

## Sex Differences in Valuations of the Environment?

**Margo Wilson**  
**Martin Daly**  
**Stephen Gordon**  
*McMaster University*

**Adelle Pratt**  
*University of Western Ontario*

---

Sexual selection theory affords a rationale for predicting that men, especially young men, may be more willing than women to risk harms and to discount the future in the pursuit of short-term gains. These propositions apply to many domains of risky behavior, and it is likely that they apply to decisions involving potential harms to the environment and health hazards as well. Two preliminary studies of university subjects' responses to hypothetical dilemmas that support the predicted sex difference are described. Important understudied questions are, to what extent reckless risk acceptance may be mitigated by material wellbeing, by marriage, and by parenthood.

---

What do people value in their surroundings? Environmental benefits cover a wide spectrum of pleasures and needs: economic and nutritive, aesthetic and recreational, health and safety. To even enumerate the full range of such benefits and to organize them into some sort of meaningful taxonomy is a formidable challenge, let alone prioritizing them or computing their net worth. Economists have approached the question of the value of environmental goods by simply asking people what they would be willing to pay for them, but this is unsatisfactory (see for example, Kahneman & Knetsch, 1992; Kahneman, Ritov, Jacowitz & Grant, 1993 regarding the

---

Please address correspondence to Dr. Wilson, Department of Psychology, McMaster University, Hamilton, Ontario, Canada L8S 4K1.

absurdities that ensue from supposing that people can place dollar values on nonmarket environmental goods). The availability of many things that people value, such as drinkable water or inexpensive paper, may be dependent on management practices and environmental protection in ways of which the consumers are scarcely aware. Even those natural resources that we use directly may be taken for granted if they are so reliably abundant and of useable quality that we have never been obliged to think about what they are worth to us. Moreover, many environmental goods such as oxygen are not even detectable by our sensory systems. But in spite of these and other difficulties facing any study of people's preferences and valuations of environmental goods, psychologists, philosophers, economists and other social scientists have not been deterred (e.g., Hechter, Nadel & Michod, 1993).

We propose that the reasons why people have particular preferences and priorities cannot be satisfactorily addressed without consideration of the ways in which our long history of natural and sexual selection pressures shaped the emotional, motivational and information-processing mechanisms underlying the expression of values and preferences. The functional significance of some valuations is obvious: warmth, satiety, and safety are valued states, for example, because of their obvious contribution to survival. But the utility of other preferences and appetites is less obvious, and perhaps less universal. Intangible states such as status, power, and self-esteem are products of psychological mechanisms which have been shaped by selection pressures in the context of social living and reproductive competition. In a long-lived sexually reproducing social species such as *Homo sapiens*, one can anticipate that numerous complex, facultative social and psychological adaptations for social-living, for mate choice, for intrasexual competition, and so forth, have evolved.

In this paper, we briefly outline an evolutionary psychological framework which can be used to derive hypotheses about factors affecting valuations of natural resources. Rather than developing a taxonomy of values or domains of environmental valuations, we present a logic by which one may predict differences in valuations as a function of sex, age, and social and material circumstances. We focus on possible differences in valuations of the environment by women versus men, as well as differences in their reluctance to risk damaging the environment, based on considerations of sexually differentiated adaptations for intrasexual competition.

First of all, is there any evidence for sex differences in environmental valuations? "Eco-feminism" is perhaps the only perspective that is consistently concerned with the issue of gender (Mellor, 1993), but to the best of our knowledge there have been few empirical studies derived from this perspective. One of the pioneering studies of valuations and attitudes to-

ward the environment was conducted by Riley Dunlap and his colleagues (Olsen, Lodwick & Dunlap, 1992) who surveyed some 1600 residents of the state of Washington in 1976. There was a moderate but significant sex difference in expressed concern about the quality of the environment, with women professing to be more concerned than men. Moreover, women were more likely to report being willing to change their habits at home with respect to household products which pollute the environment.

We are presently studying people's perceptions and views of the local wetland ecosystem of the western end of Lake Ontario which has suffered extensive environmental degradation from decades of industrial pollution, inadequate sewage treatment, excessive use of fertilizers and herbicides, and increasing amounts of vehicular combustion emissions (Remedial Action Plan, 1992). The McMaster University campus borders this wetland ecosystem. In a preliminary study, 118 McMaster University students were asked, "How concerned are you about the present state of the environment?" Both men and women expressed strong concern on a 7-point Likert scale where 1 was defined as "not concerned" and 7 as "extremely concerned," but the average was significantly higher for women (6.2) than for men (5.8). This kind of question undoubtedly covers many issues, and does not clarify what specific environmental matters women and men might be primarily, and perhaps differentially, concerned about. People could be concerned about health hazards, resource depletion, reduction in species diversity, and other more specific and local issues. It is also possible that this sort of questioning evokes greater expressed concern from women than from men regardless of the specific issue.

We hypothesize that particularly large sex differences will pertain to valuations that engage psychological adaptations shaped by a history of intrasexual competition. Environmental resources are obviously crucial to the survival and reproductive success of both sexes, but because our sexual selective history has been one of mild effective polygyny (Daly & Wilson, 1983), men may perceive a lesser reduction in the marginal utility of resource exploitation beyond immediate needs, and hence be more willing to deplete them. As discussed below, there is also reason to expect men to discount the future more steeply than women, and to be less deterred by health hazards and other risks. More specifically, we suggest the following seven propositions derived from the logic of sexual selection theory.

1. *Men may be expected to be more inclined than women to use material resources to enhance their social status, both because reproductive success has been more tightly linked to status for men than for women (Low & Heinen, 1993) and because the display of resources has been the principal way that men can enhance their attractiveness to women (Buss, 1994).*

## POPULATION AND ENVIRONMENT

2. *Men may be expected to discount the value of future resources relative to present resources more than women, both because they are less likely than women to live to see the future and because immediate, even total, resource expenditure can pay off for a man (as mating effort) but is likely to be a disaster for a woman.*
3. *For similar reasons, men may be expected to disdain health risks more than women.*
4. *For similar reasons, men may be expected to discount longterm detrimental impacts of polluting or exploiting the environment more than women.*
5. *Where material resources are unevenly distributed—where there is much variance in personal income or wealth—there is more intense intrasexual competition, and men may be expected to be relatively more inclined to take a short-term view of the merits of exploiting environmental resources. Of course, women are expected to be affected by inequitable distributions of wealth too, but men are expected to be more affected.*
6. *Where life expectancy is relatively low, for whatever reasons, people, especially men, may be expected to be relatively unconcerned about personal health hazards or environmental degradation.*
7. *All of the above six propositions are expected to be more germane to young men than older men, and these age-related effects are expected to be modulated, in part, by marital status and parental status. While women may also be affected by age and by marital and parental status, men are expected to be more affected.*

**SEXUAL SELECTION THEORY**

Darwinian selection favors those phenotypic “designs” that out-reproduce alternate designs within the same population. More specifically, selection favors whatever contributes to outreproducing others of one’s own sex. In a sexual population, all the males are engaged in a “zero-sum game” in which the paternal share of the ancestry of all future generations is divided among them, while the females are engaged in a parallel contest over the maternal share of that ancestry. In a fundamental sense, then, one’s principal competitors are same-sex conspecifics.

Darwin (1871) drew a distinction between the process of “natural selection,” which favors those improved phenotypic designs that enhance survival and the efficient transformation of resources into growth and reproduction, from “sexual selection,” which is a matter of differential access to mates. Sexual selection seemed to Darwin a quite different matter from natural selection because the attributes favored by sexual selection, such as

the famous peacock's tail, often seemed positively detrimental in other contexts. Contemporary biologists generally prefer to think of sexual selection as simply a component of natural selection, noting that distinct "selection pressures" may often oppose one another within the realms that Darwin subsumed under natural selection, too, and that selection in all its forms is ultimately a matter of differential contribution to the replicative success of one's genes relative to their alleles.

Sexual selection may further be divided into differential reproduction as a result of differential success in competitive interactions with others of one's own sex and differential reproduction as a result of mate choice by the opposite sex (Andersson, 1994).

Although it is true of both females and males that selection entails a zero-sum competitive contest for genetic posterity, the evolutionary consequences are not necessarily similar in the two sexes. In particular, sexual selection is generally of differential intensity in the two sexes, leading to a variety of sexually differentiated adaptations for intrasexual competition. In most mammals, the variance in male fitness is greater than the variance in female fitness. The male's ceiling on individual reproductive success is higher than the female's, since a male can sire a surviving offspring with very little investment of time or energy whereas each youngster demands considerable female investment (at least gestationally and usually postnatally as well). But it follows that an individual male also has a higher probability than a female of dying without having reproduced at all.

What this sex difference in fitness variance implies is that male mammals are generally subject to more intense sexual selection than females, with the result that the psychological and morphological attributes that have evolved for use in intrasexual competition are usually costlier and more dangerous in males than in females. This claim about sex differences does not hinge on maleness per se, but rather on whichever sex makes the greater investment in offspring (Trivers, 1972). Although that sex is usually the female, and perhaps universally so in mammals, there is a sizable minority of animal species, including some birds, fishes, frogs, and insects, in which males make the greater parental investment and females have the higher reproductive ceiling and greater fitness variance. In such "sex-role-reversed" species, sexual selection has operated more intensely on the females, who are larger and more combative, court choosey males, and die younger (see, e.g., Daly & Wilson, 1983).

The human animal, like other mammals, is one in which males are the most intensely sexually selected sex. The putative record for personal reproduction by a human being is of course held by a male: the Moroccan emperor Moulay Ismail the Bloodthirsty (1672–1727) is credited with 888

children (McWhirter & Greenberg, 1979). Even among despots, Moulay Ismail was a little extreme, but he does illustrate a point of broad applicability: successful men can sire more children than any one woman could bear, consigning other men to childlessness, and they have apparently always done just that (Betzig, 1986). Great disparities of status and power became possible only within the last few thousand years, after the invention of agriculture. But even among relatively egalitarian foraging peoples, who make their livings much as did most of our human ancestors, some high-status men maintain two or three wives while other men are consigned to bachelorhood. In contrast to the men, virtually all women of fertile age are married, and are in a position to reproduce if physiologically able (e.g. Howell, 1979; Hill & Hurtado, 1996). It follows that men compete not merely to attain the highest status, but to avoid the lowest. Indeed, competition is often fiercest near the bottom of society, where a man faced with predictive cues of total failure has nothing to lose by the most dangerous competitive tactics (e.g., Daly & Wilson, 1990; Wilson & Daly, 1985). It is in competitive social contexts that man's competitive psychological systems were designed by selection to be concerned with social comparisons, achievement, and status.

Successful reproduction in ancestral human environments required a longterm commitment on the part of a woman, but not necessarily by a man. Female fitness has been limited mainly by access to material resources and by the time and energy demands of each young, whereas male fitness has been limited, at least in part, by access to fertile females—and not necessarily “access” of any great duration! Therefore, it might be expected that males would find rapid resource accrual, resource display, and immediate resource use somewhat more appealing than would females, and that males would be more inclined to discount the future in their decisions about acquiring and utilizing resources. As Alexander (1979, p. 241) notes, “the entire life history strategy of males is a higher-risk, higher-stakes adventure than that of females.”

It is also reasonable to expect that sexually differentiated valuations of natural resources will be especially conspicuous in those life stages in which males have been selected to compete most intensely for reproductive opportunities. The lifestage where claiming and using resources—indeed, exploiting the resources at the expense of the future and hence being disinclined to conserve resources—would have been most rewarded would be that lifestage where such behavior would have had the greatest statistically expected payoff in reproductive success in past environments. And that lifestage for men is young adulthood—once men are themselves husbands and parents then concern for their offspring's wellbeing may re-

sult in alterations of their valuations of the environment, especially if the resources would be those of recurring value from one generation to the next, such as land or water rights.

### *Young Men as Competitors and Risk-Takers*

Several lines of evidence about lifespan development support the idea that young men constitute a demographic class specialized by a history of selection for maximal competitive effort and risk-taking. Young men appear to be psychologically specialized to embrace danger and confrontational competition. In various activities, they have been found to be especially motivated by competition and especially undeterred by danger to self (e.g., Bell & Bell, 1993; Gove, 1985; Lyng, 1990; Jonah, 1986). Interestingly, young males are also exceptionally risk-accepting in decisions about investments in stocks and bonds (Blume & Friend, 1978; McInish, 1982).

Risk of death by "external" causes such as driving fatalities is maximally sexually differentiated in young adulthood (Wilson & Daly, 1985). Mortality by suicide and homicide is also maximally sexually differentiated in young adulthood (Holinger, 1987; Daly & Wilson, 1988; 1990). The fact that men senesce faster and die younger than women even when they are protected from external sources of mortality suggests that these sex differences in mortality have prevailed long enough and persistently enough that even male physiology has evolved to discount the future more steeply than female physiology. In the case of homicides, young men are not only the principal victims but also the principal perpetrators; indeed, men's likelihood of killing is much more peaked in young adulthood than is the risk of being killed (Daly & Wilson, 1988). All of these things can be interpreted as reflections of an evolved lifespan schedule of risk-proneness.

An alternative to this hypothesis, however, is that age patterns are entirely the result of changes in relevant circumstances which happen to be correlated with age. Mated status, for example, would be expected to inspire a reduction in dangerous risk-taking because access to mates is a principal issue inspiring competition and married men have more to lose than their single counterparts. Marital status is indeed related to the probability of committing a lethal act of competitive violence, but age effects remain conspicuous when married and unmarried men are distinguished (Daly & Wilson, 1990). Similarly, men are most likely to be economically disadvantaged in young adulthood, and poverty, too, is a risk factor in homicide, but young adulthood and unemployment are again separable risk factors for homicide (Daly & Wilson, 1990).

Dangerous acts are adaptive choices if the positive fitness conse-

quences are large enough and probable enough to offset the possible negative fitness consequences. Disdain of danger to oneself is especially to be expected where available risk-averse alternatives are likely to produce a fitness of zero: if opting out of dangerous competition maximizes longevity but never permits the accrual of sufficient resources to reproduce, then selection will favor opting in (Rubin & Paul, 1979).

From a psychological point of view, it is interesting to inquire how age- and sex-specific variations in effective risk-proneness are instantiated in perceptual and/or decision processes. Wilson and Herrnstein (1985) argued from diverse evidence that men who engage in predatory violence and other risky criminal activity have different "time horizons" than law-abiding men, weighing the *near* future relatively heavily against the long term. What these authors failed to note is that facultative adjustment of one's personal time-horizons could be an adaptive response to predictive information about one's prospects for longevity and eventual success (Gardner, 1993; Rogers, 1991; 1994). Other psychological processes that have the effect of promoting risk-taking can also be envisaged. One could become more risk-prone as a result of one or more of the following: intensified desire for the fruits of success, intensified fear of the stigma of non-participation, finding the adrenalin rush of danger pleasurable in itself, underestimating objective dangers, overestimating one's competence, or ceasing to care whether one lives or dies. As drivers, for example, young men both underestimate objective risks and overestimate their own skills, in comparison to older drivers (Brown & Groeger, 1988; Finn & Bragg, 1986; Matthews & Moran, 1986; Trimpop, 1994). Apparent disdain for their own lives might be inferred from the fact that men's suicide rates maximally surpass women's in young adulthood (Gardner, 1993; Holinger, 1987). There is also some evidence that the pleasure derived from skilled encounters with danger diminishes with age (Gove, 1985; Lyng, 1990; 1993). In general, sensation-seeking inclinations as measured by preferences for activities which are thrilling and entail some disdain for danger are higher in men than in women, and decline with age (Zuckerman, 1994).

The risk-proneness of young men seems to be remarkably general in domain. Adolescents are relatively unlikely to seek medical assistance or other health enhancing preventive measures (Millstein, 1989). Young men are also relatively willing to take risks with drugs and intoxicants and chances of contracting sexually transmitted diseases (e.g., Irwin, 1993; Millstein, 1993). It therefore seems very likely that they may also underestimate the health hazards of various environmental contaminants. And if they underestimate the risks to self that they are incurring with their activ-

ities then it is very likely that they will underestimate the risks that their activities impose on other people, and on other living things.

### *Inequalities in Intrasexual Competition*

From the perspective of sexual selection theory, men more than women might be expected to be especially sensitive to cues of their status relative to their rivals. If intrasexual competition among men has been a major determinant of acquisition of resources (both material and social) which were converted into reproductive opportunities and if there has been a history of high variance in the distribution of resources and reproductive opportunities, then the masculine psyche is likely to be such as to take bigger risks to acquire, display and consume resources, especially when accepting a small pay-off has little or no more value than no pay-off, as for example when it leaves a poor man still unmarried. This argument treats risk as variance in the magnitude of pay-offs for a given course of action. In life-threatening circumstances people often take the riskier (higher variance) course of action. But people also take great risks when present circumstances are perceived as "dead-ends." For example, history reveals that successful explorers, warriors and adventurers have often been men who had few alternative prospects for attaining material and social success. Such risk-takers acquired fame and fortune by their successes, fame and fortune which would not have otherwise been won. Later-born sons of Portuguese aristocratic families were the conquerors and explorers of the fifteenth-sixteenth centuries; inheritance of the estate and noble status went to first born sons (Boone, 1986). Similar options in life befell more humble folk too. Later-born sons and other men with poor prospects have taken, and still take, the riskier option of emigrating, often with a successful outcome when the destinations were places like North America (Clarke, 1993).

Experimental studies of nonhuman animal foraging decisions have established the ecological validity of a risk preference model based on variance of pay-offs. Rather than simply maximizing the expected (mean) return in some desired commodity, such as food, animals should be—and demonstrably are—sensitive to variance as well (Real & Caraco, 1986). Seed-eating birds generally prefer to forage in low variance microhabitats as compared to ones with the same expected (mean) yield but greater variability, but they switch to preferring the high variance option when their bodyweight or blood sugar is so low as to be predictive of overnight starvation and death unless they can find food at a higher than average rate (Caraco, Martindale & Whittam, 1980). The high variance option of course

increases the risk of getting very little or no food, but a merely average yield is really no better—dead is dead—and the starving birds accept the “risk” of finding even less in exchange for at least some chance of finding enough. Such experiments, in which alternative responses yield identical mean return rates but different variances, reveal that several seed-eating birds (Caraco & Lima, 1985; Barkan, 1990), as well as rats (Kagel et al., 1986; Hastjarjo et al., 1990) switch to prefer the high variance option if their caloric intake is sufficiently reduced.

One can imagine numerous human parallels in addition to explorers, adventurers, and warriors. Taking dangerous risks to unlawfully acquire the resources of others might be perceived as a more attractive option when safer lawful means of acquiring material wealth yield a pittance, even if the expected mean return from a life of robbery is no higher and the expected lifespan is shorter. Interestingly, variations in robbery and homicide rates between places are better explained by measures of variance in income than by absolute values of poverty (Hsieh & Pugh, 1993).

People are demonstrably sensitive to variance as well as expected returns. Psychologists and economists, using various hypothetical lottery or decision-making dilemmas, have documented that people’s choices among bets of similar expected value are affected by the distribution of rewards and probabilities (Lopes, 1987; 1993), as well as being influenced by whether numerically equivalent outcomes are portrayed as gains or losses (Kahneman & Tversky, 1979). The underlying psychological dimension governing these choices among alternative uncertain outcomes has been considered to be that ranging from risk aversion to risk proneness or risk seeking. In the experimental studies of foraging decisions described above, the below-weight animal preferring the high variance option might be deemed risk seeking. One’s relative inclination toward risk aversion or risk proneness presumably reflects perceptions of subjective utilities of the outcomes as well as perceptions of the uncertainties associated with each outcome. From the reasoning of sexual selection theory, people’s perceptions of both subjective utilities and uncertainties are likely to reflect their sex, life history variables and cues of relative success in intrasexual competition. Psychological research on variations in risk acceptance has hitherto focused on stable individual differences (e.g., Zuckerman, 1994; Trimpop, 1994), with some consideration of lifespan development (Gove, 1985; Gardner, 1993), but there has as yet been little consideration of panhuman psychological adaptations designed by selection to deal with probability-weighting algorithms for different domains of utilities and for variable distributions of uncertainties.

## TRADEOFFS BETWEEN SUCCESS AND HEALTH

The line of reasoning developed in this paper suggests that men might value opportunities for resource accrual, and/or might discount associated costs such as health risks, more than women. One way to test this idea is to present people with hypothetical dilemmas. For example, we asked 197 people to imagine themselves in the following situation in which a career opportunity entailed an attendant health risk.

*"You presently live in a small southern Ontario city of 250,000 people, where you were born and where most of your family and friends still reside. For quite some time you have been waiting for some sort of advancement in your position at work, and it has finally come. The company has offered you a promotion that will significantly boost your career, but your employers inform you that it will involve relocating to their newest branch out on the west coast (about 4,000 km away), to a city of 1.5 million people, for at least two years. Most of what you have heard about this large city is appealing, but it is also famous for its smog, and last year 10 percent of the population suffered from severe respiratory illnesses there, compared to a 1 percent rate of comparable cases in your home town."*  
Do you accept the promotion?

Eighty-five percent of the men and 68% of the women accepted the promotion (Chi-Square 8.9,  $P < .01$ ). This significant sex difference in the predicted direction is supportive of our general thesis that men will discount health risk in favor of an opportunity to improve one's economic and social status. This result does not imply that men are insensitive to health risks; men might not accept the promotion if the percent of respiratory illness was much higher than 10%. Furthermore, women might not have accepted the promotion even if the health risks were the same in both places. Among the subjects in this study, only 41% of those who were parents said they would accept the promotion, compared to 81% of those without children (Chi-Square = 19.9;  $P < .001$ ). This difference supports the expectation that parenthood is relevant to valuations and preferences. Parenthood is, of course, correlated with age. Fifty-two subjects in this study were between 21 and 35 years of age and within this age category 50% of the 16 parents and 83% of the 36 nonparents accepted the promotion (Chi-Square = 6.3;  $P < .02$ ). The sample size was not adequate to address the question of whether parenthood affected men's and women's responses differently.

The results from this preliminary study suggest that this kind of trade-off dilemma is a promising research method. Various modifications could be added to take into account considerations such as other potential costs and benefits of the promotion and relocation as well as variations in the perceived likelihood of the two outcomes. It is also important to assess the ecological validity of this self-report protocol: how well do self-reports reflect people's actual inclinations and preferences?

### **TRADEOFFS BETWEEN PRESENT PROFITS WITH ENVIRONMENTAL DEGRADATION VERSUS REDUCED PROFITS WITH LONGTERM SUSTAINABILITY**

In addition to the expectation that young men are more likely to disdain personal health risks for economic and status advantages, we also hypothesize that men are more likely than women to discount future environmental degradation in favor of present profits and material successes. Another set of 104 McMaster University people considered the following dilemma:

*"Imagine you are farming a tract of land. Your father, like his father before him, lived off the profits from the farm without taking additional wage work elsewhere. You were fortunate to earn a scholarship to university to study agriculture, and now that you have inherited the farm you are considering changing the techniques of farming to be more scientific and business-like. Prior to inheriting the farm you had a successful career as a broker specializing in agricultural commodities. [After your wife died suddenly, you've decided to leave that job to return to the farm. Your two children are delighted about the prospect of living on the farm.]"*  
Presently, you are pondering whether to follow one course of action (Plan A) or another (Plan B).

*Plan A: Convert the farm entirely to hybrid corn production for livestock feed. Corn is extremely profitable to grow, but it requires heavy chemical fertilization which over time will percolate into the water table with a very high probability that the land will not be usable in 60 years without heavy chemical supplements.*

*Plan B: Convert the farm entirely to hay for livestock feed. Hay in good years can bring a good market price, but generally hay yields a modest profit. On the other hand, hay production does not diminish the quality of the soil and chemical supplements are not needed.*

Which plan did you choose? A or B? \_\_\_\_\_

Men were significantly more likely to choose the soil-degrading option: 39% of men (N=36) and 16% of women (N=68) chose hybrid corn, plan A (Chi-Square = 6.7,  $P < .01$ ). These men and women ranged in age from 17 to 24. In order to determine whether these "decision-makers" were utilizing sound economic logic we asked four additional questions (Table 1). Those subjects who chose the hybrid corn option, whether men or women, were significantly more likely to have agreed that profits can be reinvested in other ventures as a rationale for discounting the costs of damage to the land. This is very likely a common rationale for many short-term decisions with some risk of longterm environmental degradation,

TABLE 1

**Average Ratings of Agreement to Questions Intended to Assess the Reasoning Associated with Men and Women's Choices Between Present Profits with Environmental Degradation (hybrid corn) and Choice of Reduced Profits with Longterm Sustainability (hay)**

	Subjects' Sex	Hybrid Corn (A)	Hay (B)
Do you agree that because you can always invest the profits from farming in other economic ventures including other farmland that you should weigh profit over damage to the land?	M	4.6	2.5
	F	4.4	2.9
<i>Corn vs. Hay: <math>F = 15.4, P &lt; .0001</math></i>			
You would have felt more confident about making this choice between Plan A and Plan B if you knew how much acreage was involved.	M	4.3	2.5
	F	2.5	2.5
<i>Corn vs. Hay: <math>F = 33.5, P &lt; .0001</math></i>			
You would have felt more confident about making this choice between Plan A and Plan B if you knew more about the quality of the soil.	M	4.5	3.0
	F	3.0	3.8
<i>Corn vs. Hay: <math>F = 13.3, P &lt; .0001</math></i> <i>Male vs. Female: <math>F = 5.0, P = .03</math></i>			
One of the factors you considered was the fact that your children will inherit the family farm.	M	3.5	5.0
	F	3.8	5.3
<i>Corn vs. Hay: <math>F = 11.3, P &lt; .0001</math></i>			

7-point rating scale: 1 = strongly disagree; 7 = strongly agree

especially whenever there is a diversity of economic and relocation opportunities. Men who chose the more profitable but destructive crop appeared to be less confident that they had made the right decision than those who chose hay, indicating that they could have used more information; however, women (who were unlikely to choose corn in any case) showed no such pattern.

One factor which should influence decisions that may have longterm negative effects on the quality of your farm is whether your children are likely to continue farming. This was the rationale for adding the bracketed sentence at the end of the hypothetical scenario for half the subjects: "After your wife [husband] died suddenly, you've decided to leave that job to return to the farm. Your two children are delighted about the prospect of living on the farm" (the "family" version). A comparison of the family versus no family versions did not result in a significant difference in choice of crop plan. We had anticipated that parental status would be a significant factor in reducing the likelihood of both women and men discounting the possible longterm degradation of the land. But perhaps imagining that one has children cannot evoke the mindset of actual parenthood. In this sample, only four people were married and two actually had children. Even though there was not a significant difference in choice of crop for the family versus no family versions, those men and women who chose the hay option (Plan B) were significantly more likely to have agreed that inheritance of the family farm was relevant to their choice of crop plan (Table 1).

### CONCLUDING REMARKS

We would like to stress that further study of sex differences in valuations of various environmental goods throughout the life course is very likely to pay off handsomely in identifying those factors which might have real impacts on sparing our environment from further degradation. Notwithstanding the fact that men and women seem to be different in discounting risks to self and the environment, men are not impervious to social cues and life prospects. We have not addressed the question of the impacts of variations in the intensity of social competition on environmental issues, but there is good evidence in other domains such as crime that the intensity of social competition can affect men's competitiveness and risk acceptance. Thus it is entirely plausible that social and material equity might increase men's inclinations to value the future and to treat resources less exploitatively so that sustainable development is an achievable goal.

## ACKNOWLEDGMENTS

The study of environmental attitudes, perceptions, and decision-making has been supported by grants from the Great Lakes University Research Fund (GLURF grant 92-102) and from the Tri-Council Eco-Research Programme of Canada (TriCERP grant 922-93-0005).

## REFERENCES

- Alexander, R.D. (1979). *Darwinism and human affairs*. Seattle: University of Washington Press.
- Andersson, M. (1994). *Sexual selection*. Princeton University Press.
- Barkan, C.P.L. (1990). A field test of risk-sensitive foraging in black-capped chickadees (*Parus atricapillus*). *Ecology* 71, 391–400.
- Bell, N.J. & Bell, R.W. (1993). *Adolescent risk taking*. Newbury Park CA: Sage.
- Betzig, L. (1986). *Despotism and differential reproduction: A Darwinian view of history*. New York: Aldine.
- Blume M.E. & Friend, I. (1978). *The changing role of the individual investor*. New York: John Wiley.
- Boone, J.L. (1986). Parental investment and elite family structure in preindustrial states: A case study of late medieval-early modern Portuguese genealogies. *American Anthropologist* 88, 859–878.
- Brown, I.D. & Groeger, J.A. (1988). Risk perception and decision taking during the transition between novice and experienced driver status. *Ergonomics* 31, 585–597.
- Buss, D. (1994). *The evolution of desire*. New York: Basic Books.
- Caraco, T., Martindale, S. & Whittam, T.S. (1980). An empirical demonstration of risk-sensitive foraging preferences. *Animal Behaviour* 28, 820–830.
- Caraco, T. & Lima, S.L. (1985). Foraging juncos: Interaction of reward mean and variability. *Animal Behaviour* 33, 216–224.
- Clarke, A.L. (1993). Behavioral ecology of human dispersal in 19th Century Sweden. Ph.D. Dissertation, University of Michigan.
- Daly, M. & Wilson, M. (1983). *Sex, evolution and behavior*. Belmont CA: Wadsworth.
- Daly, M. & Wilson, M. (1988). *Homicide*. Hawthorne NY: Aldine de Gruyter.
- Daly, M. & Wilson, M. (1990). Killing the competition: Female/female and male/male homicide. *Human Nature* 1, 81–107.
- Darwin, C. (1871). *The descent of man, and selection in relation to sex*. New York: D. Appleton.
- Finn, P. & Bragg, B.W.E. (1986). Perception of the risk of an accident by young and older drivers. *Accident Analysis and Prevention* 18, 289–298.
- Gardner, W. (1993). A life-span rational-choice theory of risk taking. In N.J. Bell & R.W. Bell (Eds.). *Adolescent risk taking*, pp. 66–83. Newbury Park CA: Sage.
- Gove, W.R. (1985). The effect of age and gender on deviant behavior: A biopsychological perspective. In A. S. Rossi (Ed.). *Gender and the life course*, pp. 115–144. New York: Aldine.
- Hastjarjo, T., Silberberg, A., Hursh, S.R. (1990). Risky choice as a function of amount and variance in food supply. *Journal of the Experimental Analysis of Behavior* 53, 155–161.
- Hechter, M., Nadel, L. & Michod, R.E. (1993). *The origin of values*. New York: Aldine de Gruyter.
- Hill, K. & Hurtado, A. M. (1996). *Ache life history: The ecology and demography of a foraging people*. Hawthorne NY: Aldine de Gruyter.

## POPULATION AND ENVIRONMENT

- Holinger, P.C. & Klemen, E. (1982). Violent deaths in the United States 1900–1975: Relationships between suicide, homicide and accidental deaths. *Social Science and Medicine* 16, 1929–38.
- Holinger, P. C. (1987). *Violent deaths in the United States*. New York: Guilford Press.
- Howell, N. (1979). *The demography of the Dobe !Kung*. New York: Academic Press.
- Hsieh, C.C. & Pugh, M.D. (1993). Poverty, income inequality, and violent crime: A meta-analysis of recent aggregate data studies. *Criminal Justice Review* 18, 182–202.
- Irwin, C.E. (1993). Adolescence and risk taking. In N.J. Bell & R.W. Bell (Eds.). *Adolescent risk taking*, pp. 7–28. Newbury Park CA: Sage.
- Jonah, B.A. (1986). Accident risk and risk-taking behaviour among young drivers. *Accident Analysis and Prevention* 18, 255–271.
- Kagel, J.H., Green, L. & Caraco, T. (1986). When foragers discount the future: Constraint or adaptation? *Animal Behaviour* 34, 271–283.
- Kahneman, D. & Knetsch, J.L. (1992). Valuing public goods: The purchase of moral satisfaction. *Journal of Environmental Economics and Management* 24, 57–70.
- Kahneman, D., Ritov, I., Jacowitz, K.E. & Grant, P. (1993). Stated willingness to pay for public goods: A psychological perspective. *Psychological Science* 4, 310–315.
- Kahneman, D. & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica* 4, 263–291.
- Kandel, D.B. (1980). Drug and drinking behavior among youth. *Annual Review of Sociology* 6, 235–285.
- Lopes, L.L. (1987). Between hope and fear: The psychology of risk. *Advances in Experimental Social Psychology* 2, 255–295.
- Lopes, L.L. (1993). Reasons and resources: The human side of risk taking. In N.J. Bell & R.W. Bell (Eds.). *Adolescent risk taking*, pp. 29–54. Newbury Park CA: Sage.
- Low, B.S. & Heinen, J. (1993). Population, resources, and environment. *Population and Environment* 15, 7–41.
- Lyng, S. (1990). Edgework: A social psychological analysis of voluntary risk taking. *American Journal of Sociology* 95, 851–856.
- Lyng, S. (1993). Dysfunctional risk taking: Criminal behavior as edgework. In N.J. Bell & R.W. Bell (Eds.). *Adolescent risk taking*, pp. 107–130. Newbury Park CA: Sage.
- Matthews, M.L. & Moran, A.R. (1986). Age differences in male drivers' perception of accident risk: The role of perceived driving ability. *Accident Analysis and Prevention* 18, 299–313.
- McInish, T.H. (1982). Individual investors and risk-taking. *Journal of Economic Psychology* 2, 125–136.
- McWhirter, N. & Greenberg, S. (1979). *Guinness Book of Records*. Edition 26. London: Guinness Superlatives Ltd.
- Mellor, M. (1993). *Breaking the boundaries: Towards a feminist green socialism*. London: Virgo Press.
- Millstein, S.G. (1989). Adolescent health. Challenges for behavioral scientists. *American Psychologist* 44, 837–842.
- Millstein, S.G. (1993). Perceptual attributional and affective processes in perceptions of vulnerability through the life span. In N.J. Bell & R.W. Bell (Eds.). *Adolescent risk taking*, pp. 55–65. Newbury Park CA: Sage.
- Olsen, M.E., Lodwick, D.G., Dunlop, R.E. (1992). *Viewing the world ecologically*. Boulder CO: Westview Press.
- Real, L. & Caraco, T. (1986). Risk and foraging in stochastic environments. *Annual Review of Ecology & Systematics* 17, 371–390.
- Remedial Action Plan (1992). *Hamilton Harbour Stage 1 Report: Environmental conditions and problem of definition*.
- Rogers, A.R. (1991). Conserving resources for children. *Human Nature* 2, 73–82.
- Rogers, A.R. (1994). Evolution of time preference by natural selection. *American Economic Review* 84, 460–481.

M. WILSON, M. DALY, S. GORDON, AND A. PRATT

- Rubin, P.H. & Paul, C.W. (1979). An evolutionary model of taste for risk. *Economic Inquiry* 17, 585–596.
- Schoemaker, P.J.H. (1993). Determinants of risk-taking: Behavioral and economic views. *Journal of Risk and Uncertainty* 6, 49–73.
- Trimpop, R.M. (1994). *The psychology of risk taking behavior*. Amsterdam: North-Holland.
- Trivers, R.L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.). *Sexual selection and the descent of man, 1871–1971*, pp. 136–179. Chicago: Aldine.
- Wilson, J.Q. & Herrnstein, R.J. (1985). *Crime and human nature*. New York: Simon & Schuster.
- Wilson, M. & Daly M. (1993). Lethal confrontational violence among young men. In N.J. Bell & R.W. Bell (Eds.). *Adolescent risk taking*, pp. 84–106. Newbury Park CA: Sage.
- Wilson M. & Daly, M. (1985). Competitiveness, risk-taking and violence: The young male syndrome. *Ethology & Sociobiology* 6, 59–73.
- Yates, J.F. & Stone, E.R. (1992). The risk construct. In J.F. Yates (Ed.). *Risk-taking behavior*, pp. 1–25. New York: John Wiley & Sons.
- Zuckerman, M. (1994). *Behavioral expressions and biosocial bases of sensation seeking*. Cambridge: Cambridge University Press.