star (1991) has shown:

> [T]here are many other actors around for whom/which few or none of these things are true: their resources are few, their strategies restricted, their expectations scaled down. The consequence may be fragmentation, pain and silence--not possibilities that are easily entertained within managerialism. (p. 13)

Within this suggestion of differential attitude and access is an implicit critique of Latour's concept of all networks being equal except in terms of scale or quantity. It is possible that, after a certain point, quantitative difference may be transmuted into qualitative difference (Law, 1991). Though the powerful actors and networks may be quantitatively different from the weaker, they are also at times qualitatively different, and this difference may

need to be recognized and explored in order to account for the establishment and maintenance of great distributions (as well as the possibility of destabilization and dismantling them).

Recent work exploring these qualitative differences has emerged from several theorists within STS who point out the limitation of Latour's totalization of power and universal enfranchisement of otherness. Lee & Brown (1994) suggest that the method of describing society only in terms of domination and resistance, with equivalency between all actors within networks of power, has the potential to push the Nietszchean and liberal-democratic discourses into ahistorical grand narratives. Star (1991) shows how it is possible to act within the network outside the obligatory passage points which are the focus of ANT. She writes:

> [E]very enrollment entails both a failure to enroll and a destruction of the world of the non-enrolled . . . the destruction of the world of the non-enrolled is rarely total. (p. 49)

Participants' responses cannot be seen simply as domination/resistance but as multiple, including partial commitments and multiple memberships; in short, a marginal multiplicitous self positioned somewhere between standardized experience and local experience, simultaneously belonging and not belonging to specific sociotechnical networks.

In some networks, we are labelled as actors; in others, we are the Other, the as yet unlabelled actor whose position in the network cannot be fixed. Borrowing from chaos theory, Lee and Brown (1994) term the actions of the unlabelled actor "fractal strategies," and distinguish them from resistance in

that they operate beneath the resolution of power (often through indifference) and have indeterminable consequences. Focusing only on the definable actors ignores this "deterritorializing, rhizomatic movement of irrevocable splintered entities in their half-realized fractal strategies" which, even if registered, would not be enough to predict their behavior. There is no network building here, only the observation of "the impacts of events which are indiscernible outside of their own drawing, of preserving a place for an irreducible otherness at work in the very heart of every multiplicity" (p. 787). This feminist theory provides an alternative model of heterogeneity which supplements Latour's delegate/discipline sociotechnical approach in order to recognize the uncertainty and the movement in apparently stable networks: the fractal strategies that have yet to be translated, and those that refuse translation.

Fujimura (1991) suggests looking at those who have not had an opportunity to speak or questioning how their concerns were eliminated in the process of negotiation. The goal would be to encourage these silenced actors to do the work of social scientists (work that Latour claims is continuously being done), to present their own representations and address the representations of others in hopes of creating a greater multiplicity of accounts, generating new methods of representation, and increasing negotiation between perspectives. Secondly, she suggests that we do not become trapped in an endless spiral by limiting ourselves to writing agnostic, reflexive texts in order to challenge the limits of textual representation, but

rather that we acknowledge our position. As Shapin pointed out, like those of other actors (including scientists), our texts are political: they involve choices which are made based on what we hope to accomplish. Fujimura (1991) writes:

> I want to examine all practices, activities, concerns and trajectories of all the different participants -- including nonhumans -- in scientific work. In contrast to Latour, I am still sociologically interested in understanding why and how some human perspectives win over others in the construction of technology and truths, why and how some human actors will go along with the will of other actors, and why and how some human actors resist being enrolled . . . I want to take sides, to take stands. (p. 222)

While she suggests the philosophical value of Latour's approach, she is not willing to assume an agnostic position nor is she content with implicit critique or allowing explanation to emerge in description. Whereas Latour asks us to see explanation and representation as properties of networks and the work of other actors, Fujimura wants explicitly to acknowledge her role as a sociologist using sociological theory in constructing representations and explanations.

The theory of technological historian Ruth Schwartz Cowan adds another dimension to Latour's sociotechnical model. Similar to Latour's networks and the technological systems of other STS theorists, Cowan's sociotechnical systems outline the historical development of technological artifacts, researching the social, economic, and scientific conditions around those histories. Like Fujimura, Cowan wants to "take sides" in constructing her technological histories; she wants to influence policy and, she is

particularly concerned with human agency. For the most part, Cowan has focused on the technologies used by women and the role of women in constructing these artifacts, from mundane household technologies such as the dishwasher (1983) to her most recent work on genetic technologies, prenatal diagnosis, and reproductive medicine (1992; 1993). She stresses the necessity of looking at these technologies in a wider historical context which includes the motives of innovators structurally encorporated into the technology, the technology's embedded objectives, revealed by examining the social world in which the technology was produced, and finally the unintended consequences which result once the technology has been diffused. Like Latour, her discussions occupy the area of mixed questions, where decisions cannot be made by a philosophy that distinguishes matters of science and society. However, Cowan makes a clearer distinction between the development and diffusion phase of a particular artifact and assumes a more active role in developing policies to deal with these mixed questions or sociotechnical dilemmas.

For Latour, there is no difference between the way that knowledge is constructed inside and outside of the laboratory: "scientific" truths are socially negotiated before they are shipped out of the laboratory in their objective black box. Knowledge leaves the laboratory in the form of technologies which become subject to a similar social negotiation in actor networks, at the same time serving to constitute these networks. The movement from inside to outside is not characterized in terms of

development and diffusion but as a series of programs and antiprograms, regardless of whether these change the construction of the technology physically or not. Latour (1991b) derides diffusionists for considering certain changes superficial in comparison to the essential form of the developed technology; the only essence of the technology is its total existence.

Cowan (1992; 1993) distinguishes between the developmental and diffusion stages of a particular technological system to ascertain the significant actors involved at each stage. In the developmental stage, a technological system is characterized by rapid changes, a narrow application and ongoing testing. In the diffusion stage, its form is relatively fixed, its application is spreading and its use is becoming routine. In the diffusion stage, the technology becomes enmeshed in wider social relations. As the technology moves from development to diffusion, the powerful actors or decision-makers change. Despite Latour's objections, the early stages of network building could be likened to a developmental phase where the number of actors involved is small and change is rapid, and the later stages where the network expands and becomes more contingently stable likened to a diffusion phase. This comparison becomes even less objectionable if we also assume that essential changes are possible at any phase, as newer diffusionist theorists like Cowan do (Crowley, 1994). While Latour's work deals with how a technology reaches a relatively fixed form, ANT, particularly as it is supplemented by the other STS scholars I have discussed, offers the potential to extend this type of analysis to see what actors, primarily

users and consumers in the diffusion phase, do with technologies at the limits of the network: how they give body to the technology and reciprocally how their existence is specified by its introduction and use.

In the case of reproductive technology, Cowan (1992) differentiates between the closed internal feedback system of the scientific social world which characterizes the developmental stage and the release of information into a wider social context through the medical social world active in the diffusion stage. In a medical technology's development, the most powerful actors belong to the scientific social world, including scientists, technicians, suppliers, laboratory directors; in its diffusion, the most powerful actors belong to the medical social world, including practitioners, patients, technicians, families, nurses and third-party payers. While the scientific actors have more power in synthesizing the drug, the medical system has more power over individual and group decisions relating to life and death. Cowan is interested in the development of reproductive technologies as they are influenced by women; however, she is more concerned with the social and ethical implications involved as the relatively fixed form enters routine use and becomes enmeshed in wider social relations.

Cowan (1992) is focused on how the public decides about such technologies or the policy and practice concerning their use once they become embedded in a wider social context. In her work on prenatal diagnosis, she suggests that the answer to the mixed sociotechnical question, "what results of a prenatal diagnosis are sufficient/appropriate to warrant termination of

the pregnancy?" can be found in nonnormative feminist ethics which examines what actors do in various situations, how they make difficult decisions. Feminist ethics relies on a complex "narrative of relationships that extends over time" rather than a "math problem with humans" (Cowan, 1992, p. 256). Cowan suggests that the ethical principle of "nurturance matters," drawn from a nonnormative analysis of why various people find abortion justifiable in particular situations, can be used as the basis for decision-making. Nurturance is the day-to-day process of care which facilitates the transition from embryo to infant, infant to adult (feeding, sheltering, protecting, assisting). She explains:

> Indeed, no other human relationships are possible unless nurturance occurs, and thus no moral decisions can or ought to be made unless decisions relating to nurturance are made first . . . [W]hen individuals cannot, for whatever reasons, make decisions for themselves, the person or persons who have the right to make the decisions are those who are nurturing the individual in question . . . [A]n abortion policy constructed in accordance with the principle that nurturance matters is clearly one in which the decision to abort should rest entirely in the hands of the woman who is pregnant. Physicians and others who will have to provide abortion services would, under such a policy, be morally obligated to abide by the patient's decision . . . (pp. 257-258)

According to Cowan's assertions, it should be the users of reproductive technologies that determine its usefulness in the diffusion phase, meaning that the appropriate shift of decision-making power is not from scientists to doctors, but to women as users and consumers. Women must be left in control of their own reproduction based on the practical assumption that they will generally make good decisions based on ethical principles such as nurturance.

Above all, Cowan (1992) argues, decisions regarding the use of reproductive technology should not be left entirely to the government. If governments interfere with scientific research, access to scientific information, or access to abortion, then the rights of the individual will be diminished, not only by medical, but also by governmental authority. While the government is responsible for developing policy regarding these technologies, its role might be limited to facilitating women's decision-making rather than prescribing it.

Cowan's suggestions regarding effective new reproductive technology policy are furthered by her use of the historical analysis of reproductive technologies to predict the future and direct the policy surrounding similar technologies (1993). Using the example of prenatal diagnosis, she illustrates how the sociotechnical system of reproductive medicine has been strongly influenced by women users in the past and is likely to be similarly influenced in the future. She uses the examples of amniocentesis and chorionic villus sampling to show how women have acted to influence technological change, both in the development and diffusion phases. Regarding amniocentesis, a technology she considers "successful" in its diffusion phase, she locates several areas of historical influence: the women who willingly presented themselves as patients, allowing experimental trials to continue, the feminist actors (individual and collective) who sought to reform laws surrounding abortion (the only available therapy for prenatal diagnosis), and finally, individual women actors who sued doctors for failing to refer them for

amniocentesis. The initial patients influenced the technology's development, abortion rights activists paved the way for the transition from development to diffusion, and the individual women helped to insure its diffusion into routine medical practice. For chorionic villus sampling, a technology which is not yet routinely used, women have had a similar influence as patients and abortion activists. However, for other contextual reasons, including the political debate surrounding abortion, the technology has yet to reach its diffusion phase.

Cowan (1993) presents the lessons learned from these histories in terms of future policy options: women can influence the future of prenatal diagnosis because they have influenced its past; women as consumers can act to influence the availability of chorionic villus sampling by creating a demand for it; women activists can act to ensure the legality of abortion which is linked to the outcome of prenatal diagnosis techniques like chorionic villus sampling; groups who believe women are entitled access to chorionic villus sampling can use their political skills to influence national policy; and finally, women as individual actors can pursue legal action based on failure to refer for chorionic villus sampling (Cowan, 1993). The implications of these suggestions for policy making surrounding other reproductive technologies is clear, since chorionic villus sampling could be replaced by any number of existing reproductive technologies.

Returning to RU486

Latour's work is useful in analyzing the sociotechnical space surrounding RU486 because it legitimizes the view that RU486 is a socially contingent artifact rather an objective reality produced within the confines of a laboratory. In doing so, it provides opportunities to examine how attempts are made to stabilize the networks surrounding the technology through the public political processes of inscription, interdefinition and representation. The sociotechnical space surrounding RU486, an artifact embroiled in public controversy and negotiation, becomes both an emerging state of sociotechnical relations and a continuous process of translation or network building.

In its reciprocal critique of sociology which introduces nonhuman agency, Latour's ontological discussion also legitimizes the study of RU486 as a nonhuman actor. He suggests the term actant for both human and nonhuman actors to stress the ability of both, regardless of intentionality, to influence social behavior. As an actant, RU486 not only influences the social groups involved in attempting to shape it as an abortifacient, but it also causes a shift in the wider network of new reproductive technologies, as it is implicated in the issues and concerns surround their development. Other nonhuman actors' actions affect the network surrounding RU486 as well, including the other chemicals linked to its use, the newspapers, journals, and pamphlets which mobilize its representation, and even the embryo or fetus which is aborted. As Casper (1994) has suggested, in the case of reproductive

technology, this particular version of agency extended to human and nonhuman actors has ambiguous results: methodologically, it is useful; ethically, it strengthens the position of antiabortion activists who confer the attribute of agency to fetus. If we consider how RU486 is socially shaped and produced by human actors, we must also consider how it and other nonhuman actors serve to shape and produce the social context in which they participate.

Methodologically, ANT suggests using actors' accounts to trace the negotiation of relations in a particular network. To some extent, this method works for RU486 as actors' public representations can be read as strategies or attempts to stabilize the network according to their interests. For example, Baulieu, the pill's inventor, attempted to link the Canadian context with developments in both the United States and Britain, trying to shift the network depending on which geographical or historical connection seemed most favorable for the pill's success. The network's instablility is reflected in the lack of predictability and uniformity of the participants' accounts, which contain multiple perspectives and actions. The problem comes in attempting to use these accounts originating from a diverse group of actors to graphically depict their behaviors as Latour suggests. How do you depict the response of Hoechst-Roussel in Canada, both the marketers of the pill but at the same time reticent to market it because of the Canadian context, or the work of breast cancer researchers testing the pill for non-abortifacient applications, in terms of two variables, program and antiprogram? The multiple

perspectives surrounding RU486 and the resulting instability of the network resist such a reduction, likely making such sociotechnical graphs incomprehensible. Nevertheless, it might be possible to use this graphic model on a smaller scale to depict the accounts and behavior of single relevant individual or collective actors, and then juxtaposing these graphs to create possible linkages between them.

The concerns with the relativism inherent in ANT can be explored in the RU486 case. Certain truths seem to be accepted as contingently basic, in particular, the consensual assumption that RU486 "works" as an abortifacient. There appears to be little contention between actors around the pill's efficacy, although even this "truth" is challenged by the Fédération du Québec pour le planning des naissances and the Centre de Santé des Femmes de Montréal. For the most part, this basic belief seems to rely on the stability surrounding the international network of the pill's development and use. Differing representations of the pill and competition between them seem to arise based on the pill's diffusion and the moral, ethical, and legal implications of its use. What becomes interesting here is how actors attempt to establish generally agreed upon criteria to stabilize these perspectives in an attempt to convince each other of the validity of their truth claims, their successes and their failures. This relativism does make it difficult to decide which actors' accounts to include as relevant, but it does not seem to invalidate the research, only position it as one perspective (mine) amongst other possible readings. As for privileging description over explanation, it

seems clear that, in describing how the network surrounding RU486 is produced, I am also beginning to explain why that network has failed to stabilize, or why the introduction of RU486 into Canada has been delayed.

The feminist critique of ANT, which suggests that the existing sociotechnical relations may have a significant impact on the development of a new technology, holds true for RU486. The larger network of reproductive technology in Canada provides a context for RU486's development and diffusion, a context which includes, among other things, long-standing controversy surrounding abortion practice, the absence of a criminal law on abortion, and public discussions of similar technologies. This controversy-ridden setting has delayed the introduction of RU486 and similar reproductive technologies. As with Scott's (1991) example of the Australian Animal Health Laboratory, most actors in the RU486 controversy have been convinced that RU486 works as an abortifacient; according to Latour, scientists have been "successful" in enrolling them and convincing them of the truth of their claim. However, this success has also led to strong resistance and antiprograms from powerful social actors, particularly antiabortion groups who are afraid of the consequences of the pill's use in Canada. In addition to the laboratory, other form of political power emerge which influence the pill's succes.

In order to understand RU486 as a reproductive technology, it is critical to move away from Latour's focus on the most powerful actors. The abortion pill enters into a complex existing historical, social and political context

where women, as users and consumers of the technology, remain only a potential constituency. Although other actors have mobilized representations of them, their influence on the technology remains unfelt because of the actions of those who have prevented the pill's diffusion. Even though they may not be the most powerful actors in the controversy, there is value in recognizing them as potential or implicated actors. Furthermore, Cowan's suggestions for policy making surrounding other reproductive technologies show how these consumers, as potential actors, might become more powerful and influence the movement of RU486 from development to diffusion by creating a demand for it.

With recognizing a greater diversity of actors comes the possibility of recognizing a diversity of responses beyond domination/resistance. Various participants in the RU486 network act in ways that cannot be defined as such, positioning them simultaneously as inside and outside the network. For example, Dr. Ellen Wiebe, who has supported the entrance of RU486 into Canada but has used methotrexate and misopristol as an alternative method of medically inducing abortions, or the Toronto doctor who, by obtaining and administering the pill illegally, has managed to bypass the network's obligatory passage point controlling its use in Canada. While neither domination nor resistance, these marginal actions may become significant as they shift and destabilize the network, as well as redefine its borders.

Representations of the RU486 have become enmeshed in wider social relations through the constructions of various actors, including its inventor,

the media, and groups interested in its potential as an actor. Despite its absence in clinical practice, the pill exists in a network of discourse where its constructions (based on scientific knowledge claims and claims regarding its use elsewhere) have already been the focus of much public discussion and social negotiation. The usual complexity reducing node of Canada's drug-regulating agency fails (Bodevitz, Buurma, & de Vries, 1987) because the pill becomes enmeshed in social negotiation before it reaches any diffusion phase and the evaluation of efficacy and safety becomes publicly negotiated. In Canada, the pill has not reached the diffusion phase characterized by Cowan, yet its *representations* have become enmeshed in social relations. The important actors do not seem to be the scientists concerned with its development, nor the doctors who act as gatekeepers in its diffusion. The information regarding the pill has not remained within scientific discourse nor has it entered public discourse through medical practice. In this virtual sociotechnological space, the important actors seem obscured.

The controversy-ridden Canadian context has delayed the introduction of RU486 and similar reproductive technologies, locating them in an intermediary position which cannot be thought of as either a development or diffusion phase, but rather a critical phase of public negotiation surrounding their various constructions that overlaps both its development and diffusion. Although the diffusion of RU486, the artifact itself, was slowed at the Canadian border, the knowledge claims surrounding it flooded across and multiplied in Canadian media. In addition, RU486 has not only influenced

the social groups involved in attempting to shape it as an abortifacient, but it has also caused a shift in the wider network of new reproductive technologies, as it is implicated in the issues and concerns surround their development and diffusion outlined in the RCNRT. As abortion becomes inextricable from other reproductive technologies, the development and diffusion of new abortion technologies will be partially dependent on the wider context of reproductive technology, just as other technologies, such as prenatal testing and fetal tissue use, will be dependent on the availability of various abortion technologies.

Catching the RU486 controversy in progess limits our ability to see which actors accounts and actions will ultimately become contingently powerful as the network stabilizes, if it stabilizes, but it also allows the researcher a more active role in using professional knowledge as a form of intervention aimed at settling the controversy or stabilizing the network according to his or her particular perspective. Simply by choosing RU486 as a worthy site for an analysis and presenting multiple perspectives, Clarke and Montini assume an implicit political position through their research act. Cowan's discourse goes beyond the limits of relativism and reflexivity imposed by STS. She clearly believes that reproductive technologies such as RU486 should be policed according to feminist ethics with important decisions about their use left to individual women. Furthermore, she feels that women, as collective and individual actors, can insure that reproductive technologies perceived as being useful are successful in moving from a

development to a diffusion phase; their political action can result directly or indirectly in increased accessibility. To improve the odds that RU486 will move from development to diffusion, women must create a demand for it as consumers, a positive abortion climate, and enough political pressure to influence national policy regarding its testing in Canada. Her political role is not limited to feeding the controversy, but also to suggesting ways in which it should be settled.

Conclusion

As part of the larger issue of new reproductive technologies, RU486 becomes implicated in the historical interests and actions of existing sociotechnical relations and emerges as an ongoing entry point into the complex dynamic between new and existing interests. The actions of the various actors and the alliances between them, their representations of RU486 and each other, all take place within an heterogeneous environment with often unpredictable outcomes. Successful translations of the technology can occur at various points in the network and at various scales: local actors become global, and potential actors' influence leads to shifts in the larger sociotechnical network. With their emphasis on contingency, STS-based models point to a more decentralized conception of power, intentionality and influence in the development and diffusion of technology, one which recognizes a variety of actors, perspectives, strategies, and forms of membership.

Despite the inescapable contingency involved in such networks, the Canadian case of RU486 seems to confirm Cowan's assertion that there is a recognizable shift in significant actors as a technology moves from a development to a diffusion stage. By paying close attention to the sociotechnical space surrounding this critical shift, we can better understand the complex process of how scientific knowledge and technological artifacts enter a wider social context. This space becomes increasingly interesting with controversial technologies because of the delay from development to diffusion in which scientific knowledge or representations become widely diffused and negotiatiated before the technological artifact is available for use. For such "public-interest" technologies, this shift seems to be at least in part influenced by the mediated representations and decision-making which occur in the public communication environment in and around the technology. The actors of the scientific social world who influenced the "successful" development and construction of the artifact into a relatively fixed form are joined by actors from diverse social worlds who attempt to influence the "successful" diffusion of the artifact and their particular constructions of it. In this wider arena, the diffusion of RU486 seems most dependent on the actions of the pharmaceutical companies and the government, as well as the ability of other actors to influence their action with their competing representations or bypass their control of its distribution. While scientists are primarily responsible for negotiating and establishing the "effectiveness" of the artifact, a claim which the majority of

social actors might accept, their position as decision-makers regarding the artifact's transition from development to diffusion simply becomes one amongst a much wider range of social actors.

Cowan and the gender-related STS perspectives also ask us to acknowledge voices that have not been prominently represented in the media. The actors most obviously implicated in the RU486 network are its potential users; however, these actors seem to have had little direct influence on its transition from development to diffusion. They appear primarily as they have been constructed by other actors in the network. Despite their relative silence, their perspectives must be included in the analysis of a gender-sensitive technology which hopes to understand fully its sociotechnical dynamics. These silent actors also implicate the role of the researcher in analyzing gender-sensitive technologies: from Clarke and Montini's relativism and positioning of their discourse amongst those of other actors, to Cowan's suggestions of possible policy direction and political activism.

The multiple perspectives on RU486 serve to destabilize the network since large numbers of actors behave in unpredictable (or at least non-routine) ways, all seeking to stablilize the technology based on their own set of varying interests. The consumers and the pill itself, whose routine and repeated behavior in a diffusion phase might lengthen the network and add to its irreversibility, remain only potential actors. In their absence, the strength or weakness of the network depends on contingency, but also on the

ability of actors to mobilize their representations of the technology, as well as its potential users, and create links with other influencial actors. The dominant version of "public interest," negotiated in this public communication environment, will potentially influence the fate of the technology.

Building a sociotechnical network around a particular technology based on the mediated representations of the relevant actors gives us some insight into how and why some artifacts sucessfully make the shift from development to diffusion and others do not, and how and why these artifacts are shaped in particular ways as a result of this shift. At the same time, it highlights the way in which these technologies build society, influencing and creating social links in their interplay with new and existing interests. Finally, it can expose the public decision-making process by identifying those who have the potential to become decision-makers, influencial actors, and implicated actors: willingly or unwillingly, intentionally or unintentionally, knowingly or unknowingly.

Afterword

Beginning with Harold Innis, a Canadian communications tradition exists which integrates the study of technology and things themselves into the study of social organization, symbolic processes and the communication process. The work of Innis and his followers establishes a base for developing a sociotechnical method in the field of communications, and turning to STS provides a opportunity to advance this type of analysis. While both approaches share an emphasis on technology as an actor, STS's radical philosophy offers possibilities for reframing Innis' approach to eliminate some of its more problematic theoretical assumptions, and its methodology may provide communications researchers with new and productive ways of looking at communication technologies. As they enhance our understanding of technology as a social and cultural artifact, STS-based sociotechnical approaches, with their implicit and occasionally explicit recognition of the importance of communication issues and practices, can themselves benefit from a closer linkage to communications research. From this association emerges a shared recognition of technology as an actor and a more meaningful sociotechnical approach which begins to access the complex interaction between technological artifacts and social actors. [9]

Generally, STS offers the study of technology and communications freedom from the restrictive modernist assumptions that begin with the idea that there is something called technology and something called society, and

that stability is a result of maintaining a balance between these two positions, a balance of technological realism with social realism. The relationship between these two entities is based on a series of dialectical oppostions: freedom and domination, humanism and dependency, civilization and power, time and space, etc. While in some ways these modernist approaches seem to operate in the same middle ground as STS, they depend on explaining technology and society in terms of their relationships to each other, always negotiating epistemological and ontological dualism, as well as determinism.

Latour's epistemological relativism and exposure of "science in the making" clears the way to study the construction of scientific claims and technological artifacts in the same way we study other cultural products, a philosophical step imperative for a meaningful discussion of technology which eschews the technological determinism that Crowley (1994) describes as so prevalent in discussions of technology and society and that also hovers over Innis' discourse. The concept of heterogeneity extends Innis' productive but problematic treatment of the social science hermeneutic and inescapable bias, to the study of both subjects and objects, humans and nonhumans. Because STS erases the ontological and epistemological distinction between subject/object, society/nature, social/technological, the study of intersubjective relations becomes inseperable from the study of things themselves, since those relations are always embedded in irreducible heterogeneous networks; symbolic processes are inseparable from their

material context. The notion of coproduction in Latour's heterogeneous approach supplements Innis' sociotechnical model, which focuses on how the introduction and use of technology has certain social consequences by highlighting the reflexive relationship, or how the social development and use of a particular technology have consequences for the shape of that technology. It is not a matter of the consequences of one on the other, as though both existed as distinct forces, but rather how those agencies and forces are distributed and defined within networks.

This reorientation reflects a similar shift in communication studies from a content/control approach to media to a more complex analysis of the consequences of a particular communications technology (Crowley, 1994). The technological determinism of content/control approaches is refuted in ANT since it is always possible to open up the black box of technology to see how its current use is the result of a network of contingent and reflexive relations between humans and nonhumans. Technology is understood rhetorically, as a durable symbolic form of sociotechnical relations. At the same time, it is possible to describe how these sociotechnical networks might become destabilized or territorialized either through unconventional use/interpretation or the self-reflexive fractal strategies (Lee & Brown, 1994) or by the introduction of new actors (technologies) which allow other actors to bypass obligatory passage points in the network's structure. The open-ended structure of network models with their possibilities for shifts and reversals, and the reconsideration of what happens at the development and

diffusion stages of a technology problematize the emerging concern identified by Crowley that the division between producers and consumers, developers and users, and authors and readers might be re-examined.

STS-based models begin to explain the dynamic relationship between social groups and technological development and diffusion by identifying the relevant social actors around a particular technology and their influence in shaping it. ANT describes the various relations between actors in a sociotechnical network -- their alliances, interdefinitions, self-definitions -- by gathering their public representations of themselves, each other and the technological artifact. STS-based models show how heterogeneous actors shape technology through their actions (representations, translations, inscriptions), as well as how that technology and the new and existing interests surrounding it shape and constitute their social arrangements. Technological artifacts are simultaneously cultural artifacts as they become rich repositories of social action.

STS-based approaches are concerned with representation as a form of action, encoding information into broadly defined "statements" with a rhetorical focus on how that information will be received or translated by a specific audiences. Latour describes these as "loaded statements" which attempt to influence the behavior of the user inscribed within them. His notion of program/antiprogram in the development of technology is dependent on the transactional communication practices of encoding (behaving) messages or statements, sending messages, and receiving messages

(behaving); the shaping of information through communication practice. It shares many interests with communications theory: a concern for persuasion or the effects of communication, a concern for what audiences do with the information they receive, and an overriding awareness of the contingent and reflexive nature of these dual engagements. STS might gain a greater appreciation of these processes through a closer linkage with current communications research which rethinks these approaches to communication in light of new understandings and ideas about communication practice. These new communications approaches suggest a reorientation of major theoretical enclosures such as messages, audiences, and meanings, a move which articulates many of implicit preoccupations of STS-based approaches. [10]

As they focus on the ways in which social actors become connected through a network of mediated representations, STS theorists might also use communications research to begin to consider the ways in which those representations are translated by their technological context, the communications media which shape and deploy them. Links between social actors become sociotechnically interesting not only as they are constituted in relation to a particular technology, but also as they are influenced by the communication media actors use. STS could benefit from a reflexive consideration of the medium of representation and how it influences the way in which statements are received and shaped, or the stability of particular

sociotechnical networks. Addressing how particular actors choose and use various communication media for rhetorical purposes might enrich a sociotechnical analysis by providing another level of analysis and a fuller understanding of social action.

Network analysis implicitly recognizes the implications of communication processes in institutional strategies. By unpacking sociotechnical relations and exposing social links, ANT can help assess why some institutional networks are strong and stable, resisting change and intervention, and why others are weak and vulnerable to intervention. The stable functioning of a network depends on the more or less predictable and repeated pattern of interaction between its members, in other words, effective communication. Networks and institutions achieve a certain contingent structure which promotes this predictable pattern of interaction and, with it, a contingent set of shared values, beliefs and behaviors. When the communication within the network changes, the institutional structure changes and becomes vulnerable to destabilization. Using similar assumptions, communication theorists have furthered this line of thinking to recognize the role of communication media in shaping institutional knowledge systems and networks (Innis, 1951: 1972). By supplying the material forms through which information is absorbed, recorded, transmitted and shaped, communication media provided the structure for the various institutional discourses (cultural, philosophical, economic, etc.) or the various "knowledges" existing in the society. New communications media

can cause significant shifts in the structure of these institutions.

Granting communications technologies problematic status does two things. First, it acknowledges that they form not only the context but also the content of the communication process and social interaction. Technologies themselves are artifacts which are produced in conjunction with a particular context in a mutually dependent evolution, and the roles of these technologies are embedded in a complex relationship which does not exist independently from how a particular user interprets a particular technology. In other words, the interpretation process cannot rest solely with the message or the response to the message: it must also consider how that message or response depended on the interpretation and use of the communications technology which facilitated it. Attention must be paid to the channel, the medium, the thing. Second, it allows us to look at the historical role of communications technologies and the consequences of their introduction and use. As part of the circumstances surrounding the introduction of other technological artifacts, communications media play a significant part in establishing the environment which will influence their success or failure.

As they uncover the multiple actors and perspectives involved in how technologies achieve, or fail to achieve, some level of black-box status, STS-based approaches enhance our understanding of how these groups' mediated representations of the technology become subject to public negotiation. Cowan's work shows how controversial reproductive technologies become the site of public negotiation and claims making over policy, delaying the

shift between development and diffusion. She highlights the decision-making process, including many more actors than those who simply appear to have the power to make decisions: users, in particular, playing a potentially large role in shaping the technology. Furthermore, she acknowledges the wider historical circumstances surrounding the introduction and use of a technology and their critical and sometimes unpredictable consequences for its success or failure in making the transition to a diffusion phase. Similarly, ANT presents power or the domination of one perspective as a result of network stabilization, rather than as a capacity of individual actors or groups, stressing the contextual contingency involved in the predictable interpretation or use of a technology. STS's insight into constructing policy and decision-making shows how competing formulations of public interest constructed by heterogeneous audiences challenge the notion of a general "public interest," and with it, the conception of a homogeneous group of public actors with consensual belief systems. It uncovers the layers of negotiation and contingency involved in achieving closure or at least the appearance of an agreed upon, routine response to a technology.

These mediated representations enter wider social relations through various media forms: medical journals, women's magazines, television news, newspapers, pamphlets, and various other forms of electronic and print media. As representations of a particular technology become subject to public negotiation, they also become subject to public forms of communication media. As communications researchers have come to

recognize, the multiplying effect of these public media influences the meaning users or recievers attach to messages, as well as any notions of intentionality associated with the senders of the messages. As these representations multiply through various media, their meanings become further subject to the local interpretation of successive audiences and users. It is important to acknowledge the contingency and unintended consequences inherent in multi-media networks, and how this contingency influences the way networks achieve stability.

Public negotiation of technology raises the issue of establishing policies to deal with these technologies. The social change initiated by the decentralizing thrust of new "post-mass media" communications technologies has led to significant theoretical exploration about how they might be policed and who might become the important and powerful actors in the emergent sociotechnical networks surrounding their development and use. These same issues are made explicit in Cowan's work on new reproductive technologies and exist implicitly in the STS approach. New technologies like these generate controversy because the decision-making process surrounding them inspires multiple ideas about how they should be treated once they enter general use. Since they transcend previous technological barriers, no existing framework seems adequate for conceptualizing how governments might create policies around them and, by extension, how these rules might be enforced by a central authority in increasingly decentralized social relations. Understanding the decision-

making process surrounding them might begin with a joint discussion between STS authors like Cowan and Canadian communications theorists who have begun to address questions of public policy and interest.

Because it recognizes the ways in which actors seem to participate in both traditionally micrological and macrological social arenas, STS methodology moves past constricting micro/macro analytical categories to access local-global interaction. ANT adds a micrological tool to apply to sociotechnical theory, showing how the movement between local and global is achieved, how local actors extend their influence or become positioned simultaneously within larger networks, and how marginal actors can come to play key roles. With the help of his STS colleagues, Latour's theory can also access the actors who remain marginalized, and those whose multiple memberships and partial commitments make it difficult to situate them within particular networks, either locally or globally, and whose actions sometimes manage to bypass the obligatory passage points established in sociotechnical networks. ANT gives us the methodological tools to describe sociotechnical relations in which actors are constantly transgressing and redefining local/global boundaries.

One of the reasons actors seem able to engage in this local-global interation is the existence of media forms which allow them to mobilize resources from a distance; the media help to define the ability to act in time and space for both individuals and institutions. Media forms which have a wide distribution allow actors to extend their private interests into larger

public arenas, forming alliances and connections with remote actors. The ability to use media and control knowledge forms allows actors to extend their interests, to act. This capacity for doing things at a distance is becoming enhanced by new forms of electronic media, creating more opportunities for local action to become simultaneously global, further collapsing traditional notions of time and space, transcending previous limits to communication, and adding to the complexity of situating actors within sociotechnical networks. STS and communications researchers will have to pool their resources in order to begin to understand the spaces surrounding the introduction and use of these newer electronic communication technologies, spaces where the limitations of conventional analysis become increasingly apparent.

STS research shows that technology and the conditions surrounding its production and use can be opportune sites for communication research. In sociotechnical networks (i.e. all social relations), technologies become part of the heterogeneous material of social links: they are an observable form of action connecting and shaping people, things, ideas. Technology becomes not a reflection of transhistorical nature but a cultural artifact through which we carry on the conversation of our culture and structure being. As intermediaries without ontological status, media and technology appeared merely to transport information, intentions, goods, etc. with varying degrees of effectiveness. As mediators, technological artifacts become social "actors endowed with the capacity to translate what they transport, to redefine it and

also to betray it" (Latour, 1993, p. 14).

The introduction of new technologies becomes a vantage point for viewing the actions of various constituencies of social actors whose interests compete in their development phase and, when their introduction is accompanied by controversy, they highlight the public negotiation of these identities and the decision making process surrounding the transition from development to diffusion. As they become enmeshed in wider social relations, they create networks of use which constitute new or influence existing social relations and themselves become subject to the shaping power of users. The sociotechnical analysis of RU486 demonstrates how we can begin to explore more elaborate notions of social communication, not confined to the channels of mass media exclusively, but extended to various technological sites, involving both human and nonhuman actors, and dependent on the activity of a wider group of actors with diverse interests. Within this broader notion of social communication suggested by STS, more traditionally defined communications media emerge as a unique site for sociotechnical analysis.

References

Abortion pill. (1994, May 23). Editorial. Toronto Star, p. A12.

Abortion pill call. (1992, June 12). Financial Post, p. 2.

Abortion pill offered. (1994, February 28). Maclean's, p. 33.

Abortion pill won't be coming soon to Canada. (1994, May 19). Toronto Star, p. A27.

Adolph, C. (1994, September 29). Research into RU486's role in cancer treatment slowed by abortion debate. Montreal Gazette, p. A4.

Akrich, Madelaine & Latour, Bruno. (1992). A summary of convenient vocabulary for the semiotics of human and nonhuman assemblies. In W. E. Bijker & J. Law (Eds.), Shaping technology/building society: Studies in sociotechnical change (pp. 259-264). Cambridge, MA: MIT Press.

Alberta New Democrats. (1992). "Morning after" pill. [Policy statement H1.S1.92.].

American Life League. (1992). What is RU486? [brochure]. Brown, J: Author.

Ashmore, Wooffitt & Harding. (1994). Humans and others, agents and things. American Behavioral Scientist, 37, 733-740.

Bastien, G. (1994). L'avortement chimique: réflexions d'une résistante. Canadian Women's Studies/Les Cahiers de la Femme, 14 (3) 101-104.

Bodevitz, H. J. H. W., Buurma, H. and de Vries, G. H. (1987). Regulatory science and the management of trust. In W. E. Bijker, T. P.

Hughes, & T. Pinch (Eds.), The social construction of technological systems: New directions in the sociology and history of technology (pp. 243-259). Cambridge, MA: MIT Press.

Bowden, G. (1995). Coming of age in STS: Some methodological musings. In S. Jasanoff, G. E. Markle, J. C. Petersen & T. Pinch (Eds.), Handbook of science and technology studies (pp. 64-79). London: Sage.

Callon, M. & Latour, B. (1992). Don't throw the baby out with the Bath School! A reply to Collins and Yearley. In A. Pickering (Ed.), Science as practice and culture (pp. 342-368). Chicago: University of Chicago Press.

Canadian Abortion Rights Action League. (1993). RU486: the "abortion pill." Toronto: Childbirth by Choice Trust.

Canadian Abortion Rights Action League. (1990, October 17). Brief presented to the Royal Commission on New Reproductive Technologies. Halifax, N. S.

Carlson, W. B. & Gorman, M. E. (1992). Sociotechnical graphs and cognitive maps: A response to Latour, Mauguin and Teil. Social Studies of Science. 22, 81-89.

Casper, M. J. (1994). Reframing and grounding nonhuman agency. American Behavioral Scientist, 37, 839-856.

Centre de Santé des Femmes de Montréal and Fédération du Québec pour le planning des naissances. (n.d). RU-486: on l'avale la pilule ou pas? [Brochure].

Chow, W. (1993, June 22). 30 abortion foes demonstrate against

controversial French pill. Vancouver Sun, p. B3.

Clarke, A. & Montini, T. (1993). The many faces of RU486: Tales of situated knowledges and technological contestations. Science, Technology, & Human Values, 18, (1) 42-78.

Colodny, N. (1989). The politics of birth control in reproductive rights context. In C. Overall (Ed.), The future of human reproduction (pp. 30-45). Toronto: Women's Press.

Cook, R. J. (1991, December). New reproductive technologies: International legal issues and instruments (Catalogue No. 21-1989/3-41-3E). Ottawa: Government Services Canada.

Cowan, R. S. (1983). More work for mother: The ironies of household technology from the open hearth to the microwave. New York: Basic Books.

Cowan, R. S. (1992). Genetic technology and reproductive choice: An ethics for autonomy. In D. J. Kelves & L. Hood (Eds.), The code of codes: Scientific and social issues in the human genome project (pp. 244-263). Cambridge, MA: Harvard University Press.

Cowan, R. S. (1993). Aspects of the history of prenatal diagnosis. Fetal Diagnosis Therapy, 8 (suppl 1), 10-17.

Crowley, D. J. (1994). Doing things electronically. Canadian Journal of Communications, 19, 5-22.

Crowley, D. & Mitchell, D. (1994). Communication theory today. Stanford: Stanford University Press.

Dunn, K. (1992, January 28). Pill is not perfect. Montreal Gazette, p. B2.

Editorial. (1993, May 3). Toronto Star, p. A4.

Eichler, M. (1989). Some minimal principles concerning the new reproductive technologies. In C. Overall (Ed.), The future of human reproduction (pp. 226-235). Toronto: Women's Press.

Eisenstein, E. (1978). The printing press as an agent of change. Cambridge, MA: Cambridge University Press.

Emson, H. (1995, January 31). RU486 would shield women and doctors from wackos. Medical Post, p. 8.

Fédération du Québec pour le planning des naissances. (1994). RU486/PG: Policy statement. Fédération du Québec pour le planning des naissances.

Federation of Medical Women in Canada (FMWC). (1993, March 11). The Federation of Medical Women in Canada supports the legal availability of RU-486 in Canada [Policy Statement].

Firm may seek approval fo abortion pill. (1988, October 2). Calgary Herald, p. C7.

Ford, A. R. (1993). An overview of select social and economic forces influencing the development of inVitro fertilization and related assisted reproductive techniques. In New reproductive technologies and the science, industry, education, and social welfare systems in Canada (Catalogue No. 21-1989/3-41-18E), (pp. 75-139). Ottawa: Supply and Services Canada.

48% want abortion pill made legal in Canada. (1992, October 15). Toronto Star, p. A21.

France tells company to put abortion pill back on the market. (1988, October 29). Globe and Mail, p. A1, A12.

Fujimura, J. (1991). The sociology of science: Where do we stand? In Maines (Ed.), Organization and social process: Essays in honour of Anselm Strauss (pp. 208-235). New York: A. de Gruyter.

Glasier, A., Thong, K. J., Dewar, M., Mackie, M., & Baird, D. T. (1992, October 8). Mifepristone (RU486) compared with high-dose estrogen and progestogen for emergency postcoital contraception. New England Journal of Medicine, 327, 1041-1044.

Gold, M. (1994, June 6). Opponents fear abortion pill trials in U.S. will cause border flood. Vancouver Sun, p. A4.

Gold, M. (1994, June 12). French pill expected to fan flames of abortion debate. Calgary Herald, p. B3.

Government Services Canada. (1993). Proceed with care: Final report of the Royal Commission on New Reproductive Technology (Catalogue No. 21-1989/3-1E (v. 1)). Ottawa: Government Services Canada.

Hacking, I. (1988). The sociology of knowledge about child abuse. Nous, 22, 53-62.

Haraway, D. (1991). Situated knowledges: The science question in feminism and the privilege of partial perspective. In Simians, cyborgs, and women: the reinvention of nature (pp. 183-201). London: Routledge and Kegan Paul.

Harper, T. (1992, July 22). Ottawa won't ease way for French abortion

pill. Toronto Star, p. A1.

Hoechst AG. (1992). Drug-induced termination of pregnancy with mifepristone (RU486) and prostaglandin, (3rd ed.). Information from Hoechst AG, Pharmaceutical division: Health Policy Department, p. 11.

Human Life International joins nationwide RU-486 boycott. (1994, November 21). PR Newswire.

Innis, H. A. (1951). The bias of communication. Toronto: University of Toronto Press.

Innis, H. A. (1972). Empire and communications. Toronto: University of Toronto Press. (Original work published in 1950)

The inventor of the french abortion pill. (1993, October 10). Ottawa Citizen, final ed., p. A6.

Kymlicka, W. (1993). Approaches to the ethical issues raised by the Royal Commission's mandate in new reproductive technologies. In Ethical issues (Catalogue No. 21-1989/3-41-14E), (pp. 1-46). Ottawa: Supply and Services Canada.

Landsberg, M. (1992, July 28). Ottawa's hypocrisy is delaying abortion pill. Toronto Star, p. A7.

Lankin backs abortion pill testing policy. (1992, July 23). Toronto Star, p. A9.

Latour, B. (1981). Insiders & outsiders in sociology of science; Or, how can we foster agnosticism? Knowledge and Society: Studies in the Sociology of Culture Past and Present, 3, 199-216.

Latour, B. (1987). Science in action. Cambridge, MA: Harvard University Press.

Latour, B. (1988a). Comments on "The sociology of knowledge about child abuse." Nous, 22, 67-69.

Latour, B. (1988b). The pasteurization of France (A. Sheridan & J. Law, Trans.). Cambridge, MA: Harvard University Press. (Original work published 1984)

Latour, B. (1991a). The impact of science studies on political philosophy. Studies in History and Philosophy of Science, 16 (1) 3-19.

Latour, B. (1991b). Technology is society made durable. In J. Law (Ed.), A Sociology of Monsters (pp. 103-131) [Sociological Review Monograph, 38]. London: Routleledge & Kegan Paul.

Latour, B. (1992). Where are the missing masses? The sociology of a few mundane artifacts. In W. E. Bijker & J. Law (Eds.), Shaping technology/building society: Studies in sociotechnical change (pp. 225-258). Cambridge, MA: MIT Press.

Latour, B. (1993). We have never been modern. (C. Porter, Trans.). Cambridge, MA: Harvard University Press. (Original work published 1991)

Latour, B., Mauguin, P. & Teil, G. (1992). A note on sociotechnical graphs. Social Studies of Science, 22, 33-57.

Law, J. (1991). Introduction: Monsters, machines and sociotechnical relations. In J. Law (Ed.), A sociology of monsters: Essays on power technology and domination (pp. 1-23) [Sociological Review Monograph, 38].

London: Routledge and Kegan Paul.

Lee, N. & Brown, S. (1994). Otherness and the actor network: The undiscovered continent. American Behavioral Scientist, 37, 772-790.

Levathes, L. (1995, April). RU486 – an improvement. Pro-Life News, 20, 12-15.

Levybody, M. (1994, November 18). A private choice for abortion: Availability of RU486 would move abortion out of public spotlight into privacy of home. Toronto Star, p. A31.

Livingstone, B. (1988, July 23). Abortion pill on horizon. Calgary Herald, p. F10.

LLoyd-Tremaine, T & McKee, J. D. (1994). RU 486 in Canada: Medical, legal, and moral considerations. Journal of the Society of Obstetricians and Gynaecologists of Canada, 16, 2239-2254.

Lynch, M. & Woolgar, S. (1991). Introduction: Sociological orientations to representational practice in science. In M. Lynch & S. Woolgar (Eds.), Representation in scientific practice (pp. 1-18). Cambridge, MA: MIT Press.

MacDonald, A. (1992, August 20). RU-486; the abortion pill sparks debate between feminists: The risks to women have been overlooked. Ottawa Citizen, p. A11.

Marvin, C. (1987). When old technologies were new. New York: oxford University Press.

McClaren, A. & McLaren, A. T. (1986). The bedroom and the state: The

changing practices and politics of contraception and abortion in Canada, 1880-1980. Toronto: McClelland and Stewart.

McCormack, L. (1988). Public policies and reproductive technology: A feminist critique. Canadian Public Policy, XIV (4) 361-75.

Medhurst, M. J., Gonzalez, A. & Peterson, T. R. (1990). Communication & the culture of technology. Pullman, WA: Washington State University Press.

Mills, C. W. (1940). Situated actions and vocabularies of motive. American Sociologist Review, 6, 904-21.

Momentum builds for controversial drug: FMWC and CMA support RU-486. (1993). Canadian Family Physician, 39, 1483-1485.

Mullen, M. A., Williams, J. I., & Lowy, F. H. (1994). Transplantation of electively aborted human fetal tissue: physicians' attitudes. Canadian Medical Association Journal, 151, 325-330.

Murray, T. (1991, May 14). Developer of abortion pill confident that RU-486 trials will start soon in Canada. Medical Post, pp. 1 , 71.

Murray, T. (1993, October 26). RU-486 trial in U.S. bodes well for Canada. Medical Post, p. 4.

NDP backs abortion pill. (1993, June 7). Montreal Gazette, p. F1.

Nolen, S. (1993, September 13). RU-486 stirs up abortion debate. Globe and Mail, p. A9.

Pinch, T. J. & Bijker, W. E. (1987). The social construction of facts and artifacts: Or how the sociology of science and the sociology of technology

might benefit each other. In W. E. Bijker, T. P. Hughes, & T. J. Pinch (Eds.), The social construction of technological systems: New directions in the sociology and history of technology (pp. 17-50). Cambridge, MA: MIT Press.

Pill fans flame of abortion debate. (1994, June 20). Montreal Gazette, p. C1.

Pill of Choice. (1989, September 22). Science, 245, 1319-1323.

Priest, L. (1993, June 23). Canada criticized over women's health. Toronto Star, p. A1.

Pritchard, K. I. (1994). Clinical cooperative trials of the National Cancer Institute of Canada Clinical Trials Group breast cancer site group. Cancer (Supplement), 74, 1150-1155.

Raymond, J., Klein, R., & Dumble, L. (1991). RU-486: Misconceptions, Myths, and Morals. Cambridge, MA: Institute on Women and Technology.

RCNRT Staff. (1993). An overview of findings in this volume. In Social values and attitudes surrounding new reproductive technologies (Catalogue No. 21-1989/3-41-15E), (pp. 1-34). Ottawa: Supply and Services Canada.

Russell, S. (1986). The social construction of artefacts: A response to Pinch and Bijker. Social Studies of Science, 16, 331-46.

Sanger, D. (1994, May 30). Abortion pill secretly used here: Drug firm won't sell RU-486. Calgary Herald, p. A3.

Schaffer, S. (1991). Essay review: The eighteenth brumaire of Bruno Latour. Studies in the History and Philosophy of Science, 22 (1) 175-192.

Scott, J. K. (1992). Exploring socio-technical analysis: Monsieur Latour is not joking! Social Studies of Science, 22, 59-80.

Scott, P. (1991). Levers and counterweights: A laboratory that failed to save the world. Social Studies of Science, 21, 7-35.

Shapin, S. (1988). Essay review: Following scientists around. Social Studies of Science, 18, 533-50.

Sheppard, R. (1992, July 22). Abortion pill: too late to turn back the clock. Globe and Mail, p. A13.

Sherwin, S. (1989). Feminist ethics and new reproductive technologies. In C. Overall (Ed.), The future of human reproduction (pp. 259-271). Toronto: Women's Press.

Simms, G. P. (1992, November 6). Letter to the Honourable Benoit Bouchard. Canadian Advisory Council on the Status of Women.

Society of Gynaecologists and Obstetricians (1992, September). SOGC resolution regarding RU-486 [Policy statement No. 10].

Star, S. L. (1988). Power, technology and the phenomenology of conventions: On being allergic to onions. In J. Law (Ed.), A sociology of monsters (26-56) [Sociological Review Monograph, 38]. London: Routledge & Kegan Paul.

Task Group of Abortion Service Providers. (1992, December). Report on access to abortion services in Ontario [Catalogue No. 2224294]. Ontario Ministry of Health.

Taylor, P. (1991, February 2). Breakthrough that can't get started. Globe

and Mail, p. D 10.

Taylor, P. (1991, December 6). Abortion pill may be tried on cancer. Globe and Mail, p. A8.

Thompson, A. (1992, July 29). Apotex seeks right to copy French abortion pill. Toronto Star, p. F3.

Tibbetts, P. (1986). The sociology of scientific knowledge: The constructivist thesis and relativism. Philosophy of the Social Sciences, 16 (1) 39-57.

Tremayne-Lloyd, T. & McKee, J. D. (1994). RU486 in Canada: Medical, legal and moral considerations. Journal SOGC, 2239-2254.

Ullman, A., Teutsch, G. & Philibert, D. (1990, June). RU486. Scientific American, 262, 42-48.

Van Wagner, V. & Lee, B. (1989). Principles into practice: An activist vision of feminist reproductive health care. In C. Overall (Ed.), The future of human reproduction (pp. 238-258). Toronto: Women's Press.

Walker, K. (1990, March 27). What's it like to be developer of abortion pill RU-486? Medical Post, p. 21.

Weber, S. (1990, March 21). Safe abortion pill has few side effects. Medical Post, p. 8.

Wiebe, E. R. (1994). Methotrexate and misopristol used in abortions. Canadian Medical Association Journal, 150, 1381-1382.

Wigod, R. (1994, February 18). No-surgery abortions soon to be available: New method uses two drugs. Vancouver Sun, p. B3.

Women doctors back 'abortion pill'. (1993, June 27). Toronto Star, p. J2.

Footnotes

[1] Although it is referred to variously as RU486, RU-486, or RU 486, or mifepristone I have chosen to use the first form throughout the text, except as it appears otherwise in direct quotations.

[2] One of the most obvious limitations of this type of study is that focusing on the pill primarily as an abortifacient is, in a sense, giving it some level of black box or unchallenged status, since it ignores the compound's potential for developmental change in areas outside of the abortion controversy. Nevertheless, my main purpose is to provide a sociotechnical analysis of RU486 in a Canadian context, and that context has generally been the abortion arena. Another related concern is the lack of closure possible in studying any current controversy, an issue that will subsequently be explored more theoretically.

[3] See the Canadian Journal of Communications, Vol. 19, 1994, for examples.

[4] STS theory focuses primarily on identifying and analyzing the actions of the relevant social groups around a particular technology, and how these groups shape and are shaped by particular technologies. ANT falls under this type of analysis, focusing on the predominating actor in shaping the technology and the coproduction of society and technology in sociotechnical networks. It will be discussed more explicitly later in the essay.

[5] The grouping of actors I have identified in relation to RU486 compares closely to those identified by Clarke and Montini, although I have included a short section on the Canadian newspaper media. The limited scope of the paper means that other actors, outside of these groups and within them, have not been examined, and that not all of the actions of the actors I present here have been documented. My representation of these various positions was developed using information packages distributed and published by the various groups and other published material in Canadian journals, magazines, and periodicals up to March 1995. For a visual summary of actors and their positions see Appendix.

[6] Roussel Uclaff and Hoechst AG (1992) have established three critieria which govern the introduction and use of RU486 in any country. They are:

Principle No. 1

> The registration of mifepristone [RU486] for the drug-induced termination of pregnancy can only be applied for in countries that have a definitive statutory ruling on abortion and where pregnancy termination is tolerated by society

Principle No. 2

> The country in question must have an advanced medical infrastructure. This must include the availability of prostaglandin and strictly controlled distribution of mifepristone.

Principle No. 3

There must be an actual wish for the licensing of mifepristone from a representative competent body of a particular country.

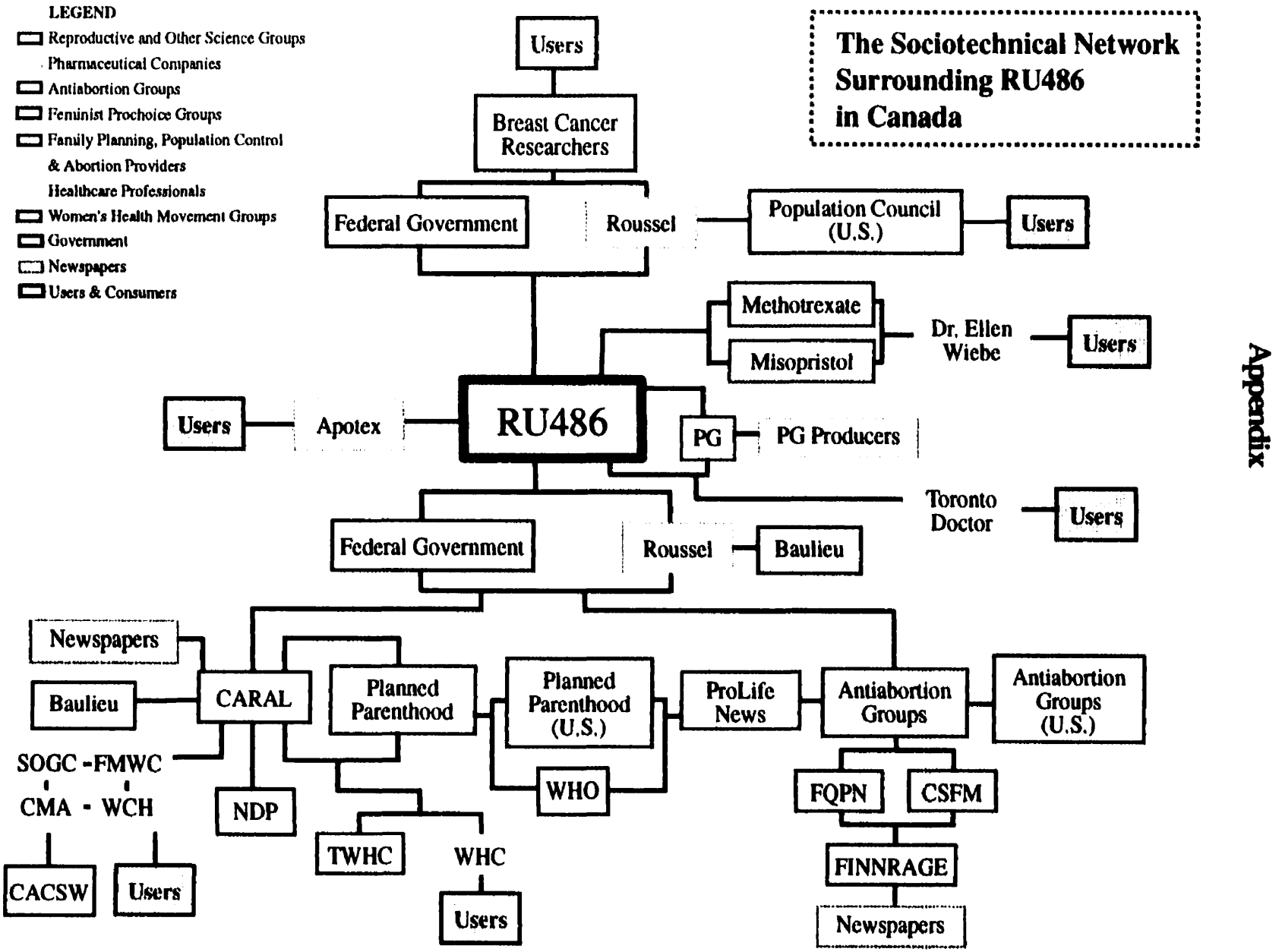
[7] These included the Toronto Star, The Calgary Herald, The Globe and Mail, The Montreal Gazette, and The Vancouver Sun.

[8] Akrich and Latour (1992) have identified some key terms which attempt to advance this symmetrical ontology.

[9] Many of the issues addressed in the afterward return to those raised in the Canadian Journal of Communications, Vol. 19, 1994.

[10] See editors D. Crowley and D. Mitchell (1994) for a collection of essays which report on current areas of communication research. Especially relevant are the authors' introduction, M. Poster, I. Ang and J. Collins.

The Sociotechnical Network Surrounding RU486 in Canada



Acronyms

CARAL= Canadian Abortion Rights Action League

CACSW= Canadian Advisory Council on the Status of Women

CMA= Canadian Medical Association

CSFM= Centre de Santé des Femmes de Montréal

FINNRAGE= Feminist International Network of Resistance to Reproductive and Genetic Engineering

FMWC= Federation of Medical Women in Canada

FQPN= Fédération du Québec pour le planning des naissances

PG= prostaglandin

NDP= New Democratic Party

SOGC= Society of Obstetricians and Gynecologists of Canada

TWHC= Toronto Women's Health Collective

WCH= Women's College Hospital in Toronto

WHC= Women's Health Clinic in Winnipeg

WHO= World Health Organization

Explanatory Notes

With some simplifications, the chart focuses on most of the various interactions between the heterogeneous actors (chemicals, social groups, professional groups, and so on) in the network influencing RU486's transition from development to diffusion in Canada. Links between actors indicate various types of connections: acknowledged or unacknowledged alliances, similar representations of RU486, common concerns, etc. Keeping in mind the difficulties of assessing an ongoing controversy, I have included these actors as relevant for their perceived current or potential role (regardless of intentionality) in shaping the technology, including those

reflexively shaped by it. It is important to remember the dynamism of these interactions, the changing positions of actors and continuous negotiation of the technology over time, which is not captured here as well as this network's connection to a wider range of reproductive technologies both by the Royal Commission on New Reproductive Technologies and other actors who consider it part of the wider issue of women's health.

The chart shows several paths through which RU486 might reach users. The most conventional path, through the link between the federal government's drug regulating body and Roussel Uclaff, appears to be the most contested. Large groups of actors with various motives and constructions of RU486 have polarized this part of the network into acceptance/rejection positions with only the Toronto Women's Health Collective (TWHC) and the Women's Health Clinic (WHC) in Winnipeg appearing to bridge this gap by problematizing the technology beyond these alternatives. The most active participants in this area of the network appear to be the Canadian Abortion Rights Action League (CARAL) and antiabortion groups who have spent considerable effort mobilizing allies to further their interests. Worth remarking here are unusual connections made between prochoice advocates of the pill and the publication ProLife News which both consider the pill an improvement in abortion methods, and feminist and prochoice actors, the Fédération du Qubec pour le planning des naissances (FQPN) and the Centre de Santé des Femmes de Montréal (CSFM), and antiabortion groups which both oppose the pill's

testing. The diffusion of RU486 through this path seems impeded by the inability to enroll the support of either the federal government or Roussel Uclaff.

While this route to general use seems blocked, the pill might be more successful in reaching at least some potential users through various other paths. Only one of these, the one which connects breast cancer researchers testing the pill for other purposes and users, includes the link between the government and Roussel. Other possibilities include the Toronto doctor who administered it illegally to patients, Apotex which offered to market the pill in Canada, and the Population Council which has been granted the rights to test and market it in the U.S. As chemicals which behave in a similar way to RU486, methotrexate and misopristol might also influence the path to users by duplicating the consequences of RU486. These actors have the potential to destablilize and shift the network by bypassing controls and distribution routes established by the government and Roussel (including the use of the technology itself).