

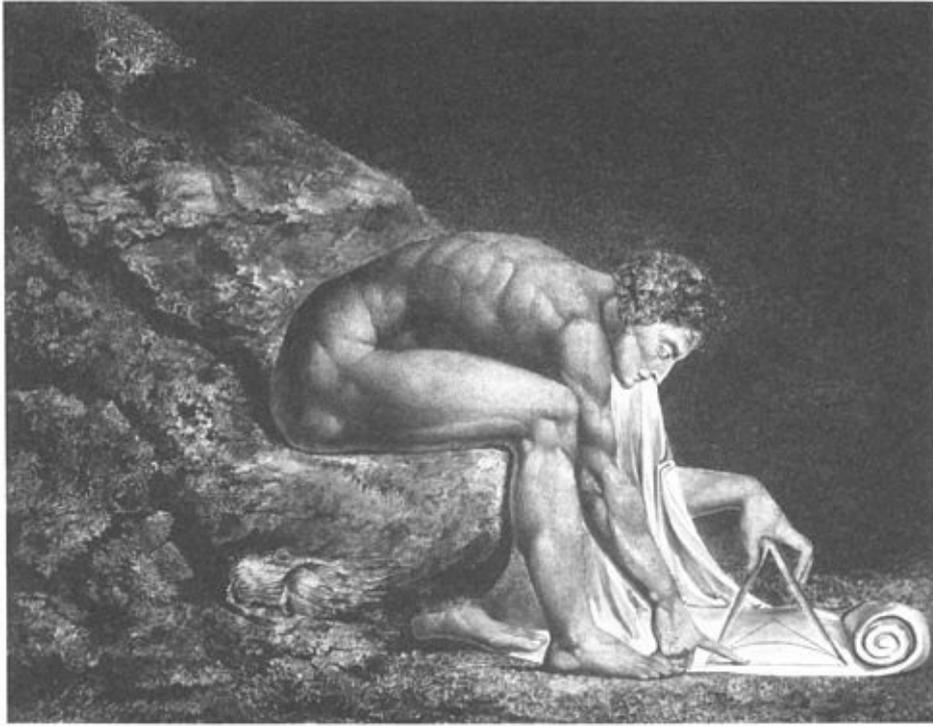


RISK

John Adams



RISK



Frontispiece "Newton" by William Blake (source: Tate Gallery, London/Bridgeman Art Library, London).

RISK

John Adams

University College London



London and New York

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First published in 1995 by UCL Press
Third impression 1996
Fourth impression 1998
Fifth impression 2000
First published 2001 by Routledge

11 New Fetter Lane
London EC4P 4EE

Routledge is an imprint of the Taylor & Francis Group

This edition published in the Taylor & Francis e-Library, 2002.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library.

Library of Congress Cataloguing in Publication Data

Adams, John, 1938–

Risk: the policy implications of risk compensation and plural
rationalities/John Adams.

p. cm.

Includes bibliographical references and index.

ISBN 1-85728-067-9.—ISBN 1-85728-068-7 (pbk.)

1. Risk—Sociological aspects. 2. Risk management—Social
aspects. I. Title.

HM256.A33 1995

302'.12—dc20 95–88

CIP

ISBN 0-203-49896-8 Master e-book ISBN

ISBN 0-203-70444-4 (MP PDA Format)

ISBNs: 1-85728-067-9 HB

1-85728-068-7 PB

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PREFACE

This book began as a collaborative venture with Michael Thompson. For over 15 years my research into risk, mainly on the road, was focused on the theory of "risk compensation". This theory accords primacy in the explanation of accidents to the human propensity to take risks. The theory postulates that we all come equipped with "risk thermostats" and suggests that safety interventions that do not affect the setting of the thermostat are likely to be frustrated by behavioural responses that reassert the level of risk with which people were originally content. My research had noted that there were large variations in the settings of individual thermostats, but had little to say about why this should be so.

About ten years ago I read Michael's article "Aesthetics of risk" (Thompson 1980), and about five years later met the man himself. His research into risk over the past 20 years has been central to the development of a perspective that has come to be known as "cultural theory" (Thompson et al. 1990). Risk, according to this perspective, is *culturally constructed*; where scientific fact falls short of certainty we are guided by assumption, inference and belief. In such circumstances the deterministic rationality of classical physics is replaced by a set of conditional, probabilistic rationalities. Risk throws up questions to which there can be no verifiable single right answers derivable by means of a unique rationality. Cultural theory *illuminates a world of plural rationalities*; it discerns order and pattern in risk-taking behaviour, and the beliefs that underpin it. Wherever debates about risk are prolonged and unresolved—as, for example, that between environmentalists and the nuclear industry—cultural theory seeks an explanation not in further scientific analysis but in the differences in premises from which the participants are arguing. Michael thought that risk compensation was obvious common sense, and I thought that cultural theory would cast helpful light on how the thermostat was set.

This book grew out of a joint research project called "Risk and rationality" that we undertook for the Economic and Social Research Council. It draws upon much of our earlier work, and makes connections that had earlier eluded us. When we first discussed the idea of a book with Roger Jones of UCL Press we rashly promised to produce "the complete theory of risk". Trying has been an educational experience, but the complete theory of risk now seems to me as likely as the complete theory of happiness.

The writing did not go as planned—but then this is a book about risk. Michael, who is self-employed, was distracted by consultancy offers from all around the world that he could not refuse. I stayed at home and got on with the writing, making use of Michael, when I could catch him, as a consultant. Inevitably the book does not have the balance originally intended between his perspective and mine. In Chapter 11 I refer to the "tension" between cultural theory and risk compensation. This refers to my unresolved difficulty in reconciling cultural theory with the *reflexivity* of risk. The world and our perceptions of it are *constantly* being transformed by our effect on the world, and its effect on us. My perceptions of risk have been altered by the process of writing this book. I now see the stereotypes of cultural theory—egalitarians, individualists, hierarchists, fatalists and hermits—everywhere I look. But which am I?

I think I can see elements of all these stereotypes in my own make up. Am I more sophisticated and complex than all the other risk-takers in the world? I doubt it. In applying these stereotypes to others I am reducing their complex uniqueness to something that I can (mis)understand. In its raw state the reflexive fluidity of the world overwhelms our limited powers of comprehension. We resort to simplification and abstraction in an attempt to cope. Cultural theory postulates a high degree of pattern and consistency in the midst of all the reflexive fluidity. The insistence in *cultural theory* (Thompson 1990) on the *impossibility* of more than five "viable ways of life" I find unproven and unprovable, but I still find the theory useful. For me, limiting the number of risk-taking types to five is defensible, not just by theoretical speculation, but by virtue of five being a small and comprehensible number; theories of behaviour, to be useful and widely communicable, must be simple. Risk compensation and cultural theory provide a life-raft that saves one from drowning in the sea of reflexive relativism; they are two sets of simplifying assumptions deployed in this book in an attempt to make sense of behaviour in the face of uncertainty. They are not the complete theory of risk.

In "test marketing" draft chapters of the book on a variety of people with an interest in risk, it became apparent that many from the scientific and managerial side of the subject are unaware of the anthropological literature on risk, and its roots in the work of Weber, Durkheim, Marx, Malinowski, Parsons and other old masters of sociology and anthropology; they have reacted with scepticism and impatience to the theorizing of Douglas, Wildavsky, Thompson and other, more recent, workers in this tradition. On the other hand, some in this tradition have complained that my treatment of cultural theory is "superficial and derivative"—to quote from the comments of one referee on a part of Chapter 3 which was submitted to an academic journal as an article. The literature on risk, measured by pages published, is over-whelmingly dominated by the scientific/managerial perspective. In trying to make cultural theory accessible to the scientist-managers, I have stripped it of most of its historical baggage, and many of its claims to "scientific" authority. I have retained what I consider to be its easily communicated essence; I have treated it as a set of abstractions that help to make sense of many inter-minable debates about risk. I have no illusions that my efforts to bridge the divide between the "hard" and "soft" approaches to risk will satisfy everyone—indeed cultural theory warns that everyone will never agree about risk. But attempting the impossible has been fun.

John Adams

LONDON

ACKNOWLEDGEMENTS

By far the largest debt incurred in writing this book is owed to Michael Thompson. His wide knowledge of the anthropological literature, his shrewd insights, his gift for seeing a problem from a new angle, his patience when he was having difficulty getting information through my cultural filter (see Ch. 3 on the subject of cultural filters), and above all his ability to disagree agreeably, have made the writing an enormously educational, stimulating and enjoyable experience. I look forward to arguing with him for years to come.

The earliest, indeed formative, influence on my thoughts about risk was Gerald Wilde, who coined the term "risk compensation". I thank him for his hospitality and many entertaining tutorials on the subject over the years. As I observe in Chapter 2, *everyone* is a risk expert. This has made the job of consulting the experts quantitatively daunting. Argument, I believe, is the most educational form of discourse, and this book is the result of years of arguing with just about anyone who would tolerate my banging on about the subject; for the risk researcher, life is one never-ending field trip. This makes the task of acknowledging all my debts quite impossible—I did not always make notes at the time—but toward the end of the process, the participants in our ESRC-sponsored workshop on risk and rationality helped me to get my thoughts into focus: David Ball, David Collingridge, Karl Dake, Mary Douglas, Maurice Frankel, Gunnar Grendstadt, Joanne Linnerooth-Bayer, Mark MacCarthy, Gustav Ostberg, Alex Trisoglio, Brian Wynne. In addition Bob Davis, John Whitelegg, Mayer Hillman, Stephen Plowden, Robin Grove White, Edmund Hambly, Jacquie Burgess, Carolyn Harrison, and the late Aaron Wildavsky, have all been helpful. I doubt that any of these people would agree with all of this book but, whether they like it or not, they have all had an influence on it.

Louise Dyett, Tim Aspden and Guy Baker in the UCL Department of Geography drawing office have played a vital rôle in producing, and helping to design, the illustrations.

Anna Whitworth's constructive criticism of preliminary drafts has been much appreciated. I am also grateful for her sharp editorial eye which has prevented the publication of many spelling mistakes and lapses in political correctness.

Chapter 1

RISK: AN INTRODUCTION

One of the pleasures of writing a book about risk—as distinct from one about an esoteric subject such as brain surgery or nuclear physics—is that one has a conversation starter for all occasions. *Everyone* is a true risk "expert" in the original sense of the word; we have all been trained by practice and experience in the management of risk. *Everyone* has a valid contribution to make to a discussion of the subject.

The development of our expertise in coping with uncertainty begins in infancy. The trial and error processes by which we first learn to crawl, and then walk and talk, involve decision-making in the face of uncertainty. In our development to maturity we progressively refine our risk-taking skills; we learn how to handle sharp things and hot things, how to ride a bicycle and cross the street, how to communicate our needs and wants, how to read the moods of others, how to stay out of trouble. How to stay out of trouble? This is one skill we never master completely. It appears to be a skill that we do not want to master *completely*.

The behaviour of young children, driven by curiosity and a need for excitement, yet curbed by their sense of danger, suggests that these junior risk experts are performing a balancing act. In some cases it is a physical balancing act; learning to walk or ride a bicycle cannot be done without accident. In mastering such skills they are not seeking a zero-risk life; they are balancing the expected rewards of their actions against the perceived costs of failure. The apprehension, determination and intense concentration that can be observed in the face of a toddler learning to toddle, the wails of frustration or pain if it goes wrong, and the beaming delight when it succeeds—are all evidence that one is in the presence of a serious risk-management exercise.

Most decisions about risks involving infants and young children are taken by adults. Between infancy and adulthood there is a progressive handing over of responsibility. Adults are considered *responsible* for their actions, but they are not always considered trustworthy or sufficiently well informed. A third tier of responsibility for the management of risk consists of various *authorities* whose rôle with respect to adults is similar to that of adults with respect to children. The authorities are expected to be possessed of superior wisdom about the nature of risks and how to manage them.

The news media are routinely full of stories in which judgement is passed on how well or badly this expectation is met. Consider an ordinary news day chosen at random—28 January 1994, the day this sentence was written. A perusal of that day's papers¹ reveals that the business sections and the sports pages contain virtually no stories that are not about the management of risk. They are all about winning and losing, and winners and losers. The heroes are people who struggled against the odds and won. Prudence and caution, except for the occasional bit of investment advice for old age pensioners, are mocked as boring. The arts pages were full of risk stories within risk stories. A novel, to win critical acclaim, must be *novel*; cliché and plagiarism are unpardonable sins. Mere technical competence is not enough; suspense and tension must be deployed to

catch and hold the attention of the reader. Risk is embodied in great works of art; and, to capture the interest of the arts pages, risks must be taken by their creators. They are interesting only if they are attempting something difficult. Great art risks failure. But to be boring, predictable and safe is to guarantee failure.

What of the features pages? The motoring sections of most of the papers were dominated as usual by articles focused on the performance of cars—although the main feature in one was devoted to question of whether or not airbags caused injuries, and another paper ran a small story about a new car seat for children, with the claim that it "reduced the risk by 90%". The life-style section of another ran a double-page spread on high-performance motorcycles under the headline "Born to be wild".

The health pages were of course entirely devoted to risk stories: a new chickenpox vaccine whose effectiveness remains to be proven; a series of mistakes in cervical cancer screening that "put patients' lives at risk"; the risk of blood transfusions transmitting hepatitis-B; a vasectomy that did not work; concern that epidural anaesthetics administered during childbirth might harm the babies; the fear that bovine spongiform encephalopathy might have spread to humans in the form of Creutzfeldt-Jakob disease; doubts about the efficacy of drugs prescribed to control high blood pressure; doubts about the accuracy of the diagnosis of high blood pressure, and claims that it is increased by the act of measuring it; claims that "the Government's present [health] screening programme cannot be justified by the results"; a lottery held to choose who would be given a scarce new and unproven drug for treating multiple sclerosis; and a member of parliament who died while waiting for a heart transplant, with credit for the shortage of donors being given to the seat belt law. Even the gardening pages were dominated by problems of decision-making in the face of uncertainty: combinations of soil,

climate, aspect, fungicides and insecticides *might* be propitious for this plant and not for that.

The news pages were overwhelmingly devoted to risk. Risk it would appear is a defining characteristic of "news". On 28 January 1994 an aid worker had been killed in Bosnia; the US President's wife, Hilary Clinton, visited the aftermath of the Los Angeles earthquake, most of whose victims were reported to be uninsured; an Englishman staked his life savings of £150,000 on one spin of the roulette wheel in Las Vegas, and won; the death of a budgerigar was blamed on passive smoking, and a woman was turned down as a prospective adoptive parent because she smoked; the roof of a supermarket in Nice collapsed killing three people (56 column-inches), and a fire in a mine in India killed 55 people (nine column-inches); Prince Charles was fired at in Australia by a man with a starting pistol, and Princess Diana's lack of security was highly publicized, and lamented; further restraints were threatened on cigarette advertising; death threats were made by Moslem fundamentalists to a couturier and a fashion model following publicity about a ball gown embroidered with a passage from the Koran; the Government launched its "green" plan, and environmentalists complained about its in-adequacy. A few more headlines: "Rogue train ignored signals", "Russia's high-risk roulette", "Mountaineer cleared of blame for woman's death fall", "£440,000 losers in a game of Russian roulette (the costs of a lost libel action)", "Libel law proves costly lottery", "Fall in family fortunes", "The cat with 11 lives", "Gales strand trains and cause road havoc", "Fire-bombs in Oxford St raise fear

of fresh IRA campaign", "Israelis have 200 N-bombs" and "Diet-conscious add years to life expectancy".

Television news and documentary programmes on the same day provided a further generous helping of things to worry about, and films added fictional accounts of neurosis, angst, murder and mayhem. Daily we are confronted with a fresh deluge of evidence that in this world nothing can be said to be certain, except death—stories of large-scale tax evasion having removed taxes from the short list of certainties. How do we cope?

Grown-up risk-taking, like that of children, is a balancing act. Whether it be the driver at the wheel of a car negotiating a bend in an icy road, or a shopper trying to decide whether to buy butter or the low-fat spread, or a doctor trying to decide whether to prescribe a medicine with unpleasant side-effects, or a property speculator contemplating a sale or a purchase, or a general committing his troops to battle, or a President committing his country to curbing the emission of carbon dioxide, the decisions that are made in the face of uncertainty involve weighing the potential rewards of an act against its potential adverse consequences.

Every day around the world, billions of such decisions get made. The consequences in most cases appear to be highly localized, but perhaps they are not. Chaos theorists have introduced us to a new form of insect life called the Beijing butterfly—which flaps its wings in Beijing and sets in motion a train of events that culminates two weeks later in a hurricane in New York. Extreme sensitivity to subtle differences in initial conditions, the chaos theorists tell us, makes the behaviour of complex natural systems inherently unpredictable. Prediction becomes even more difficult when *people* are introduced to such systems—because people respond to predictions, thereby altering the predicted outcome. Rarely are risk decisions made with information that can be reduced to quantifiable probabilities; yet decisions, somehow, get made.

The universality of expertise in risk management is a problem for those who aspire to recognition as risk *EXPERTS*. The certified experts—those who write books, learned articles and official reports on risk—have an abstracted expertise that is sometimes useful, but is more often misleading. They can demonstrate that the general public's ability to estimate mortality rates for different causes of death is often very wide of the mark (Fischhoff et al. 1981); they can demonstrate, in the words of the Royal Society quoted in [Chapter 2](#), that there is a "gap between what is scientific and capable of being measured, and the way in which public opinion gauges risks and makes decisions". They can demonstrate that ordinary people in managing the risks in their lives, rarely resort to precise quantification. But what do their scientific measurements signify? Very little, this book suggests.

Risk management is big business; the *formal sector* of the authorities—the realm of the expert—involves government, commerce, and industry; it employs actuaries, ambulance drivers, toxicologists, engineers, policemen, mathematicians, statisticians, economists, chaos theorists, computer programmers and driving instructors—to name but a few. The work of this sector is highly visible. It holds inquests and commissions research. It passes laws and formulates regulations. It runs safety training programmes and posts warning signs. It puts up fences and locks gates. It employs inspectors and enforcers—many in uniform. Its objective is to *reduce* risk.

But there is also the *informal sector* consisting of children and grown-up children, and

it is much bigger business; it consists of billions of freelance risk managers—ordinary common-or-garden experts—each with his or her own personal agenda. They go about the business of life—eating, drinking, loving, hating, walking, driving, saving, investing, working, socializing—striving for health, wealth and happiness in a world they know to be uncertain. The objective of these risk managers is to *balance* risks and rewards.

The formal and informal sectors co-exist uncomfortably. For the freelance risk managers, the activities of the formal sector form a part of the context within which they take their decisions. Sometimes the efforts of the formal sector are appreciated: when, for example, it assumes responsibility for the safety of the water you drink. Sometimes its efforts are thought to be inadequate: when it fails to slow down the traffic on your busy street. Sometimes its efforts are resented: when it sets speed limits too low, or its safety regulations interfere with activities you consider safe enough. But in all of these cases, behaviour in the informal sector is modified by the activities of the formal sector. You do not boil your water if they have made it safe. You take more care crossing the road that their negligence makes dangerous. You watch out for the police or safety inspectors whose silly rules you are breaking.

The formal sector responds to the activities of freelance risk-managers in various ways. Often it is patronizing. Road engineers with their accident statistics frequently dismiss condescendingly the fears of people living alongside busy roads with good accident records, heedless of the likelihood that the good accident records reflect the careful behaviour of people who believe their roads to be dangerous. Those who live alongside such roads, and know their dangers, are more likely than the engineer, beguiled by his statistics, to cross them safely. Sometimes the formal sector's response is abusive: the people who flout their rules are stupid, irresponsible or childish. But most commonly the formal sector is mystified and frustrated. How, they wonder—despite all their road improvements, vehicle safety regulations, speed limits, alcohol limits, warning notices, inspection procedures and fail-safe devices—do so many people still manage to have accidents?

A significant part of the explanation appears to lie in the formal sector's division of labour. Risk-management at an individual level involves no division of labour; the balancing calculations that precede a risky act are all done in the head of the individual. But when institutions assume responsibility for risk management, it becomes difficult to identify where the balancing act is done. Consider road safety. One can list institutions concerned with maximizing the rewards of risk taking: the car industry, the oil industry, the road builders, that part of the Department of Transport which sees its function as aiding and abetting the process that generates increasing traffic, the Treasury and Department of Trade and Industry who point to this increase as evidence of growing prosperity. One can list other institutions concerned with minimizing the accident costs of road traffic: the police, the casualty services, PACTS (the Parliamentary Advisory Committee on Traffic Safety), ROSPA (the Royal Society for the Prevention of Accidents), Friends of the Earth and Greenpeace, who are concerned about the global threats of traffic pollution as well as the danger to cyclists and pedestrians, and that part of the Department of Transport responsible for road safety. But where, and how, is the balancing act done? How do institutional risk-managers manage individual risk-managers? And how do individual risk-managers

react to attempts to manage them? And can we all do it better?

The search for answers begins, in [Chapter 2](#), with a look at the prevailing orthodoxy, as exemplified by the Royal Society's approach to risk management.

Chapter 2

RISK AND THE ROYAL SOCIETY

In 1983 Britain's Royal Society published a report called *Risk assessment*. Its tone, in keeping with the Royal Society's standing as the country's pre-eminent scientific institution, was authoritative, confident and purposeful. The report drew upon and exemplified the prevailing international orthodoxy on the subject of risk, and became a major work of reference. In 1992 the Society returned to the subject with a new report entitled *Risk: analysis, perception and management*. Although it was published by the Royal Society, the Society was sufficiently embarrassed by its contents to insist in the preface that it was "not a report of the Society", that "the views expressed are those of the authors alone" and that it was merely "a contribution to the ongoing debate". By 1992 the Royal Society was no longer capable of taking a collective view about risk; it had become a mere forum for debate about the subject. What happened? What is this "ongoing debate", and how did it derail their inquiries into the subject?

For their 1992 report the Society invited a group of social scientists—psychologists, anthropologists, sociologists, economists and geographers—to participate in their study. The social scientists, with the exception of the economists, could not agree with the physical scientists of the Royal Society. The disagreement that is found between the covers of the 1992 report can be found wherever there are disputes about safety and danger. It is a disagreement about the nature and meaning of "risk". The resolution of this disagreement will have profound implications for the control and distribution of risk in all our lives.

"Actual risk": what is it?

The 1983 report distinguished between *objective risk*—the sort of thing "the experts" know about—and *perceived risk*—the lay person's often very different anticipation of future events. Not surprisingly, given the report's provenance, it approached its subject *scientifically*. This is how it defined the subject of its study in 1983:

The Study Group views "risk" as the probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge. As a probability in the sense of statistical theory, risk obeys all the formal laws of combining probabilities.

The Study Group also defined *detriment* as:

a numerical measure of the expected harm or loss associated with an adverse event...it is generally the integrated product of risk and harm and is often expressed in terms such as costs in £s, loss in expected years of life or loss of productivity, and is needed for numerical exercises such as cost-benefit analysis or risk-benefit analysis.

The Royal Society's definition of "detriment", as a compound measure combining the probability and magnitude of an adverse effect, is the definition of "risk" most commonly encountered in the risk and safety literature (see for example Lowrance 1980). It is also the definition of common parlance; people do talk of the "risk" (probability) of some particular event being high or low, but in considering two possible events with equal probabilities—say a fatal car crash and a bent bumper—the former would invariably be described as the greater risk. But, definitional quibbles aside, the Royal Society and most other contributors to the risk literature are agreed about the objective nature of the thing they are studying. There is also general agreement that progress lies in doing more of what physical scientists are good at: refining their methods of measurement and collecting more data on both the probabilities of adverse events and their magnitudes. One of the main conclusions of the 1983 report was that there was a need for "better estimates of actual risk based on direct observation of what happens in society" (p. 18).

Across the Atlantic in 1983 the American scientific establishment was also taking an interest in risk and coming to similar conclusions. The National Research Council, which is the principal operating agency for the National Academy of Sciences and the National Academy of Engineering, published a report entitled *Risk assessment in the Federal Government: managing the process*. Like their counterparts in the Royal Society, they stressed the importance of the distinction between the "*scientific basis*" and the "*policy basis*" of decisions about risk. Their report repeatedly stressed the importance of maintaining "a clear conceptual distinction between assessment of risks and the consideration of risk management alternatives." They warned that "even the *perception* that risk management considerations are influencing the conduct of risk assessment in an important way will cause the assessment and regulatory decisions based on them to lack credibility".

In the study leading up to its 1992 report, the Royal Society set out maintaining the distinction between objective and perceived risk. The Study Group's terms of reference invited it to:

consider and help to bridge the gap between what is stated to be scientific and capable of being measured, and the way in which public opinion gauges risks and makes decisions.

It failed. The gap remains unbridged. The introduction of the 1992 report repeats the 1983 report's definitions of risk and detriment, and the first four chapters of its 1992

publication still cling to the distinction between objective and perceived risk. They are illustrated by the usual tables of objective risk—the risk of dying from being a miner, or a smoker, or not wearing a seat belt, and so on. They contain many qualifications about the accuracy of many risk estimates, and admonitions against using them mechanistically, but these warnings are presented as exhortations to try harder to obtain accurate quantified estimates of objective risk. [Chapter 4](#) concludes that "if risk assessment is to be more than an academic exercise, it must provide quantitative information that aids decisions...".

However, by [Chapter 5](#) the distinction between objective risk and perceived risk, fundamental to the approach of the Royal Society's 1983 report and the first four chapters of its 1992 report, is flatly contradicted:

the view that a separation can be maintained between "objective" risk and "subjective" or perceived risk has come under increasing attack, to the extent that it is no longer a mainstream position.

A contention of chapters [5](#) and [6](#) of the 1993 report, that the physical scientists found variously maddening or frustrating, is that risk is culturally constructed. According to this perspective, both the adverse nature of particular events and their probability are inherently subjective. Slipping and falling on the ice, for example, is a game for young children, but a potentially fatal accident for an old person. And the probability of such an event is influenced both by a person's perception of the probability, and by whether they see it as fun or dangerous. For example, because old people see the risk of slipping on an icy road to be high, they take avoiding action, thereby reducing the probability. Young people slipping and sliding on the ice, and old people striving to avoid doing the same, belong to separate and distinct *cultures*. They *construct* reality out of their experience of it. They see the world differently and behave differently; they tend to associate with kindred spirits, who reinforce their distinctive perspectives on reality in general and risk in particular.

Before exploring (in Ch. 3) the variety of ways in which risk is constructed, I turn first to the way in which this variety frustrates those who seek to subject risk to the measuring instruments of objective science.

Can risk be measured?

Lord Kelvin once said "Anything that exists, exists in some quantity and can therefore be measured" (quoted in Beer 1967).

Physical scientists tend to be suspicious of phenomena whose existence cannot be verified by objective replicable measurement, and Kelvin's dictum epitomizes the stance of those who address themselves to the subject of risk. They might be called "objectivists", or perhaps "Kelvinists" in keeping with the theological character of their position—the dictum that underpins their objective science is itself incapable of objective proof.

[Chapter 5](#) of the 1992 Royal Society report overstates the current strength of the opposition to the Kelvinists. The view that there is a distinction to be made between, *real, actual, objective, measurable risk that obeys the formal laws of statistical theory* and *subjective risk inaccurately perceived by non-experts* is still the mainstream position in most of the research and literature on safety and risk management. Certainly the view that there is no such thing as "objective risk" and that risk is "culturally constructed" is one that some members of the Royal Society appear to find incomprehensible, and others, more robustly, dismiss as relativistic, airy-fairy nonsense. Much can depend on whether or not they are right.

Britain's Department of Transport belongs to the Kelvinist camp. It measures the safety or danger of a road by its casualty record—the consequences of real accidents. It draws a clear line between actual danger and perceived danger. The Department is prepared to spend money only to relieve actual danger. If a road does not have a fatality rate significantly above "normal" (about 1.2 per 100 million vehicle kilometres), it is not eligible for funds for measures to reduce the danger.

Sir Patrick Brown (1991), Permanent Secretary of Britain's Department of Transport, has announced that "funds for traffic calming will be judged on casualty savings, not environmental improvements or anxiety relief. All up and down the country there are people living alongside roads that they perceive to be dangerous, but which have good accident records. They are told in effect that if you don't have blood on the road to prove it, your road is officially, objectively, safe, and your anxiety is subjective and emotional.

In the road safety literature, and the safety literature generally, it is still the mainstream position that casualty statistics provide the only reliable measure of the success or failure of safety schemes. The foremost academic journal devoted to safety issues is *Accident analysis and prevention*; the metric of success and failure is embedded in its title. Safe roads, or airlines, or factories, or hospitals, or schools, or playgrounds, are those with few accidents. The objective of accident analysis is accident prevention.

Why was the Royal Society studying risk in the first place? In 1983 they put it this way:

Governments are now seen to have a plain duty to apply themselves explicitly to making the environment safe, to remove *all* risk or as much of it as is reasonably possible.

They were seeking to offer advice about how risk might be eliminated, or reduced, or at least better managed. By 1992 the objective of managing risk had been included in the title of their report *Risk: analysis, perception and management*. This, one might

think, is a worthwhile and uncontentious objective; it is one shared with hundreds of journals and campaigning organizations concerned with safety all around the world. The "plain duty" to reduce accidents permeates the study of risk. If risk exists, according to the Kelvinists, it exists as a probability that can be measured—by accident statistics. But can it?

The area of risk-taking that generates the greatest volume of accident statistics is danger on the road. It is a category of risk that can be clearly distinguished from other areas of risk-taking activity. Although major problems are encountered in defining the categories of injury severity, the *fatality* statistics in most highly motorized countries are probably accurate within a few percentage points, and the circumstances of each fatal accident are recorded systematically and in considerable detail. Furthermore, the numbers of fatal accidents are large enough to permit statistical analysis of intervention effects. The British Medical Association (1980) has observed that deaths and injuries on the road are one of the few subjects where preventive medicine can be based on reliable statistics on the effects of intervention.

But controversy still surrounds the interpretation of these statistics. Consider this view of the change over time of safety on the roads.

I can remember very clearly the journeys I made to and from school because they were so tremendously exciting...The excitement centred around my new tricycle. I rode to school on it every day with my eldest sister riding on hers. No grown-ups came with us...All this, you must realize, was in the good old days when the sight of a motor car on the street was an event, and it was quite safe for tiny children to go tricycling and whooping their way to school in the centre of the highway. (Roald Dahl, in *Boy*, recalling his childhood in Llandaff, Glamorgan in 1922.)

The young Roald Dahl was doing something that was "tremendously exciting" and yet "quite safe". Was he taking a risk?

[Figure 2.1](#) shows that between 1922 and 1986, while the motor vehicle population of England and Wales increased 25 fold, the number of children under the age of 15 killed in road traffic accidents fell from 736 per annum to 358. Allowing for changes in population, the road accident death rate for children is now about half its level of 70 years ago. The child road death rate per motor vehicle has fallen by about 98 per cent.

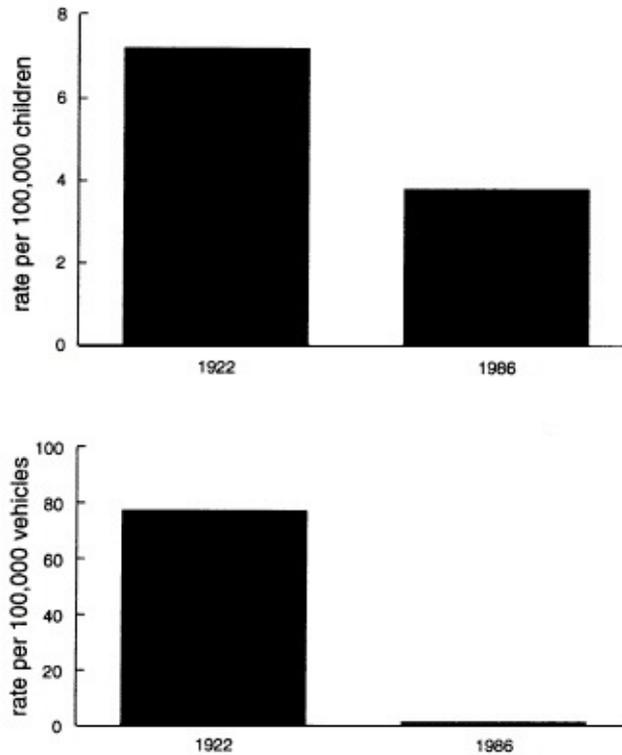


Figure 2.1 Child road accident fatalities (*source*: Hillman et al. 1990).

On the basis of these statistics, the conventional wisdom would conclude that Roald Dahl's *subjective* belief that the roads used to be "quite safe" was simply wrong; *objectively*—statistically—they have become very much safer. Certainly, this is the way politicians and safety officials routinely interpret the evidence. A British Government road safety report (Department of Transport 1990) says, for example:

Over the last quarter of a century, Britain's roads have become much safer. Road accidents have fallen by almost 20% since the mid-1960s; the number of deaths is down by one third. At the same time, traffic has more than doubled.

The orthodox school of risk assessment treats accident statistics as objective measures of risk. The most commonly used scale is the number of "events" (accidents or injuries) per 100,000 persons per unit of time (see, for example, Urquhart & Heilmann 1984 and Hambly 1994). These measures are interpreted by *experts* as objective indices of risk, and sometimes compared with the subjective judgements of lay people, usually with the aim of demonstrating the hopeless inaccuracy of the latter. A British Medical Association study (1987), for example, reports enormous disparities between lay estimates of deaths and actual deaths attributed to a variety of causes. High-way engineers swap anecdotes about roads that have good accident records, but which nevertheless provoke complaints from local residents about their danger. The engineers insist that the roads with few accidents are safe, and that the complainers are neurotic.