TA-KONZEPTE UND -METHODEN

Citizens and Experts in Risk Assessment: Technical Knowledge in Practical Deliberation

by Frank Fischer, Rutgers University

This paper explores the tensions between experts and citizens in the assessment of technological and environmental risks from the perspective of practical reason. Much of the discussion of the politics surrounding the acceptance or rejection of technologies such as nuclear power and biotechnology has focused on the purported "irrationality" of lay citizen. They are said to be unable to understand scientific findings and their implications for rational policymaking. By comparing the formal logic of technical inquiry and the informal ordinary language logic of argumentation, the discussion reverses the issue and interrogates the rationality of the scientist in judgments pertaining to public decisions. Employing the case of GM foods, the explication reveals that ordinary citizens focus on important questions that scientific experts often ignore or neglect. Citizens, it is shown, follow a different kind of logic than scientific experts, one more attuned to the normative realities of the social world. Demonstrating the scientific expert's need to take the citizen's normative logic into account, the essay offers an epistemological approach for bringing together these two different modes of reason in public policy deliberation.

1 Cultural rationality vs. technical rationality?

Can citizens meaningfully participate in complex decisions about environmental and technological risks? We know less about this than the discussions of citizen participation would suggest. In the main, such discussions are shaped by outmoded understandings of both science and politics. From the conventional view, the issue looks doubtful. But from a postempiricist understanding of science and politics, the question becomes more complex and, depending on how one understands participation, much less unthinkable (Fischer 2003).

While expert risk assessments have been employed – albeit unsuccessfully – to circumvent the "irrationalities" of citizen decision-making, additional research into the question of why many communities have so adamantly rejected the advice of the experts now offers quite a different perspective (Kasperson and Stallen 1991). Whereas technical experts have portrayed the citizen movements and the public more generally as incapable of digesting technical findings, and thus susceptible to irrational fears, such conclusions can be seen to rest on a limited understanding of the community decision-making process (Slovic 1992).

One way to approach this is through Plough and Krimsky's (1987) distinction between "technical" and "cultural" rationality. In their work on environmental risk assessment, they define technical rationality as a mind-set that puts its faith in empirical evidence and the scientific method; it relies on expert judgments in making policy decisions. Emphasizing logical consistency and universality of findings, it focuses attention in public decision-making on quantifiable impacts. "Cultural rationality", in contrast, is geared to – or at least gives equal weight to – personal and familiar experiences rather than depersonalized technical calculations. Focusing on the opinions of traditional social and peer groups, cultural rationality takes unanticipated consequences to be fully relevant to near-term decision-making and trusts process over outcomes. Beyond statistical probabilities and risk-benefit ratios, public risk perception is understood through a distinctive form of rationality, one that is shaped by the circumstances under which the risk is identified and publicized, the standing or place of the individual in his or her community, and the social values of the community as a whole. Cultural rationality can, in this respect, be understood as a form of rationality inherent to the social-life world. It is concerned with the impacts, intrusions, or implications of a particular event or phenomenon on the social relations that constitute that world. Such concerns are, in fact, the stuff upon which social and environmental movements are built (Fischer 2000).

Another important contribution to understanding the relations of technical to cultural knowledge is that of Wynne (1996). Examining the reactions of north-western English sheep farmers to scientific reports about the safety of radioactive contamination caused by the nuclear fallout from Chernobyl in 1986, Wynne presents an insightful perspective on the way local citizens reflect on matters pertaining to risk. Subjected to administrative restrictions on sheep grazing and commercial sales, the farmers interacted for two years with government scientists responsible for both the restrictions and the official governmental position on the behavior of the radioactivity. Wynne offers a list of questions and criteria that emerged in the course of the farmer's lay assessments of the scientific judgments put forth by the government experts. Although based on a particular experience, they approximate a more general set of "criteria by which lay people rationally judge the credibility and boundaries of authority of experts of knowledge." He found, in this respect, that they asked questions related to both technical and cultural rationality.

With regard to technical rationality, as Wynne shows, the farmers inquired about the nature and validity of the scientific predictions made by the risk experts. They asked if the experts had paid attention to other types of knowledges. And they asked about the specific scientific practices involved, as well as questions about the content and form of the experts' knowledge. In terms of cultural rationality, they discussed the ways the scientists responded when they were criticized: Do they admit error or failures of omission? They asked about the institutional and social affiliations of the particular scientific experts: Were there obvious concerns or worries about social or political bias? Could they be trusted? And they asked what other kinds of lay experiences might have "spill-over" effects on the current decision-problem, such as knowledge of previous nuclear accidents that might influence the farmers' or scientists' thinking about the fallout on the grazing lands.

Focusing on how ordinary laypersons cognitively process uncertain information, social psychological research shows the ways in which citizens' draw on past experiences in making assessments. Given the complexity of most policy issues, especially technological ones, citizens tend to fill knowledge gaps with information about social processes, or what has been called the "social process theory" of cognition. (Hill 1992). Of particular importance, in this respect, are their own experiences and those of the social groups to which they belong.

Not all people, of course, have the same experiences. It is possible, in this regard, to think of a continuum across which people with different levels of experience can be distributed. For example, public administrators and political activists who have considerable experience with a particular issue or problem develop relatively well-integrated knowledge structures that actively guide their perceptions and expectations in future decisions. These "schemas" inform such individuals or groups about how events are expected to unfold, as well as how particular people ought to act in given sets of circumstances (Conover 1984; Fisk and Taylor 1984). They also explain how substantive issues in a particular area of politics interrelate or how decision-making procedures are expected to operate. Members of the lay public who spend much less time dealing with and thinking about policy issues invariably hold less developed schema. Their ability to perceive and analyze the various dimensions of comparable issues, as a result, is necessarily far more limited, often giving the impression that they are uninformed. What the research shows, however, is that in such situations citizens mainly rely more heavily on *procedural* than on substantive schemas. Citizens turn to these often well developed generalized procedural schemas that can be applied to a range of different situations, from political decision-making to committee work in the office.

An important effort to test this social process theory of cognition in the case of a policy decision is Hill's (1992) sophisticated empirical study of the role of past experiences in citizens' assessments of a nuclear power plant in California. Hill's research documents the ways in which technical experts and administrative policy specialists have largely misunderstood the thinking of the lay public. Not surprisingly, he found the laypersons to have nothing of the technical understanding of the scientific experts involved with the plant. At the same time, however, he found the citizens' cognitive processes

to be far from confused or uninformed. Rather, citizens conformed to the social or cultural process model focusing on case-specific contextual information. Whereas technical experts and nuclear power managers portrayed the new plant as providing local citizens with additional sources of electrical power coupled with a lower local tax base, local residences focused attention on safety procedures. The principal concern that opened a lengthy public debate about the siting of the plant was the fact that it had been inadvertently located near an earthquake fault line and that the engineers had failed to properly equip the plant to withstand a sizable quake. Although technical in nature, this question wedged the debate open to a wide range of social and political questions about the engineers associated with this failure. Hill's findings led him to conclude that the layperson's knowledge was not just different from that of the technical knowledge of the experts, but that it was in fact a *complement* to the assessment methods of the nuclear experts and politicians. By judging how well the general engineering arguments in support of such plants apply to the specific substantive impacts of decisions in particular local contexts, the lay public's emphasis on case-specific social processes effectively counterbalanced the technical expertise of the evaluators.

The turn to cultural rationality and its emphasis on social processes is most apparent in the case of uncertain data. Uncertainty opens the door for competing interests to emphasize different interpretations of the findings. Moreover, "wicked" problems like Nimby (Not in my backyard), raise normative as well as empirical uncertainty. The question of how to define the situation is as problematic as the question of what to do about it. Competing definitions emerge from multiple, often conflicting perspectives. Normatively, in such cases politicians and activists advance counter-arguments about the nature or definition of the problem itself. Empirically, each side engages in what we have previously described as the politics of expertise (Fischer 1990), employing the same or similar data to suit their own purposes.

Where does this leave the public? Consider the empirical dimension of the problem. If two experts stand before an audience of citizens and argue over the empirical reliability of a given set of statistics, what basis does the citizen have for judging the competing empirical claims? In this situation, citizens are forced to rely more on a socio-cultural assessment of the factors surrounding a decision. And not without good reason. Although scientific experts continue to maintain that their research is "value-neutral", the limits of this view become especially apparent once they introduce their technical findings into the sociopolitical world of competing interests. In the absence of empirical agreement, there is every reason to believe that interested parties will strongly assert themselves, advocating the findings that best suit their interests. In such cases, at least in the immediate situation, there is nothing science can do to mediate between such claims. One can call for more research but, as experience shows, there is little guarantee that further research will bring either certainty or timely results in a particular conflict.

The presence of cultural rationality is especially strong when there is reason to believe in the possibility of deception or manipulation, which has often proven to be the case in environmental politics. In a world of large industrial giants with vastly disproportionate power and influence compared to that of local communities, it comes as no surprise to learn that citizens tend to be wary of the kinds of distorted communications to which such asymmetrical relations can give rise. Where citizens have compelling reasons to suspect that a risk assessment is superficial or false, they can only turn to their own cultural logic and examine the results in terms of previous social experiences. Turning away from the empirical studies themselves, they ask questions like: What are our previous experiences with these people? Is there reason to believe we can trust them? Why are they telling us this? (Perhaps even, Why don't they look us in the eye when they tell it?)

Such questions are especially pertinent when crucial decisions are made by distant, anonymous, and hierarchical organizations. Citizens want to know how conclusions were reached, whose interests are at stake, if the process reflects a hidden agenda, who is responsible, what protection they have if something goes wrong, and so on. If they believe the project engineers and managers either don't know what they are talking about, or are willing to lie to serve the purposes of their company, workers or citizens will obviously reject the risk assessment

statistics put forth by the company. For example, if they have experiences that suggest they should be highly distrustful of particular company representatives or plant managers, such information will tend to override the data itself. From the perspective of cultural rationality, to act otherwise would itself be *irrational*.

Given the limits of science in questions of public policy, coupled with the citizens' reliance on cultural ideologies, how should we approach deliberation about environmental risk? The critics of environmentalism continue to argue that more and better science is the answer. Recognizing the limits of existing science, the scientists have a greater responsibility to point out the shortcomings and criticisms of their own analyses (Rubin 1994). But this misses the role of cultural rationality and the problem that it addresses. The solution is not to be found in greater scientific clarification per se, but rather in answers to normative questions about the social system and the way of life more generally. Whereas the critics take this to mean a call for a different society, significant numbers of people are worried that the society they live in and accept is not working the way its leaders tell them it does. For this reason, any attempt to rule out social ideology can only miss the crucial part of the problem. The challenge ahead is not just more science, but rather how to better understand the interactions between science and ideology – facts and values – and most importantly how to systematically integrate them in a more comprehensive analysis.

2 Rationality in Practical Deliberation

The case for cultural reason and the reliance on ideology is generally made in terms of uncertainty; in the face of uncertainty people turn to their social experiences to fill in the gaps. Without the knowledge needed to make an empirical assessment, they make predictions based on extrapolations from their ordinary knowledge. But support for the turn to cultural reason can be even stronger. Indeed, it can be grounded in epistemology. This, though, involves turning from the formal conception of scientific logic to the informal logic of practical reason. The move itself is an apparent appeal, as this is the way we reason in the world of social affairs. Not only is it what the citizens are already doing, there is nothing inherently irrational about it. Practical discourse is, in fact, the mode of reason geared to the everyday world of social action.

Practical reason refers here to the work of "ordinary language philosophers" who have set out to understand how we think and reason in the everyday world, especially in absence of ultimate values and with incomplete knowledge. Much of the work has, moreover, been advanced to deal with the very problem that confronts risk assessment and communication. Asking how society proceeds without the assistance of the kind of rationality called for by formal scientific methodology, these philosophers have sought to reconstruct the informal logic of everyday discourse. That is, how do ordinary people deliberate and argue about the question of action? In the process, they have shown that the philosophers of positivist science throw the baby out with the bath water. It may be the case the kinds of decisions dealt with in the everyday world cannot be proven with the kind of rationality demanded by science, but to judge them then as irrational is to misunderstand how social reason functions. As writers such as Toulmin (1958), Scriven (1987), and others have made clear, such a judgment rests on a logical error. The positivists have falsely imported into the everyday world the epistemology of another domain. As Scriven (1987) has put it, "the classical models of reasoning provide inadequate and in fact seriously misleading accounts of most practical…reasoning – the reasoning of the kitchen, surgery and the workshop, the law courts… office and battle field." To be sure, common or ordinary reasoning frequently has components that can usefully be represented by the formal logics of induction and deduction. The problem is, as he explains, "they are only components, and a completely distorted picture of the nature of reasons results from supposing that these neat pieces are what reasoning…is all about."

But can we be more precise? What exactly is an informal logic of practical reason? Many people have a good intuitive sense that such a mode of reason exists without being able to say more precisely what it looks like. Toward this end, we can turn to Toulmin's approach to practical reason, or the "logic of good reasons", especially as elaborated by Taylor (1961) and

adapted to policy analysis by Fischer (1995). Without going into detail, which space here does not permit, we can understand a complete judgment in the practical world to involve four interrelated levels of evaluation, extending from the very concrete to the abstract (or the other way around).

Each of these levels constitutes a discourse unto itself. If we pursue the scheme from the concrete to the abstract (rather than from the abstract to the concrete, which can also be the direction of a deliberation), it begins with a very familiar question: Does a particular program (rule, assessment, policy, or project) fulfill a particular norm or standard? Which in ordinary language might more simply be approached as the question "Does it work?" Here we can easily interpret the goal of a risk assessment as an effort to answer the question: Does a particular decision or action meet certain acceptable standards of safety? It is a question to which all of the techniques and methods of empirical analysis can be brought (Covello 1993). Called here "technical verification", it is what the mainstream risk analyst takes to be the essence of rationality.

The problem with risk assessment is that it stops here. For a practical judgment, however, the evaluation moves on to the justification of the norms and standards against which the program is judged. That is, the legitimacy or validity of the standards also has to be tested, a task which is carried out through three additional discourses. The first of these discourses can be called "situational validation". Concerned with the context to which the norm and standard is applied, evaluation at this level asks if there is anything about the decision which requires that an exception be made to the rule or judgment rendered at the level of technical verification. Here we find a classic example in the politics of risk assessment, namely "Nimby" (Not in my backyard). Take, for instance, the case of GM foods. Beyond an empirical assessment, oppositional groups will argue that even if GM Foods might be shown to be safe, they should under no circumstances be sited in areas near organic farms.

Beyond an assessment of the situational context, the evaluation logically moves to "societal vindication", concerned with the contribution of the particular project or policy to the existing social order. This involves stepping outside of a particular value or belief system and asking if it has instrumental or contributive value for the political economy of the social system. That is, the frame or point of reference changes in societal vindication. Whereas in first-order discourse the issues pertain to a particular program and the affected group(s), the evaluation shifts to the impact on the society as a whole. Here we find prominent arguments – those of corporate leaders and governmental officials – about the contributions of technology to economic growth and thus a major source of social well-being. GM foods, it is argued by business leaders, is needed to fuel an expanding economy in the face of international competitiveness, or to feed the hungry in Africa. Environmentalists, on the other hand, point to possible health risks that cannot be anticipated at the present time and the irresponsible manipulation of nature for corporate profits. Which leads to the fourth level of discourse, social or "ideological social choice".

Whereas industrialists anchors their argument to the functional considerations of the existing social order, the environmentalist typically calls for a more natural, organic way of life. Here we confront the role of ideology in the positive sense of the term. The essence of the green critique is to assess the existing system from the point of view of ideal principles and values – the stuff of fourth-level discourse – and to offer an alternative vision of how we might live together sustainably. This could include lower levels of materialism resulting from less emphasis on consumerism and a more organic, spiritual relationship with nature.

The essential point here is that all four discourses are part of a complete or comprehensive judgment; all have a valid role to play in an assessment of a technological or environmental risk. Where the technical risk analyst offers data that corresponds to the first level of the evaluation, he or she fails to see that such data is only one component of a full evaluation. In judging the citizen "irrational" after listening to the results of a risk assessment and then speaking about the kind of society we live in, the technical analysts fails to see that citizens also address essential components of the complete assessment. Insofar as the risk analyst rejects such information as irrelevant, arguing that the citizen

cannot follow the argument, from the perspective of practical reason he or she can in fact be judged as irrational. Indeed, the logic of practical reason helps us to understand – even diagram – the classic Aristotelian statement that the acceptability of a statement or judgment is in the last instance on its relationship to the good way of life. Involving the justification of the standard or norm against which a particular measurement is made, the line moves directly from technical verification to ideological choice.

Table 1: The four-level discourse model

Logic of Practical Reason	*Types of GM Food Discourses*
Ideological Choice (Because of) ↑	Environmental Movement: Irresponsible manipulation of nature for corporate profit and unknown health risks. Long term effects cannot be measured at the present time. Call for more organic foods. Hunger from maldistribution, inadequate supply of food in the world.
Systems Vindication (Because of) ↑	Industry Economists: Increase the overall food supply and protect the environment from dangerous pesticides. Biotechnology should be seen as part of ecological modernization. Increased food supplies will help feed the hungry in the Third World.
Situational Validation (Because of) ↑	Medical and Nutrition Experts: Organic farms need special protection again seed contamination. There is also a need for protective labeling of GM foods for people with allergies. Farmers in developing countries are unable both to buy the modified seeds and compete with those who can, thus leading to increases in unemployment and poverty.
Warrant (Since) ↑	Risk Analysts: Measured again acceptable safety standards no harmful effects are found.
Data → Technical Verification → Conclusion	

A critical judgement is presented here as one that is pursued progressively through the four phases of practical deliberation. The formal logic of an empirical assertion moves from data to conclusion, mediated by a warrant backed by normative and empirical assumptions (cf. table 1). In normal discussion these assumptions generally serve as part of the background consensus and are called into question only during disputes. The task of a comprehensive-critical assessment is to make explicit these assumptions through a progressive critique extending from validation to ideological choice (or from ideological choice to validation). It is here that we can understand Habermas's classical Aristotelian contention that in the last instance an empirical statement must be judged by its intentions for the good and true life. As reflected through the logical link of an empirical assertion to the level of ideological choice, a full delineation of the logic of a practical reason discloses its meaning and implications for the pursuit of a particular conception of the ideal society.

An important methodological test of the four-level scheme is its ability to plug facts into normative policy deliberations. This can be demonstrated by relating it to the naturalist conception of ethical theory that emphasizes the contribution of empirical information to normative discourse (Fischer 1980, pp. 211-212). Naturalists list six types of empirical knowledge that influence value judgements. All can be located across the twelve component questions of the four levels. For example, these include knowledge about the consequences that flow from alternative actions and knowledge about alternative means available, both of which are basic to technical verification; the particular facts of the situation and knowledge of the established norms that bear on the decision is essential to situational validation; the general causal conditions and laws relevant to the problem are inherent components of systems vindication; and knowledge about values that bear on the decision and about the fundamental needs of humankind belongs to ideological social choice.

The starting point for such practical deliberation depends on the particular policy at issue and the debates that it has generated. Typically, the issue of contention relates most specifically to one of the levels, potentially expanding to one or more of the other levels as an argument

progresses. In policy issues that are highly contentious, however, there can be arguments emerging at all levels at the same time, as illustrated by the GM Foods example.

The four-level discourse model has been applied to concrete policy issues in a number of ways. Most important has been the work of Hoppe (1993), who has shown how the four levels correspond to the types of argumentation that occur across the phases of the policy cycle (Hoppe and Peterse 1993; Gabrielian 1998). Agenda-setting in significant part turns on ideological concerns; policy formulation concentrates heavily on issues of systems vindication; implementation focuses on issues pertinent to situational validation; and evaluation is a clear-cut case of technical verification. In this respect, Hoppe sees the policy process as moving from the reflective to the practical orders of reason, which he interestingly illustrates by attaching his analysis to Lynn's (1987, pp. 146-149) conceptualization of the policy process as a set of games: the high (ideological) game, the middle (systemic) game, and the low (technical) game.

Secondly, Hoppe and associates (Hoppe et al. 1990; Hoppe and Grin 2002) use the four-level discourse model to map out the structural properties of policy belief systems (understood as clusters of normative and causal assumptions). Adapting Lakatos' theory of a scientific research program as possessing a hard core surrounded by protective belts, in much the same way as Sabatier (1987, p. 667 and Majone (1989, p. 150) have, Hoppe et al. (1990, p. 124) conceptualize the level of ideological choice as the hard core of a policy belief system, the content of systems vindication as the near core, and the content of situation validation and technical verification as the secondary protective belts. Where the hard core of a policy belief system is stable and resistant to change, the secondary components are much more flexible. In this view, 'the hard core consists of strategies and methods for converting abstract ideas into action.' These "strategies generate permissible and advisable courses of action, while excluding or discouraging others." Like a scientific research strategy, "a policy belief system's long-term destiny would be determined by the flexible periphery's capacity to generate a range of policy programs in a wide array of different policy areas." Like a research program's instructions for "puzzle solving, a policy belief system's malleable periphery should generate (more so than rival belief systems) practical solutions and innovative ways of dealing with problems of everyday policy making," while "degenerating tendencies in the periphery may become fatal to a policy belief system." Hoppe et al. (1990, p. 139) argue that the four-level model assists in conceptualizing this by showing that "first-order discourse may help explain why one rather than another course of action is in fact adopted," while "second-order policy discourse analysis may help address the larger question of why others are quietly abandoned or simply forgotten." In this view, policy discourse coalitions seek to deflect challenges away from the core assumptions and axioms and engage in argumentative combat at the level of secondary assumptions. The strategy is to protect core assumptions by attempting to redirect or redefine challenges to lower-level considerations (also Mathur 2003). Policy change thus mostly occurs at the levels below the core assumptions. Only when the protective belts cannot hold – that is, withstand rigorous criticism – will alterations be made to the core, and even then not easily. Importantly, Hoppe et al. (1997, p. 124) recognize the vulnerability of core assumptions to interpretive "reality shifts." As they put it, the "capacity to reframe issues and harmonize interests from a new perspective may, in the end, be of the greatest importance."

The ability to logically analyze policies – one's own or those of one's opponents – offers insights into the construction of acceptable alternative policies. After organizing a policy argument into its component parts, the analyst can turn his or her attention to political consensus formation. In much the same sense that Roe (1994) speaks of metanarratives, the process involves an attempt to convert a static conception of a policy position into a dynamic argument with persuasive power. Once the possible areas of policy consensus and conflict are identified, the analyst can design an alternative policy proposal that addresses the key issues of conflict. The test of the alternative argument is how well it stands up to the criticisms and objections of the political audiences it has to persuade, the breadth of its appeal, the number of views it can synthesize, and so on. In many cases, this means the analyst must attempt dialectically to move

the proposal beyond the narrow defence of a particular argument in order to present a more comprehensive picture of the political situation. Since a narrow argument can be defended only within a limited context of belief, as Hoppe argues, the policy analyst must at times try to offer a new or reformulated view to replace or revise a belief or value system that impedes the construction of consensus.

The development of such policy proposals must remain as much an art as a science. The process involves conjecture and speculation, analogy, and metaphor, and logical extrapolation from established causal relationships and facts. Unlike the scientist's analysis based on a closed, generalized model, the policy analyst's proposal has to be open and contextual. Where the former model follows the formal principles of inference, the latter is based on the rules and procedures of informal logic. In matters related to technology, the practice is perhaps best recognized in the technique of scenario writing

3 Conclusion

This paper has explored the tensions between experts and citizens in the assessment of technological and environmental risks from an epistemological perspective. A good deal of the discussion about this issue has focused on the inability of citizens to participate "rationally" in the decision process, in particular the citizen's inability to grasp or accept scientific findings and their implications for rational policymaking. Rather than concentrating on the facts, citizens movements such as the environmental movement are said to concentrate on espousing an ideology. Instead of considering the technical issues at hand, they refocus the analytical process through their ideological lens. The analysis here has turned the question around and applied the informal logic of ordinary language to the scientific mode of decision-making. Instead of criticizing the citizen, this has permitted us to question the rationality of the scientists in decisions pertaining to public policy. In the process, contrary to the standard take on the issue, we showed that ordinary citizens rationally focus on important questions that scientific experts ignore or neglect. The logic of practical reason assists in revealing the systematic connections between the scientists' technical data and the particular social situation, the societal system and the way of life. Indeed, practical reason makes clear that the connection is more than just logical; it is essential and necessary for the scientific risk analysts to better integrate the citizen's perspective into his or her own analysis. The challenge is not an easy one, but given its importance it should be moved to the topic of the epistemological agenda.

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Contact

Prof. Frank Fischer
Professor of Political Science
Political Science Department
Rutgers University
Newark, New Jersey 07102, USA
Tel.: +1 - 973 - 353 - 51 05
Fax: +1 - 973 - 353 - 51 03
E-Mail: ffischer@andromedea.rutgers.edu

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