Environmental policy is designed within the confluence of markets, missing markets, and no markets. Within this mixture, economists offer working rules to help make outcomes more efficient, usually based on ideas formed by rational choice theory. The rules ask decision-makers to compare benefits in relation to costs, to account for the risks and gains across time and space for winners and losers, to facilitate the movement of resources from low-value uses to high-value uses, and to equate incremental gains per cost across policy actions. The environmental economic challenge is to find effective decision rules that will help move an economy towards efficient resource allocation in the face of market failure, for example, externalities, non-rival consumption, non-excludable net benefits, nonconvexities and asymmetric information (see Hanley, Shogren and White, 2007).

Experimental methods have proven to be a useful tool in addressing this challenge. Environmental economists used experimental methods relatively early on, following the lead of Vernon Smith, Charles Plott and other pioneers. Experimental methods began to take hold in the 1980s, primarily in the area of non-market valuation (see Bohm, 1972; Bennett, 1983; Knetsch and Sinden, 1984; Coursey, Hovis and Schulze, 1987). Today, experimental economic research is commonplace in environmental economic discussions and research programmes, with data being generated both in the laboratory and field (see for example the research in Cherry, Kroll and Shogren, 2007). Experiments in this area can be grouped broadly into two categories, institutional and valuation. Institutional experiments test-bed new institutions such as marketable pollution permits and ambient non-point pollution taxes prior to implementation; valuation experiments use the laboratory or field to study how people value goods and services that are not otherwise bought and sold in markets.

Institutional experiments build on traditional designs to test the efficiency of alternative exchange mechanisms under different economic circumstances. Usually the institutions under examination are those theoretically argued to correct for some market failure. Benefits and costs in these institutional experiments are induced by the experimenter – buyers have pre-assigned resale values; sellers have designated induced costs; and the goal is to measure the efficiency of a set of alternative incentive schemes.

In contrast, valuation experiments flip the institutional experiment on its head, using experimental methods to elicit preferences for some particular private or public good given alternative market and non-market circumstances. Here eliciting homegrown preferences or values – those residing within the minds of people – is of ultimate interest. Research in value elicitation has been environmental economics’ most unique contribution to experimental economics. The work has produced insight into how the framing of a question affects values, how different demand-revealing incentives elicit different values, and how unintentional cues affect a person’s value for...
a good. Consider now a few examples of institutional and valuation experiments used in environmental economics.

**Institutional experiments**

Institutional experiments focus on evaluating market and non-market solutions to environmental problems. The key to these institutional experiments rests in the dialogue between the laboratory and potential or actual applications to environmental policy. For decades, environmental policy around the globe has been proposed and implemented in the real world with minimal input from insight gathered using experimental economics methods. Today, however, this is changing. Researchers are now using experiments to help understand and affect policy development, and this link between the laboratory and policy is probably more rigorously explored in environmental economics than any other area (Bohm, 2003).

Institutional environmental economic experiments can be categorized as three broad areas – institutions to provide incentives to control externality problems that arise from pollution or land use; institutions to increase the voluntary provision of public goods, such as climate change, or to manage effectively common property, such as fishing zones; and institutions designed to manage resources through negotiation and cooperation, that is, the Coase theorem. We now briefly consider each in turn, starting with early work, moving to current applications, and general principles.

First, experiments examining economic solutions to externality problems began in earnest with Plott’s (1983) work on Pigovian taxation. Plott designed a competitive market of buyers and sellers who trade a valuable good. After first establishing that traders ignored negative social costs in a competitive market, he explored whether Pigovian taxes or tradable permits could equate private incentives with social costs. Both increased efficiency with repeated trading periods and quickly hit 100 per cent efficiency. Since then there has been an explosion of work examining incentive systems in a variety of settings, producing a growing and positive dialogue between policy proposals and insight from experimental studies.

Probably the most active area today remains the experimental work that tests the efficiency of tradable permit systems. Experimental methods have evaluated the efficacy of different trading rules in a variety of settings (for example, Bohm and Carlén, 1999). An important early example is the US Environmental Protection Agency’s Acid Rain emission trading. This work revealed a basic flaw in the original design of the permit auction run by the Environmental Protection Agency (EPA) (see Cason, 1995; Cason and Plott, 1996). The laboratory results revealed how the EPA could increase the efficiency of the auction by changing how permits were allocated. Originally, buyers and sellers submitted bids and offers for emission permits, and the EPA set the market price discriminatively off the demand curve by first matching the seller with the lowest offer to the buyer with the highest bid. The matching then continued with the second lowest offer to the second highest bid, and so on, until the equilibrium quantity is reached. Rational sellers should see through this auction, and