FROM THE SOURCE TO THE MAINSTREAM IS UPHILL:

THE CHALLENGE OF TRANSFERRING KNOWLEDGE OF CRIME PREVENTION THROUGH REPLICATION, INNOVATION AND ANTICIPATION

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Abstract: *Knowledge, in combination with pragmatic, cultural, organisational and conceptual factors, determines the performance of practitioners such as police, local government community safety officers and product designers. This paper addresses the serious and widespread obstacles to the transfer and application of knowledge generated by professional criminological research, development and evaluation, to the mainstream of practice in the overlapping fields of crime prevention and problem-oriented policing. The emphasis is on those obstacles inherent in the nature and form of knowledge itself. It therefore relates content-free concepts of knowledge management to content-rich considerations of the particular qualities of crime prevention knowledge and how it is applied in practice. It covers key issues of replication, innovation, and anticipation through, for example, foresight activities. It draws on ideas from design, evolutionary epistemology, memetics, more conventional anthropological views of cultural transmission and evolution, and organisational research on diffusion of innovation. The aim is to open up new ways of thinking centring on 'genotypic' principles of prevention that apply across contexts and across time – which can provide the foundations for practical suggestions for training, guidance and design of knowledge bases. So many, and diverse, connections emerge to the works of one renowned social scientist that this paper seems almost an exercise in following the Donald Campbell trail.*

TRANSFER AND APPLICATION OF KNOWLEDGE: THE PROBLEM OF MAINSTREAMING

The fundamental approaches to crime prevention are known. We are beginning to establish what is effective and cost effective in broad terms and work continues to develop a reliable and systematic evidence base. Building on major assessments of what works in crime prevention and reduction for the US Congress (Sherman et al., 1997) and the UK government (Goldblatt and Lewis, 1998; Ekblom, Lehman and Pease, 2001), the UK Home Office is midway through a £400m Crime Reduction Programme which aims to be both evidence-based and to generate more such evidence through rigorous evaluation and assessment of cost-effectiveness (eg Home Office, 1999). On the academic side, a 'Campbell Collaboration' for crime and justice[1] has now been inaugurated whose primary purpose is to generate high-quality reviews of evidence of effectiveness and cost-effectiveness of crime prevention (see Farrington and Petrosino, 2001). Building a rigorous knowledge base of what works, and is cost-effective, is a challenging task (and as will be seen one that we can never aspire to finish). Equally challenging to the strategic delivery of crime prevention policy and practice is the **transfer** of the knowledge we have acquired, from its source – often in intensively nurtured and well-funded demonstration projects involving top-level, practically-oriented academics working with advanced and committed practitioners under controlled conditions – to **application** in the mainstream by police, local community safety staff, designers, architects and others. For a number of fundamental reasons to be discussed below, moving crime prevention knowledge from source to mainstream encounters so many obstacles that it seems like an exercise in struggling uphill. The aim of this paper is to look closely at this important task, and draw on understandings from a range of fields, to help do it in a smarter and more effective way.

Attempts to apply the results of successful demonstration projects, and of research and evaluated good practice more generally, have regularly encountered difficulties in delivering mainstream activity that performs nearly so well – even allowing for the more complex and less favourable conditions often found in the mainstream. Evidence for this is found for example in assessments of England's Safer Cities Programme (Sutton, 1996; Knox, Pemberton and Wiles, 2000); research accompanying 'Thematic Inspections' of crime reduction in the police forces of England & Wales by Her Majesty's Inspectorate of Constabulary (Hough and Tilley, 1998; Read and Tilley, 2000); a UK Audit Commission review of local crime prevention (Audit Commission, 1999); research on Problem-Oriented Policing in both UK and US (see Leigh, Read and Tilley, 1998; Eck, 2001; Scott, 2001); and assessment of early experience of the Burglary Reduction and Targeted Policing Initiatives of the UK's Crime Reduction Programme (Tilley et al., 1999; Bullock et al., in press).

Three common symptoms are of central relevance here:

(1) Shortcomings of analysing crime problems.

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[1] Following the success of the Cochrane Collaboration in reviewing health care interventions, the Campbell Collaboration was founded in February 2000 to produce systematic reviews of social, educational and criminological interventions. The aim of the Campbell Collaboration is to make the best knowledge about "What Works" immediately available electronically (e.g. on the World Wide Web) to all interested persons, including scholars, practitioners, policy makers and the general public. These systematic reviews will be subject to rigorous quality control, will cover research throughout the world, will be regularly updated and will be revised in the light of cogent criticisms. The Campbell Collaboration further aims to stimulate higher-quality evaluations to feed the knowledge-gathering process in the future. Farrington and Petrosino (2001) describe the general background to Campbell and the aims of the Crime and Justice Group in particular. The website is http://campbell.gse.upenn.edu .

(2) Shortcomings of devising solutions customised to these problems and their causes, and innovative.

(3) Shortcomings of implementing the solutions.

Some important but fairly mundane and tractable factors account for some of these limitations of performance, such as lack of project planning and management skills; and pragmatic constraints of timing, funding, securing agreement etc. Beyond these is a range of challenging fundamental causes, which together form a pernicious and resilient web across the path of good practice:

(1) In the police particularly but not exclusively, cultural and organisational change to accommodate the preventive, problem-oriented approach is slow. There is the familiar over-concentration on catching criminals rather than tackling wider causes of crime.

(2) Compartmentalised, method-oriented thinking still predominates, alongside a myopic emphasis on problems internal to the organisation rather than 'out there' (Eck, 2001; Scott, 2001; Read and Tilley, 2000; HMIC, 2000); analytic thinking, and the risk-taking inherent in innovation, do not follow naturally from the organisation's style of working and are not rewarded. Certain kinds of organisational structures and processes – for example, top-down implementation of detailed guidelines and protocols and imposition of detailed objectives and targets – impede, or foster, attention to problem-solving, use of evidence and learning as part of day to day practice (Nutley and Davies, 2000). In this respect, changing the thinking of individual practitioners through education and training may have only limited impact if they are pressured into recidivism the moment they return to routine work: **organisational development** is needed to change the whole organisation simultaneously, including the way it learns (Argyris and Schon, 1996).

(3) But organisations, too, do not exist in isolation. The wider environment of public expectation and media criticism which the police and local government inhabit is not conducive to problem-orientation and innovation. Nor are the rules governing public accountability and the way money can be spent, and stifling and over-detailed central control in general (Nutley and Davies, 2000; Faulkner, 2001:288-289). Key Performance Indicators in principle are valuable 'levers' for encouraging practitioners to act on research such as repeat victimisation (Tilley and Laycock, 2000), but their narrow and superficial use ('my Chief requires me to find 5 hot-spots per month') can be part of the problem.

(4) Additional difficulties occur where crime problems, causes and solutions span major divisions of labour in society (Ekblom, 1986; Ekblom, 2001a), and partner organisations must find ways to pool their resources of time, money, knowledge and technology, and link their diverse approaches and priorities to deliver prevention. In extreme cases there may not even be a starting-point of consensus about the extent, existence or definition of particular crime and community safety problems, let alone what to do about them. The working culture of any one institution may comprise a distinct blend of explicit knowledge, hidden assumptions or beliefs, motives and values that are hard to tease apart and rationally link up to partner institutions or individuals.

(5) Practitioners' understanding and choice of interventions is similarly hampered by fragmentation. There are still significant occupational divides between enforcement-oriented and civil approaches, and within the latter, between situational and offender-oriented prevention (Ekblom, 2000a). Solutions are thus compartmentalised and restricted in scope when experience suggests the benefits of synergy. 'Natural history' classifications which are based on familiar, face-value categories (particularly 'sweeping' ones such as 'physical security', 'social' or 'community prevention') have immediate

appeal but are too vague and inconsistent to help when it comes to detailed capture and storage of what works information, and selection and planning of action by the user. Better frameworks do exist (for example Clarke's (1997) '16 techniques' of situational prevention) but they are partial, not comprehensive, and may be insufficiently analytical.

(6) There are limitations to the depth and quality of practitioners' understanding of the causes of crime and thus their interpretation of the specific crime problems they analyse. In part this can be attributed to the predominance of the narrow 'blame-the-offender' cultural focus which precludes wider and more dispassionate causal analysis. But there is also a lack of time for analysis, reflection and learning, and lack of provision for teaching. A tradition of 'oral transmission' of knowledge (Scott, 2001) imparts limited and perhaps inaccurate information, and constantly draws practitioners back into their own occupational culture. Career development traditions of generalism and 'moving on' among police and local government mean that individuals acquire only limited practical expertise, invest limited time in education and training for any one job and are rarely in a position to learn how to apply it, teach or coach new staff for long, and give feedback to educators about the longer-term benefits and limitations of their courses.

(7) That training which is available is often superficial. Modular formats are convenient and helpful for keeping up with changing knowledge. But they are insufficient as a substitute for more intense foundation courses, and inadequate if put together without the necessary underpinning of a needs assessment, an aim and a set of learning outcomes.

(8) Education, training, briefing and mass-media are not the only deficient knowledge transfer mechanisms. Laycock (2000, 2001), and Tilley and Laycock (2000) emphasise the lack of contact and cultural common ground between researchers and practitioners which prevents each from understanding, and communicating with, the other's world. Sherman (1998) makes similar observations. More generally still, there is growing understanding that traditional, centralised or top-down knowledge diffusion mechanisms are not universally applicable, especially to circumstances where localised solutions are appropriate (Nutley and Davies, 2000).

(9) Whether knowledge is imparted through training and education, mass media, or by live, hands-on advice and collaboration between practitioners and researchers, and whether diffusion is centralised or decentralised, an even more fundamental difficulty lies with the nature, scope and quality of that knowledge itself. The state of criminological knowledge is incomplete and fragmentary. Although criminologists are moving gradually in the direction of integrated models of the causation of crime (see Wikström et al., 1995; Ekblom, 1994, 2000a), there is still far to go.

(10) The terminology in use to describe causes of, and interventions in, crime is often vague and inconsistent. This hinders thinking, communication and collaboration. This is a particular problem with international knowledge bases, where translation and inexperienced interpretation add a further layer. And no lexicon will help if the underlying concepts themselves are loosely defined. As the report of a current European debate put it (Ministère délégué à la Ville, 2001:4), 'Making the information exchanged comprehensible, going beyond translation the vocabulary and the concepts of crime prevention vary from one country to another and are vehicles of misinterpretation and misunderstanding.' The consequences of a lack of a conceptual framework (Ekblom, 2000a, 2001b) go beyond communication and thinking – they underlie the fragmentary nature of crime prevention knowledge, and contribute to the failure of theory to inform practice (Laycock, 2001) and practical interventions to inform theory (Farrington, 2000).

Ultimately the improvement of performance in crime prevention must rest on a combination of remedies to all these constraints – establishing a problem-oriented and

innovative culture receptive to research evidence, designing organisations and their management procedures to be conducive to this culture, and establishing a wider supportive climate for those organisations in their turn; improving training and building bridges between practitioners and researchers; and improving the quantity, quality, form, conceptual basis and organisation of crime prevention knowledge itself. This paper focuses on the last, knowledge, although links to the other issues are made where appropriate.

There is growing awareness that knowledge does not flow naturally from source to mainstream, but has to be actively moved uphill. There is no 'gravity feed' mechanism: passive dissemination is not enough to ensure implementation of research findings and the adoption of an evidence-based approach (Nutley and Davies, 2000). Consequently, alongside efforts to generate knowledge through research, development, evaluation and high-quality evaluation reviews such as in the Campbell Collaboration, explicit efforts to transfer that knowledge are being stepped up. At the time of writing there is much activity involving a mix of climate-setting, education and training, practitioner networks, guidance material and the establishment of knowledge bases:

(1) Detailed 'what works' and 'how to do it' material is being assembled in the form of 'toolkits' for the UK government-supported Crime Reduction website (www.crimereduction.gov.uk, which also provides for practitioner discussion groups to share experience horizontally). Toolkits aim to supply a strategic and tactical framework for understanding local crime problems and contexts, and how to identify, implement and evaluate solutions.

(2) The new European Crime Prevention Network has interests in sharing knowledge and training, and is accompanied by a new EU funding stream, Hippokrates, to this end.

(3) Europol is seeking to develop knowledge bases (Browne et al., 2001) and centres of excellence (Kerkhof, 2000) for organised crime prevention practice.

(4) The International Centre for the Prevention of Crime maintains a 'digest of good practice' directory (www.crime-prevention-intl.org)

(5) The Council of Europe has a range of action projects and reports which aim to transfer knowledge and know-how to Eastern European and CIS countries (eg Alexandersson et al., 1999).

(6) On the more traditional education and training side, analysis of the needs for education and training formed an important aspect of the guidance material put out by the Home Office to accompany the Crime and Disorder Act 1998 (www.homeoffice.gov.uk/cdact/actgch6.htm), which established a statutory duty on local authorities and the police, with other key agencies and the community, to work together at district level to develop and implement strategies for reducing crime and disorder in the area. At the time of writing, another major training review is taking place.

(7) The UK now has:

- a 'Community Justice' National Training Organisation (www.communityjusticento.co.uk) which promotes training, development and education for practitioners in a wide range of relevant fields;
- a Crime Reduction College;
- and various charitable organisations, foremost among them Crime Concern (www.crimeconcern.org.uk) and NACRO (www.nacro.org.uk) which have an important national training role.

(8) The new Regional Crime Directors structure of the Home Office in England and Wales is developing a target-setting, support and quality assurance role, in which it is currently planned that criminological researchers with practical experience will coach, and hand-hold, local practitioners.

(9) Within the design against crime field, a current UK government-funded project (www.designagainstcrime.org) managed by the Design Council aims to transfer knowledge (and also to alert and motivate designers and design decision makers) by assembling a list of exemplars, producing materials for teaching design against crime from school to graduate levels, and developing a national scheme on information and training.

By the time this paper is published many of these developments may of course have progressed further or been overtaken by events, but the trend towards actively organising the transfer of knowledge is likely to grow. When designing any knowledge base or setting out any training curriculum, however, we have to be very clear why we are doing it and what exactly we are hoping to transfer. To rush into construction is to court serious risks of expense and effort on the part of the designers and compilers and confusion and wasted opportunity for practitioners.

Help is at hand from one direction: a set of approaches known as 'knowledge management' appears to have emerged as a discipline almost overnight, to cater generically for transfer in an increasingly knowledge-driven society. Knowledge management (see for example Macintosh (1999) for one description of the field) requires investment in the capture of knowledge, sharing of that knowledge, ensuring it flows effectively; and promoting its application. In effect it aims to embed within an organisation or a network an entire knowledge-culture and set of supporting systems (even to the extent of 'knowledge proofing' all other processes and facilities).

However, this approach, while very useful, is not sufficient because it is content-free. In this paper I seek to put some of that content back, by dealing with knowledge in fairly generic terms but attuned to what we know about crime prevention. More specifically, my aim is to help to improve the process of moving crime prevention knowledge uphill from source to mainstream by discussing: the purpose and nature of that knowledge, from a practical, task-performance perspective; how the form of useful knowledge is determined by the particular qualities of prevention; the implications this has for the collection of crime prevention knowledge through research, impact and process evaluation; and the organisation of that knowledge so it may be readily shared, retrieved and applied to tackle current, emergent and anticipated crime problems.

In the course of all this I first cover knowledge in terms of day-to-day practice, and then revisit some of the issues from the perspective of the race to innovate between preventers and offenders, which involves anticipation as well as quick adaptation, and places greater requirements on us to speed up and deliberately direct the development of knowledge. This involves drawing on a range of unfamiliar ideas from the fields of biological and cultural evolution and a wider understanding of (occupational) culture. Finally, I make particular reference to the need for the organisation and transfer of knowledge to be based on a common conceptual framework to link practical methods and theoretical principles and mechanisms of prevention, much as medical science does for medicine. As well as taking us through some intellectually interesting territory, all this has practical implications for the design of crime prevention knowledge bases and other media of transfer.

Henceforward, in referring to *the* Knowledge Base I mean the body of crime prevention knowledge however it is conveyed – not merely the transfer medium of *a* particular computerised knowledge- or database.

THE PURPOSE OF KNOWLEDGE: IMPROVING, EXTENDING, AND SUSTAINING PERFORMANCE

Prevention can happen as an entirely incidental function of human activity, as when a passer-by deters a burglar merely by walking down the street at the right moment. But my present focus is purposeful 'crime preventer' roles. A wide variety of people and institutions, private, public and commercial, act as purposeful crime preventers. They are involved in carrying out tasks which deliver, or support, crime prevention interventions. These can range from self-protection and informal social control, to job-related surveillance and site management (as in railway platform staff), to dedicated private security services, to design of products and environments against crime, to formal and professional policing, probation and punishment and rehabilitation of offenders.

Purposeful performance is about transforming inputs into desired outcomes. Improvements in the performance of crime prevention practitioner roles, through better judgements, decisions and actions, aspire to several things:

(1) Better **responsiveness** to crime problems **– targeting** on needs of victim and wider society, and on causes of crime; and **prioritisation** of prevention

(2) Greater **cost-effectiveness** of prevention

(3) Greater **legitimacy/ acceptability** of actions

(4) More complete **coverage** on the ground, in terms of the proportion of crimes that need tackling which actually receive the appropriate action

(5) Wider **scope**, in terms of the range of crime problems preventers are willing and able to tackle.

Such improvements in performance can be delivered by professional crime prevention practitioners, when directly implementing the intervention themselves. Alternatively, professionals can **insert** prevention in the community – **mobilising** other people and institutions to take on responsibility for various 'crime preventer' roles. Mobilisation can be described as an algorithm under the acronym CLAMED (Ekblom, 2001c; Ekblom and Pease, 2001):

(1) **Clarifying** the preventive goals to be achieved and tasks to be done in tackling a particular crime problem – whether these involve implementing the interventions themselves or helping and motivating others to implement.

(2) **Locating** the preventers – identifying institutions and individuals with the potential to own the goals and take responsibility for carrying out the crime prevention tasks – and qualified to do so because of their resources, acceptability for the role and the alignment of their interests.

(3) **Alerting** them (if they don't know already) that there are particular tasks to be done, or raising expectations that may lead them to apply pressure on others to do the tasks (as with consumer pressure on car manufacturers to raise security).

(4) **Motivating** them to do it (for example by legislation to impose duties, regulation, incentives and persuasion – reviewed in Laycock and Webb, 2000 and discussed in Ekblom and Pease, 2001).

(5) **Empowering** them to undertake the tasks and achieve the goals.

(6) **Directing** them towards specific crime prevention roles and goals, and away from possible negative side effects and excesses of interventions, such as stigmatisation, loss of privacy or even vigilantism.

Empowerment in particular can be delivered by supplying practitioners and the organisations in which they work with a range of **resources**. These include **raw materials** such as funds and basic information; and a **capacity** to use those materials to the desired end. In an education, training and support context, this capacity is characterised as human resources with a set of **competencies** or practical skills and know-how, which are underpinned by (more cognitive) **knowledge**. (This is reflected in the 'core competencies' approach to crime prevention education and training adopted, for example, in the UK's Crime Reduction College and advocated by the 'Community Justice' National Training Organisation. See for example Home Office (1997). Competencies are complemented by various kinds of **equipment** to make them more effective, such as CCTV (and the know-how to use that). They may also acquire certain **legal powers** or wider moral **legitimacy** to render what they do acceptable (and to place limits on that).

Individual practitioners and professional organisations acquire these various kinds of empowerment through a range of **capacity-building** processes and facilities: **legislation** to bestow powers; **education and training**; 'off-the-shelf' supply of **guidance and operational information** from an infrastructure; transmission, transfer or sharing from **networks**; and **partnership**. The main rationale of the last is the pooling of complementary resources to tackle problems like crime whose symptoms, causes and/or solutions span the normal division of labour in society (Ekblom, 2001a). Organisations with the power and the legal obligation to act, such as the police, may not always be the ones with the know-how or the scope to influence the opportunities and incentives for crime (Laycock and Webb, 2000).

In this wider context, raw materials and basic human resources are the major enablers, and awareness and motivation major drivers, combined in an organisational and network **culture** and a wider **climate** of support. However, neither money, staff nor will are much use without reliable knowledge and know-how. Appropriately applied, these are the key to performance in reducing crime. They are not merely distinct and detachable components, of course, but bind the whole together and provide the core substance. Without them, all the organisational procedures, structures and task management frameworks in the world are just hollow shells (which, sadly, does not stop these being continually invented).

CRIME PREVENTION AND WHAT WE CAN KNOW ABOUT IT

Moving beyond the rather limited and abstract concepts of competency and underpinning knowledge into a more content-rich zone, we can actually identify *five* distinct types of crime prevention knowledge:

(1) **Know-about –** knowledge about crime problems and their costs and wider consequences for victims and society, offenders' modus operandi, legal definitions of offences, patterns and trends in criminality, empirical risk and protective factors and theories of causation.

(2) **Know-what –** knowledge of which causes of crime are manipulable – what preventive methods work, against what crime problem, in what context, by what intervention mechanism/s, with what side-effects and what cost-effectiveness, for whose cost and benefit.

(3) **Know-how** – knowledge and skills (competencies) of implementation and other practical processes, operation of equipment, extent and limits of legal powers, instruments and duties to intervene, research, measurement and evaluation methodologies.

(4) **Know-who** – knowledge of contacts for ideas, advice, potential collaborators and partners, service providers, suppliers of funds, equipment and other specific resources, and wider support.

(5) **Know-why** – knowledge of the symbolic, emotional, ethical, cultural and value-laden meanings of crime and preventive action.

Doing practical, operational crime prevention involves gaining, and applying, all five Ks. But know-how, and in particular its *process* aspect, brings it all together. This paper focuses on know- what and know-how, with some reference to know-about; and know-why makes a brief but important appearance.

A familiar way of organising descriptions of know-how for local crime prevention schemes is the '*preventive process'* (Ekblom, 1988, 2000a; Laycock and Webb, 2000) equivalent to 'SARA' in Problem-Oriented Policing terms (Hough and Tilley, 1998; Leigh et al., 1998). This involves:

(1) Identification of crime **problem** and setting of **objectives** for reduction.

(2) **Diagnosis** of causes of crime problem.

(3) Selection of specific **interventions**, and creation of practical, cost-effective and acceptable operational **solutions.**

(4) **Implementation** and '**insertion**' (mobilising other individuals and institutions to implement specific interventions – Ekblom, 2000a; Ekblom and Pease, 2001).

(5) **Evaluation, feedback** and **adjustment**.

Dutch experience (van Soomeren, personal communication, 2001) has centred round a more general project planning and management/ quality assurance methodology such as ISO 9001. Since the preventive process or its equivalent is a cycle, in a training context it has sometimes proved more fruitful to engage with the police culture by inaugurating the process at the 'doing' stage, after which evaluation allows for analysis and (re)consideration of the problem.

A more detailed version of the preventive process is in Alexandersson et al. (1999) and Ekblom (2001a). Variations on this process centre, for example, on approaches that identify indicators of risk some distance causally upstream of crime rather than waiting for crime patterns to become established – for example the **'risk and protective factors'** perspective of Farrington (2001), or **crime impact assessment**. **Design against crime** works through a range of processes including:

(1) **Remedial** design to existing items post-manufacture or -construction (fitting an add-on security product, such as a crooklock to a car; or making a modification, such as building an entrance porch onto a housing block)

(2) **Adjustment or upgrading** of successive versions of an existing product (eg a more secure generation of mobile phones)

(3) **Creating** something more or less entirely new (and untried and untested by criminals) – such as a new shopping centre, a new personal organiser or a new financial system.

All these design models involve repeated cycles of generation, testing, selecting among alternatives and adjusting the chosen design. And the whole family of variations on

the preventive process each involve some balance between replication of what has been done before, and innovation. We now turn to these.

Know-What: Replication, Innovation and Outcome Evaluation

Replication of successful crime prevention methods is an obvious aim of transferring practice knowledge. But even where we have good-quality, relevant and reliable 'what works' information for tackling a specific crime problem, replication is a lot harder than we may at first think. Tilley (1993a) studied a number of attempted replications, in the Safer Cities programme, of the highly successful Kirkholt burglary prevention project (Forrester et al., 1988, 1990). The replications strikingly failed to deliver such good results. This suggested a paradoxical quality of crime prevention replication itself. In practical terms what, exactly, can be replicated if apparently close, literal, high-fidelity copies are likely to be less effective than the original?

Mechanisms, Contexts and Theories

Tilley's own answer is to define replication in a less literal, and more abstract, way. The Scientific Realist approach he adopts focuses on how causal intervention **mechanisms** – the way the preventive method works – interact with necessary features of the **context** to trigger the desired preventive **outcome** (Pawson and Tilley, 1997). The unsuccessful Kirkholt replicates may have attempted to trigger a preventive effect in the new locations by means that insufficiently fit the specific crime problem there (burglary of *terrace* houses with *back alleys*) or its wider causal context (offenders motivated by *drugs;* neighbours with irremediably *hostile or indifferent relations*).

Practical replication, from this perspective, is not about mere cookbook copying of superficial features of interventions, and then hoping they will work like crop dusting uniformly gets rid of pests; or even a matter of looking for vaguely similar circumstances in which to implement the interventions. Rather, it is about getting the right mechanism to trigger the desired causal process of intervention in the right context, to deliver the desired outcome. Significantly, many of the studies of mainstreaming listed at the start of this paper noted the practitioners' *lack* of attention to preventive mechanisms. They were unclear about how, exactly, the intervention was supposed to work.

It is worth looking more closely at the concepts of mechanism and context. A **mechanism** is a dynamic process of causation, leading up to a particular event or set of events. That event can be the crime itself, and the mechanism describes the causation of that crime. Alternatively, the event can be the *non*-occurrence of an expected crime. In this case the mechanism can describe the intervention, a new and distinct causal influence which interrupts, diverts or weakens the *existing* mechanism – the causes that would have led to the criminal event.

Now for the **context**. Interventions do not act in a causal vacuum – as just described, they work by changing the balance of causal mechanisms that are active, undermining some old ones and/or introducing others that are new (Tilley and Laycock, 2000). Causation always involves some interaction between entities in which there is an exchange of energy, matter, information or influence. While we often think of contexts as an out-of-focus, taken-for-granted background, they are not a kind of optional 'add-on' feature to understanding how an intervention works – they are central. Matches which set alight dry newspaper may nonetheless fail to ignite damp firewood. The causal mechanism for the bonfire lies not merely in the capacity of the matches to set things alight in the right conditions of dryness,

but inseparably in the capacity of the paper to be set alight, and in the absence of rain. Likewise, a whole conjunction of causal conditions has to be present for a particular crime to occur – as described in Cohen and Felson's (1979) Routine Activities Theory, where a 'likely offender has to meet a suitable target in the absence of capable guardians'. (A much-elaborated version of this forms the Conjunction of Criminal Opportunity, described below.) The causal capacity of the offender to be provoked into defacing posters has to be matched by the capacity of a particular poster to provoke. And on the intervention side, a particular treatment may prevent recidivism only for offenders with a particular personality capable of being influenced by that treatment, in a wider family and employment context supportive of the process. Neighbourhood watch may only work where good neighbourly relations already exist or are capable of being established, and neighbours can physically see and hear each other's homes.

Transferrable knowledge has to be based on **regularities** of some kind, patterns of events or observations which can be predicted to apply if certain conditions are present. Conventional (social) science regularities take the form of **theories** – highly compressed and generic causal abstractions applicable across many contexts that can be used to explain, predict and manipulate events. From the Realistic Evaluation perspective, descriptions of how crime preventive interventions *work* are abstracted regularities of a more localised and particular kind. They take the form of 'Context-Mechanism-Outcome configurations' (Pawson and Tilley, 1997), which are a kind of self-contained packet of explanation and prediction for a specific kind of non-event (that is, a criminal event otherwise expected to happen in the absence of the intervention). Theories tend to focus on very narrow aspects of causation. A theory of prevention (in this case deterrence) might, for example, describe and explain how, in general, perceived *risk* of the offender getting caught is a more potent preventive cause than perceived *cost* of getting caught. In contrast, a Context-Mechanism-Outcome configuration (CMO) would aim to describe a wider and more complete web of causation – spelling out all the essential influences, including those characterised by theories, that come together to make a set of related criminal events fail to happen. A CMO might explain how a CCTV camera acts to reduce crime in a *particular* car park, how some rather more abstracted regularity acts across certain *types* of car park, or even, if enough research has been done and enough knowledge synthesised – across car parks or enclosures *in general*.

As CMO configurations become more generalised and abstract they more closely resemble conventional theoretical explanations, albeit integrated rather than single-factor ones. Both mechanisms and theories are *generative* – that is, they can explain, or generate predictions of, an open-ended set of observations or pattern of results given that we also have other information on context. Like theories, too, CMO explanations are highly *conjectural* – hypotheses to be tested and if necessary falsified.

In testing theory, it is usual to look for evidence which exclusively shows one alternative explanation to be true. In the case of mechanisms, by contrast, it is likely that several are operating simultaneously – several of the hypothesised processes may be true and moreover a number may be active in any given situation. In fact, in one set of car park contexts, Tilley (1993b) identified nine possible mechanisms behind a possible CCTV effect, and used detailed information, in exploratory fashion, to try to identify which were active. To illustrate just two, the cameras could have acted by literally facilitating surveillance and arrest; or by especially attracting to the car park those drivers who were security-minded anyway, and thus who would be sure to conceal valuables and lock doors. This multiple causation is not really surprising, though, because the immediate causal precursors of criminal events involve actors in a number of roles (offenders, preventers, promoters – see Ekblom, 2000a, 2001c, and below) all in close interaction, perceiving and anticipating one

another's moves against each other and against the crime target, in front of a complex environmental backdrop. The 'combinatorial' nature of the mechanisms that act through these causal precursors means that we can develop a kind of language for generating quite systematic and rigorous descriptions of causes (including theories where available), and of interventions.

Implications of a Mechanism Approach for Evaluation, Knowledge and its Application

Mechanisms certainly complicate the task of evaluators. Crime prevention initiatives often involve implementing a whole package of methods and evaluators have to try to identify which method or combination of methods from that package actually worked, and are worth replicating (Ekblom and Pease, 1995; Farrington 2000). Now they are being asked to look additionally within each method to see which mechanisms worked in which contexts. However, a focus on micro-detail of mechanisms and evidence for their operation (as advocated by Pawson and Tilley, 1997 under the label 'Realistic Evaluation'), and the related approaches of 'Theories of Change' and 'Rival Explanations' (reviewed and compared from a crime prevention perspective in Laycock, 2000) does have advantages. It may help to unravel 'package' impacts where conventional evaluation designs that neglect this extra level of theorising and data exploration may not. As Pawson and Tilley (1997) note, too, sensitivity to contextual interactions can often resolve apparently conflicting evaluation findings – a serious problem for the practitioner seeking authoritative advice. So methodological improvements in internal validity of evaluations (attributing cause and effect), straightening out conflicting findings and improved capacity for context-sensitive replication should outweigh the extra effort of looking for mechanisms and CMO configurations. Finally, Farrington (2000) urges that evaluations of interventions should wherever possible be used to test theories. If we strive to link our mechanisms and CMO configurations to theories, or complexes of theories, this purpose can still be served.

Turning now to the results of evaluations, i.e. knowledge of what works, the causal significance of context has implications here, too. At the very least, there is a major generalisation problem. Not even the best-stocked and highest-quality store of 'what works' information is sufficient to guarantee that knowledge gleaned in one context can successfully deliver when simply applied without significant adjustment to others. And one can never hope to conduct enough properly-evaluated replications to give coverage to the full range of contexts likely to be encountered.

Given all that has been said in this section so far, the proper approach to replication here would be to **assemble generic principles of intervention and then apply them alone or in combination as appropriate to specific circumstances** – fitting theories and/or abstract distillations of preventive mechanisms to particular problems and contexts. From this perspective a 'true replication' of one distinctive feature of the Kirkholt project could be identified as the whole Repeat Victimisation approach (Tilley and Laycock, 2000; Laycock, 2001). (Interestingly, this approach relied not only on 'pure' knowledge products comprising a 'programme theory' and a set of 'articulated tactics', as these authors put it, but on an entire system of transfer and support implemented and developed over some years).

In terms of application there is an obvious trade-off in the utility of the extremes of specific and generic knowledge. Specific CMO configurations are more easily envisaged and implemented, because they spell out relatively complete descriptions of causation; but, being localised or 'situated', they cover only limited ranges of problem and context. Theories, describing one or two very abstract causal processes, apply over a wider range of crime problems and crime contexts, and hence are more transferrable; but they may be challenging to convert to specific practical interventions and there is greater risk of

interference from unmeasured or uncontrolled intervening variables on the way.

In practice though, such 'intervening variables' should not be considered as some extraneous nuisance as they would be if a researcher was seeking a convenient way of testing a particular theory. In real-world implementation they are part of the game. This means knowledge based much more on a wide range of theoretical principles; and in CMO terms, configurations that are more generalised, structured and synthesised – a huge and jumbled pile of situation-specific configurations would be unusable.

Such structure and synthesis will at the very least involve 'branching contingencies'. *If* neighbour relations are good, *then* the following mechanisms may work (given further contextual specifications). *If not*, then other mechanisms may work and other interventions may be appropriate. (Such a synthesis of some neighbourhood watch findings is in Tilley and Laycock, 1995.) Interestingly, our knowledge of 'what works' in the remedial treatment of convicted offenders has also begun to evolve in this interactional direction, treatment being contingent on type of individuals to receive it and whether they have reached the right state of readiness to benefit (Vennard and Hedderman, 1998; Andrews et al., 1990). And of course, the same applies in medical science where contemporary gene-specific treatments are the culmination of a process of customising treatments to patients.

From Abstract Principles and Mechanisms to Real-World Intervention Methods

Generic intervention *principles* (such as 'discouragement through increased effort') and spelt-out, context-specific intervention *mechanisms* (such as 'blocking offender access to target enclosure in terraced houses') are both regularities, and hopefully evidence- and theory-based. They are invisible abstractions that are generative of patterns of outcomes. But to realise any intervention we have to implement real-world *methods* (such as a specific course of literacy skills for offenders, or the addition of a concierge) or *designs* (e.g. the most appropriate design of alley gate – ten bars, galvanised, slam-locking or whatever). This is equally valuable know-what information. However, the decision to deploy particular methods and designs should be subordinated to the choice of principles and mechanisms, and the details of their realisation should reflect these too. (For brevity, 'methods' are henceforth taken to include practical designs.) But note that one person's intervention method is another person's implementation principle – someone has to have expert knowledge of how best to galvanise the gates, or the best employment terms for concierges.

We have already seen, with the car park CCTV example, how one intervention method can trigger and act through several possible mechanisms. This means that any knowledge base of interventions would have to articulate between real-world *methods* of prevention, the several spelt-out *mechanisms* by which those methods are conjectured to work in particular contingent contexts, and the generic *principles* which, singly or in combination, underlie the mechanisms. In terms of knowledge base design, a structure is needed which promotes 'flipping' between these three perspectives. In practical terms this could well involve a relational database, with its one to many, and many to many relations (Ekblom, 2000c; Ekblom and Tilley, 1998).

The problem-oriented approach subordinates choice of method to the nature of the crime problem and the causes to be tackled. So when good, professional practitioners design a real-world intervention method or select and adapt an existing one to a particular context, they need to draw on, and bring together, a whole range of generic principles and mechanisms, and an equally wide range of specific methods to realise them. (This is not only to get the best out of past experience, but to avoid making matters worse. Fitting a communal entrance porch to a medium-rise building to block unwelcome access and

facilitate surveillance needs to be checked to ensure it doesn't offer a foothold for burglars to reach first-floor windows, as once reputedly happened when such a fixed recipe was being followed.) This is often facilitated by taking the offender's perspective, or 'thinking thief' (Ekblom, 2001d,e). More broadly put, practitioners have to be helped to think more like **expert consultants**, innovating and reconfiguring their diagnoses and solutions on the fly, and less like **technicians** slotting in a simple prepackaged remedy to one of a limited set of fault diagnoses, like a washing machine service engineer. Bodies of 'what works' knowledge therefore need to be designed in such a way as to help practitioners to consider the *whole* interacting picture of causes of crime and the *whole* range of possible intervention principles, mechanisms and methods as they apply to a problem in situ, and then work up customised proposals.

Feedback

There is, though, a further step in the application of knowledge. Good first-guesses can be made about what combination of generic principles and what realised methods are likely to work in the new context, particularly as we begin to find out more about context/mechanism interactions. But in most cases there is an element of launching into the unknown. A stage of **feedback and adjustment** is therefore required to get the intervention right. (Of course, persistent failure to get one approach working should lead to its abandonment in favour of another.) The classic project management 'plan-do-review' cycle should be shortened and repeated so that clues to misalignment and failure are picked up and acted upon quickly rather than held back till the very end when adjustment is difficult.

This all resembles the creative trading-off of diverse requirements, simulation, prototyping, laboratory attack testing and field testing that goes into the process of designing a material product from first principles. It suggests that crime prevention practitioners of all kinds could learn a lot from the thought processes and techniques of product designers. From a broader perspective, the emphasis on transfer of generic intervention principles and local realisation and adjustment enables the resolution of a long-standing quality-assurance dilemma in evidence-based crime prevention – how to ensure interventions are designed simultaneously to reflect expert, reliable, evidence-based knowledge, from the *centre*, of what works, without stifling innovation and adaptation to *local* context. Nutley and Davies (2000) discuss this with particular reference to the Repeat Victimisation strategy described by Laycock (2001) – seeing it as a useful hybrid of centralised and decentralised approaches to diffusion of innovation. The Communities That Care approach (summarised in Farrington, 2000) promotes a similar blend.

In view of what was said above about the existence of multiple mechanisms behind a crime reduction effect, one important task during the trial-feedback-adjustment cycle should be to determine which of the conjectured preventive mechanisms are in fact operating in the particular context. Feedback is a useful way of identifying which causes are active, and the knowledge gained helps the practitioner to tweak the right controls next time round. It is also of more technical use in evaluation: what better way to know that you have caught hold of a cause by its tail, than when you can move it up and down, and see the preventive effect switch on and off in step? This happened with Poyner and Woodall's (1987) installation and removal of anti-shoplifting equipment in a London store. Medical research abounds with examples of similar Scientific Realist approaches – adding neurotransmitter chemicals, blocking receptor molecules etc, to unpick causes by manipulation. However, this ideal may only apply to crime prevention under limited circumstances – namely, when there is a ready ability to control conditions and manipulate the causes, and a sufficient flow rate of criminal events for changes in frequency to be rapidly and reliably observed. In many cases, sadly,

this is as unrealistic as the aspiration to the universal application of random controlled trials in project-type work. Feedback is, however, easier to apply in more routine, case-type activity, like the handling of domestic assaults. Sherman (1998) argues for the routine collection of feedback on outcomes of patrol attendance at various kinds of incident to improve performance of practitioners.

Information on conjectured mechanisms and theories – not only those that appear to have operated, but also those which were ruled out – is of more lasting value than the important but ephemeral role it can play in feedback. It can contribute to the assembly of *comparative and representative* knowledge of how important or unimportant these mechanisms were in general. (Phillips (1999) attempts to do this in her review of CCTV evaluations and the mechanisms that underlie the pattern of impacts and non-impacts observed.) And a mechanism that failed to work in one context may well work in another and is worth recording for that alone.

The wider significance of the feedback requirement elaborated in this section is that in practice, there is no sharp divide between **replication** (involving adaptation of existing preventive methods to tackle the same crime problems in new contexts) and **innovation** (generating distinctively novel methods and/or tackling new crime problems). The performance processes involved are on a continuum from 'try something that has always been shown to work against all such problems, and in all such contexts' to 'try something entirely new to cope with entirely new problems and entirely new contexts' (see also Osborne's (1998) typology of evidence-based innovations, also summarised in Nutley and Davies (2000)).

We will return to all these know-what issues when we adopt an evolutionary perspective.

Collecting Know-How – a Key Role of Process Evaluation

The replication-innovation issue connects closely to another facet of Tilley's (1993a) study of replications. Practitioners attempted a too-literal copying of the specific interventions devised for Kirkholt, when they should have been more intelligently following the steps of the preventive process to home in on the specific local problems in the new locations, and customise solutions which may or may not resemble the original.

This once more illustrates that know-what alone is insufficient for good performance. Successful prevention requires knowing how to deliver the right interventions to the right causes of a crime problem, properly attune them to the context, and adjust through feedback; and do all this in an efficient, effective, sustainable and acceptable way. Replicating crime prevention interventions therefore needs the Knowledge Base to capture the key ingredients of know-how. As with interventions, these regularities of knowledge can take the form of *generic* implementation principles (such as 'always consider testing situational intervention methods on elderly users'), or *specific* elements that have to be attended to for particular intervention methods to succeed (such as 'check in advance whether alley gates require cat-flaps' (Johnson and Loxley, 2001)). Wider difficulties of implementation, relating for example to joint decision-making issues, have been well-described by Hope and Murphy (1983) in the UK, and Pressman and Wildavsky (1984) in the US, and many of the lessons have long been incorporated in practitioner guidance materials.

The steps of the preventive process provide a self-evident framework for specifying and organising know-how (including how the other types of knowledge are to be obtained and used as the process unfolds). They therefore also define the key questions of a process evaluation to capture this information from particular crime prevention projects or

programmes (see Sutton, 1996, for an example). Under 'collecting information on crime problems', for example, the Knowledge Base can assemble novel and useful (or useless) features of crime surveys developed and employed in an initiative.

It is also useful to capture and improve on practical know-how of the means of obtaining feedback itself. As already said, feedback in crime prevention may be too slow, unreliable or expensive if it relies on waiting for sufficient numbers of potential crimes to fail to happen. It therefore becomes important to specify *intermediate* outcomes, and to develop rough and ready indicators of these to give quicker and cheaper knowledge of results. Knowledge of detailed intervention mechanisms can guide this process.

As the Campbell Collaboration emphasises, it is important to know what *doesn't* work in particular contexts, or at all – practitioners do not want to waste effort and opportunity in using or reinventing the flat tyre. But this applies to know-how as much as to know-what. A good understanding of the generic causes of failure at a number of levels is vital to salvage constructive knowledge from unsuccessful schemes. (Rosenbaum's (1986) 'theory failure, program or implementation failure, and measurement failure' are a good start but can be developed further as will be seen below.) A learning culture supports this approach; and an innovative culture accepts an element of unpredictability, extemporisation (rather than rigid management plans) and failure as a risk inherent in pioneering work, provided that strategic goals are adhered to, lessons are learned and mistakes are not replicated.

All these proposed requirements for acquiring know-how and know-what information on implementation, intervention, context and outcomes of success or failure can be costly of time and effort – often in short supply in a practical situation where bidding for, and spending, money has to be done within a set timeframe. But the potential collective benefit of such information, in terms of improved performance over a much wider set of activities and a longer time-frame, means that it is worth devoting a 'tithe' to evaluation (Ekblom and Pease, 1995). Such evaluation becomes easier and more routine at the point of conduct, the more the **infrastructure** for 'evaluability' is put in place in advance (Ekblom, 1996b).

NEW PERSPECTIVES ON THE CRIME PREVENTION ARMS RACE – BIOLOGICAL AND CULTURAL EVOLUTION

The here-and-now operational view of knowledge, adopted so far, is not the whole story: knowledge itself must evolve, and the knowledge-gathering, synthesis and transfer processes must be *designed* to help it evolve efficiently. In earlier papers (Ekblom, 1997, 1999) I described crime prevention as an arms race between preventers and offenders, with move and adaptive countermove played out over shifting ground as social and technological change constantly create new opportunities for offending – new targets, new environments, new business models, new information sources. There are strong similarities with military arms races, biological coevolution of predator and prey, and other 'evolutionary struggles'.

In this analysis, individual elements of crime prevention knowledge – particularly know-what – become wasting assets. (A Knowledge Base containing what used to work is worse than useless – ask any ammonite!) And new crime problems emerge which we don't immediately know how to tackle. (In an interesting equivalence between the Campbell collaboration and Cochrane, its medical counterpart, this is equivalent to the arrival of new occupational diseases and the evolution of antibiotic-resistant pathogens.) Sustaining and extending crime preventive performance therefore becomes a race to innovate and to disseminate that innovation – a race to acquire, share and apply new knowledge faster than offenders and wider aspects of social and technological change can invalidate it.

This new perspective requires us to extend the criteria for improved performance that we set out when discussing the purpose of knowledge. For improvement to be significant, and sustained, it involves more than just **building** of the capacity of practitioners by transferring to them what we know already, or even **developing** that capacity by incrementally pushing forward the frontiers of evaluated knowledge. It requires **gearing up** in an entirely new way.

To gear up we must go beyond the management and expansion of existing knowledge assets and jump to a higher level where we deliberately improve the overall process of knowledge management itself – capturing, organising, storing, maintaining, updating and transferring the knowledge more quickly and more effectively. Part of this is deliberately bootstrapping our own self-awareness of what knowledge is, the better to improve it. But there is more: if crime prevention, and hence crime prevention knowledge, is now in an evolutionary game, it should itself adopt evolutionary tricks to keep up (Ekblom, 1997, 1999; Cohen et al., 1995). Mainstream Knowledge Management institutions (eg Macintosh, 1999) have acknowledged the same evolutionary need, and hence the same concern with improving *processes* that act on knowledge assets. The evolutionary pressure here is not, however, that of the arms race between predator and prey, but the commercial pressure of competition.

At this point, therefore, it is worth pausing to introduce some developments in evolutionary and cultural anthropological thinking which may not be familiar to those in the crime prevention field. These developments cover both the nature of knowledge, and how it evolves. The aim is partly to generate immediate practical suggestions, but partly also to open up a different way of thinking which might help academics and practitioners alike to produce new ideas in the future – and to explore some fascinating connections on the way. This will mean revisiting some topics already covered, but from a fresh angle.

New Developments in Evolutionary and Cultural Thinking

Conventional biological evolution is no longer the whole story. Donald Campbell – he of the Collaboration in fact – also had something else named after him: Campbell's rule (Durham, 1991). According to this rule (Campbell, 1960, 1965, summarised in Blackmore, 1999:17), biological evolution, creative thought (at the heart of innovation, of course) and cultural evolution resemble each other. They do so because all are evolving systems where there is blind variation among the replicating units and selective retention of some units at the expense of others. The analogy with cultural accumulations is not from biological evolution *per se*, but from a general model of evolutionary change for which biological evolution is but one instance. This kind of thinking was developed in tandem with the philosopher of science, Karl Popper (eg Popper, 1972; Tilley, 1982).

Knowledge as social scientists usually understand it is perhaps a subset of culture, but Plotkin (1993) explicitly defines knowledge in 'universal Darwinist' terms which relate more deeply to all the kinds of evolution on Campbell's list. Following Campbell (1974) himself, he calls this approach to understanding the universals of the acquisition and application of knowledge 'evolutionary epistemology'. The approach applies whether that knowledge was genetically inherited from its parents or psychologically learned during an organism's lifetime. **Inherited** means obtained by 'genetic learning' across generations over evolutionary timescales, where adaptations such as the permeability of a reptile's skin reflect knowledge of the mean and range of the humidity of the environment. The knowledge is acquired through the trial and error process of variation; natural selection of the fittest (weeding out of the less fit by predation and competition for finite resources); and high-fidelity replication in the next generation. **Learned** means obtained by a single animal during

its lifetime through trial and error generation of behaviours, and retention of successful ones – those that led to reward. (Throughout this discussion of learning the more sophisticated cognitive learning mechanisms of humans, and the wider range of goals than mere survival and reproduction, are set aside for simplicity of exposition.)

Inherited knowledge reflects things about the world which are constant or only very slow to change in relation to the time span between successive generations of animal. Learning is a specific adaptation which evolved to gain knowledge of the much faster changes that occur *between* generations – within an individual animal's lifetime – which inheritance mechanisms cannot track. With both learned and inherited knowledge, the ultimate purpose of the knowledge is survival and reproduction of the animal – or at the genetic level, the successful transmission to future generations of the particular genes encoding the adaptations. This evolutionary epistemology relates rather closely to the performance framework adopted in this article – knowledge in a biological context is 'for' adaptation and practical problem-solving that leads to survival and replication, whether of organisms in their lifetime or of genes across generations.

With animals, learning usually dies with the individual that acquired it during its lifetime. The kind of learning most animals are capable of (such as some equivalent of 'the best food in winter is under *that* log') relates to the unique, and changeable, circumstances of those particular individuals' habitats. From the 'selfish gene's' perspective (Dawkins, 1976), in which organisms are mere 'vehicles' for reproducing genes, this knowledge is as disposable as the individuals that accumulate it. There is neither any survival benefit, nor any mechanism, to write this knowledge into the genes and transfer it to the next generation. In the special case of humans, however, learning also means cultural transmission of knowledge, across and between generations, of the fruits of learning by others.

Certain cultural/social anthropologists have long proposed 'diffusion' models to explain for example how particular tools and techniques spread within or between cultures – whether this concerns traditions of pottery design or new methods of crime prevention. (These models are related to organisational/industrial science views on innovation summarised in Nutley and Davies, (2000) although the two approaches do not seem to have joined up.) There is now emerging a Darwinian approach to the transmission of culture, known as 'memetics'. This term is modelled on 'genetics' and coined – as 'meme' equivalent to 'gene' – by Dawkins (1976).

Memes are ideas, patterns of behaviour, plans, beliefs, religions or advertising jingles, that are transferred from one human mind to another. As they transfer – replicate – they are copied more or less accurately. Successive copying errors allow them to evolve. As any shopper for soap powder knows, or any reader of emails, there is intense competition for brain-space. From the meme's eye view, those variants which get into the next generation of the transfer process by copying and reproduction, and by their appeal or utility to the human host, survive to compete another day; those which do not, die out. Hence memes can vary (mutate), differentially survive and replicate – in the same way as genes do in biological evolution. They can be said to have a selfish life of their own, albeit one that is totally dependent on the existence of humans, their speech and their information and communications technology to store, reproduce and transmit them. Biological viruses are entirely dependent on living cells in the same way.

Darwin based his model of *natural* selection on the *artificial* genetic selection of livestock. Advertisers and evangelists alike are accomplished craftspeople of artificial memetic selection and transfer; but now we may see a practical science emerging, which we should usefully watch for its potential impact on professional education, training and on-the-

job guidance. From the human host's perspective, in traditional societies most transfer of memes is vertical – parents/extended family to children. In modern societies, an increasing proportion is horizontal – with children and adults picking up knowledge, values etc from each other, from books and from mass media including the Internet. As the rate of social change accelerates, the younger generation in particular may judge the older generation a less useful source of ideas to copy, and place more weight on information from their contemporaries (Laland and Odling-Smee, 2000). In training terms, this means less of an emphasis on formal once-and-for-all learning of everything at the start of a career, and more on continuing professional development, on-line guidance and networking.

A recent, readable exposition of memetics is in Blackmore (1999). Hull (2000) further explores the concept. Debate in this still very contentious and rapidly-developing area continues (see the articles edited by Aunger, 2000, and referred to individually at points below). Key issues centre on the nature of memes, how they are replicated from one human mind to the next, and even the validity and utility of the concept altogether. These qualifications apart, I believe there is enough to be gained from applying biological and cultural models of evolution and transmission to crime prevention knowledge, provided that concepts like memes are used with due awareness of contention.

Replication and Innovation from Evolutionary and Cultural Perspectives

Replication and innovation in crime prevention are both ways of generating new responses to crime based on past knowledge. Replication relies on this knowledge to a greater and more literal extent; innovation to a lesser but broader-ranging extent. As discussed, they are surprisingly close in crime prevention practice. Translating the ideas developed in the previous section into evolutionary terminology suggests further approaches to getting know-what and know-how in the most appropriate format for transfer, particularly for handling the future. It also provides a more convenient language for articulating concepts of transfer, replication and innovation.

Know-What Translated: from Generic to Genotypic

With biological replication, Dawkins (1976) identifies three key features for making it work: fidelity (accurate copying), fecundity (potential of fast, efficient copying) and longevity (the gene to be copied stays around long enough for the copying to be achieved). Blackmore (1999) applies these features to memes. In crime prevention terms, this covers the replication of individual crime prevention methods or designs. It also relates more strategically to the issue of **programme integrity** – the faithful replication of a programme's favoured intervention methods, ability to sustain the implementation and teach it to a stream of new staff, and avoidance of 'mission drift'. An interesting attempt to manage this process explicitly, in an offender-oriented crime prevention context, is the *Communities That Care* programme (Farrington, 2000).

Fidelity has to be qualified. As we have already seen in the earlier discussion on mechanisms and contexts, extremes of literal fidelity in replication, if they can be achieved, are much less likely to work than people had assumed. From the evolutionary perspective they are fixed, 'inherited' responses that assume that the when and the where of the new context don't matter. To a significant extent, genetic transmission relies on the *environment* to carry fixed and predictable information to the next generation – which is why humans have 'forgotten' the gene for synthesising vitamin C, and normally rely perfectly well on

finding it in the natural diet. This goes wrong, of course, when our environment, and our diet, change. Implicit knowledge of crime prevention, too, is only revealed when the context changes, and what once worked now fails. We therefore have to find ways of excavating the hidden contextual ingredients.

This may not always be possible. What kind of knowledge of 'what works', then, can be transferred with fidelity across successive generations of practice, and between different contemporary contexts – but which is capable of evolution in the longer term and adaptive learning in the shorter? Some concepts in biological development can help here: know-what could usefully take a form closer to the **genotype** than to the **phenotype**. The genotype is the information in an organism's genes that describe how to make it. The genotype has the potential to develop in different ways according to the environment in which it is deployed, adjusting and unfolding through processes of maturation/ learning/ feedback. The phenotype, the completed adult organism, is one specific realisation of the genotype having undergone one specific life-trajectory of development. In the terms of the earlier discussion of replication and innovation, genotypic know-what in crime prevention is equivalent to the transfer of generic **principles** of intervention (and implementation) with the potential to be realised in different ways in different contexts. In the short-term at least, alongside such principles we must transfer highly specific, phenotypic, crime prevention **methods** that are known to work in various combinations in the here and now, such as a particular design of lock.

Know-How Translated: from Replication to Reconstruction

The debate about memes and cultural transmission connects replication to another significant and related issue. There is a powerful case to be made that cultural replication is not simply some kind of 'photocopier' process, but that each new 'copy' of some meme involves the recipient in **reconstructing** it from limited information (to demonstrate this, try recalling a recently-heard joke sufficiently well to re-tell it, or whistling a newly-heard tune) (Bloch, 2000; Boyd and Richerson, 2000). In the biological world genotypes lead to phenotypes through the process of embryological development, maturation and learning, a succession of reconstructive stages in which the unfolding organism interacts with, and takes in material and successively more complex information from its environment. Each stage, itself the product of an earlier interaction, then acts as a component of the next interaction – a process known as **epigenesis** (Plotkin, 1998).

In practical crime prevention terms, such reconstruction is self-evidently important. With the preventive process, and in particular the stages of insertion in the community, implementation and intervention of preventive action, we can even make out a kind of epigenetic sequence where more and more information is gathered and incorporated in the unfolding plan of action. We can therefore note the importance of both having the right **descriptive information** and having an orderly **scaffolding** for efficient and accurate reconstruction of the action, stage by stage, from descriptions of schemes stored in a knowledge base. Contrast this to Scott's (2001) account of the inadequacy of orally-transmitted knowledge in policing, where much information is lost and distorted; and contrast it, even, with the paucity of the descriptions of many crime prevention projects that one finds in management information systems or best practice guides.

Another part of the same reconstructive picture has already been introduced, but the message of replicating Kirkholt and other success stories is more clearly articulated in genetic or memetic terms. Fidelity of replication is greater in a *functional* sense when practitioners try to copy **instructions** – intelligently following a process which involves taking in information on the problem and context, applying appropriate principles and generating a

customised solution – rather than reverse-engineering from end-**products** (Blackmore, 1999; Hull, 2000). The products in question could be a commercial rival's secure car design or a successful burglary reduction scheme. A specific example of instructions is the performance standard approach to design, discussed under the 'future' heading below. Effective instructions require not just information and structure, but the communication of an organised set of goals or objectives (Sperber (2000) underlines the contribution of 'intentionality' in understanding fidelity in cultural transmission.) Toolkits for creating effective sets of instructions via plans, flowcharts, checklists, decision trees and feedback recognise this (see, for example Hough and Tilley, 1998; and the toolkits at www.crimereduction.gov.uk).

One message from consideration of replication as innovation and reconstruction is that the academic concepts of external validity and generalisability, while remaining important considerations in evaluations and Campbell-type evaluation reviews, are too narrow to depict what must underlie high-fidelity replication of principles in new circumstances. In fact, the kind of replicability required is more proactive, covering conditions that must be present – or if not naturally present, actively established. (In this, it is more like the 'method' section in accounts of chemistry experiments: '…care was taken to keep the temperature and pressure constant…' etc). Thus, for example, if a certain intervention needs, to make it work, the context of good community structure in terms of mutually-supportive relations between neighbours, then part of the groundwork of any replication would involve trying to establish these conditions, for example by setting up residents' associations.

To guide future reconstruction of successful schemes in potentially different contexts, key aspects of the preventive process therefore need to be recovered during process evaluation and recording for a knowledge base. One step of that process worth mentioning here is when proposed intervention mechanisms are converted into real-world crime prevention methods. **Troublesome Tradeoffs** (Ekblom, 2001d,e) centre on the need to design these methods so they serve their purpose without excessive cost, or unacceptably interfering with other goals such as convenience, aesthetics, environmental concerns, reliability, safety or privacy. The particular tradeoffs that were in play in a given attempt to design a preventive method, and the pros and cons of rejected, alternative, solutions with different balances of those tradeoffs, could be useful for practitioners reconstructing in different contexts. For example, a solution that was too expensive to use in a context where offenders were amateurs, could yet be useful elsewhere against professionals. The experience is thus not wasted.

All of this gives us clues about how best to design knowledge bases supportive of reconstruction, where the action-descriptions they contain have a fighting chance of being replicated successfully and systematically. To build on recommendations listed previously, each entry for a traditional **'case study'**-type knowledge base of crime prevention schemes must centre on clear instructions for applying combinations of accurately described generic principles and specific methods. Principles and methods alike must not only cover interventions, but also describe the activities of implementation and insertion. For each of these 'three I's' should be listed distinctive 'points to watch during reconstruction' such as tradeoffs and feedback/adjustment issues. The whole should be presented in a structured sequence of stages embedded in the Preventive Process, which effectively offers a pathway for 'recapitulating' the development of the scheme. Preliminary attempts to follow some of these maxims were developed by Ekblom and Tilley (1998); and Ekblom (2000c). Case studies may not, however, be the most efficient way of organising what-works knowledge, although they are undoubtedly necessary for illustrative purposes. The synthesised, distilled, approach based on **toolkits** and containing contingent choices and instructions may well be

better. (For an equally preliminary attempt to specify something along these lines see Ekblom, 2000b.) The end result may take the form of a branching flowchart or algorithm than a linear set of instructions, and would be more suited to interactive media than paper.

Knowing and Coping with the Future

Gearing Up is about catching up with existing crime problems we can't yet handle, tackling new, emergent, problems and preparing for the unknown ones that the future will throw at us. Biological evolution can only teach us about adaptation to problems in the here and now – the 'blind watchmaker' (Dawkins, 1986) cannot look ahead – it simply collides with the future. (If it was so capable then the evolution of resistance to malaria would not have bequeathed many of African origin the agonies of sickle-cell disease. This was a 'quick-fix' that conferred immediate advantage without thought of longer-term consequences.) But even blind evolution has ways of coping with the unknowable future, beyond this 'level zero', which we can build on in our smarter, culturally and scientifically-mediated ways. We can distinguish several higher levels of perception and response to the future.

Level 1 – Spare Capacity

The first level of coping is simply being ready to respond with 'plain' replication or 'more of the same'. An example is spare capacity to handle a wave of car crime that involves familiar Modus Operandi. But maintaining spare capacity is expensive, although some savings can be made with greater efficiency.

Subsequent levels involve coping innovatively. Innovation is *desirable* for its ability to deliver greater cost effectiveness of existing types of solution. But it is *vital* when old problems demand new solutions by virtue of their numbers going out of control, and even more so when new problems emerge. As Campbell's rule acknowledged, at some point in the creative process, variation – the generation of ideas – has to be blind, irrespective of whether it concerns evolution of a new type of armoured skin for a reptile or design of a new crime-resistant wrapping for a CD box. But the creative process can be *prepared*, ready to swing into action in several ways, involving the detection and prediction of problems and the subsequent response to them. Various kinds of knowledge are needed for each approach, and the knowledge itself must be organised for deployment.

Level 2 – Scanning and Innovative Capacity

The next simplest approach is being prepared for the future by looking out for emergent crime problems. The medical world invests considerable effort in **scanning** for outbreaks of new diseases, or old ones returning with new virulence. We can do the same with new crimes and new Modus Operandi (Ekblom and Pease, 2001), shortening the cybernetic 'control loop' of 'change→detect-and-respond' as much as we can. Specific threats coming over the horizon can then be assessed and responded to, whether by doing nothing, further monitoring or acting to develop and deploy preventive measures.

Purely on the response side, we can invest in **developing and building innovative capacity**: familiarising designers with crime and how to prevent it, for example, as is currently happening with the UK Design Council's Design Against Crime initiative (www.designcouncil.org.uk; www.designagainstcrime.org). As with adapting to the problems of the present, it is the richness of the repertoire of generic principles and methods of know-what and know-how which enable large numbers of potentially good ideas to be generated to meet predicted threats. In this connection, the UK's Foresight Crime Prevention Panel

(DTI, 2000) argued for a hard science base for crime prevention and a wider design against crime capability. Another aspect of preparing for innovation is improving the retrievability of the repertoire through organisation of the Knowledge Base. A third aspect is the deliberate establishment and cultivation of networks of influential innovators – who can both transfer knowledge to their fellows, take in knowledge from the centre, and return new or amended knowledge to the centre.

The significance of this last aspect is insufficiently recognised: for the centre to be able to dispense knowledge, it has first to obtain it. Reliance on centrally-initiated development and evaluation studies is insufficient. Encouraging innovation out there among practitioners rather than stifling it with over-management, can feed the centre with new and sometimes unexpected knowledge in the form of new practical or even, occasionally, theoretical principles. If the knowledge-harvesting mechanisms are there, doing can lead to thinking. Such benefits are more likely to flow if the practitioners themselves are already well-versed in generic knowledge of intervention *principles* so they have a strong and evidence-based repertoire from which to create new ideas (and if they are committed to selective commissioning of high quality evaluations). However, simply loading them down with detailed knowledge of concrete intervention *methods* is another form of asphyxiation. Such information should therefore not be dominant in guidance material. But it should be readily retrievable when wanted, particularly because (as Petroski (1992) notes in a kind of countervailing principle) much progress in design comes from trying to resolve faults and flaws in existing products, a point related to the obsolescence issue discussed below.

Level 3 – Future-Proofing

Beyond building, and liberating, innovative capacity in a generalised way, the next level involves specific actions to **future-proof** individual crime prevention methods and designs, and to future-proof the whole armoury. Situational crime prevention in particular requires this treatment because it has to face the extremes of the arms race. However, it is worth pointing out that offender-oriented interventions (whether enforcement tactics and technologies, or treatment) also face resistance from criminal individuals, organisations and subcultures. Moreover, the validity of their analysis of causes, and efficacy of their interventions, depends just as much on the changing social and cultural background.

To future-proof our armoury of interventions they must be made as **adaptable** to social and technological change and to offenders' countermoves and hence as **sustainable** as possible. It is also necessary to **monitor for obsolescence** and **weed out** those practices which no longer work and have run the course of modifications to keep them going. Here, a 'pipeline' of new security systems can be maintained (as with satellite TV, banknotes and credit cards), so that old methods can immediately be replaced as they become defunct. We also have to make situational interventions **varied** – so the offender can't quickly 'crack one, crack them all'; and **unpredictable** through the richness and subtlety of interventions that we can design.

Design against crime, as a subset of situational prevention (Ekblom, 2001d,e), faces an even more intense innovative requirement for adaptation and sustainability. Paradoxically, although design embodies cultural evolution, its individual products, once they leave the factory or are erected on a building site, are largely fixed – like the anatomy of mature organisms. As such, it is only a matter of time before criminals find ways round them or social and technological change pass them by. We can resolve this paradox by noting that the design concept resembles the genotype, the manufactured design realisations the phenotype.

Adaptability of the manufactured or built *phenotype* can be achieved most simply by designing products into a wider **secure system** that involves humans or at least intelligent, decision-making software able to react by making instant countermoves to offenders, summoning assistance and so on. (This has echoes of Dawkins' (1982) 'extended phenotype', in which for example, a beaver's dam is as much an expression of the beaver's genetic plan as are its teeth and tail.) A neat example of such adaptability appeared as a prize-winning entry in the Royal Society of Arts' 2001 Student Design Awards (www.rsa-sda.net/sda_oe_2001/htm/br/br_14.htm): a 'gypsy' style ring, with diamonds embedded in the circumference, was fitted with a platinum housing that the wearer could slide neatly over the gemstones when out and about in risky areas. (One could almost imagine her saying to herself 'This looks like a three-diamond situation, I'd better shift the cover round a bit.') The more general issue of designing products for use by real people in real situations means that any security system that relies on, or has to mesh with, human actions must be very well-researched. For example, designers of goods that cease to function when removed from their familiar home, or when an unauthorised user (with different fingerprints, say) tries to operate them, must identify and cope with all the contingencies of legitimate use – servicing in a dusty workshop, coping with resetting after a power-cut, lending to one's son or daughter etc. This represents a huge amount of practical know-about knowledge concerning legitimate 'Modus Operandi' that matches the information designers need to know about the criminal equivalent.

Alternatively, the products themselves can be made **upgradeable** in some way. This is normally the field of remedial design, but it is possible to anticipate and facilitate such remedy in advance. The Amsterdamse Poort shopping mall was designed to take security shutters, but these were not to be installed unless the crime problem became too large and security staff proved unable to cope; security add-ons are made for cars (pre-designed options being better than poorly-integrated after-purchases); and software patches can be downloaded for defending computer facilities against new attacks by viruses or fraudsters. In effect, these feedback strategies are the equivalent of **learning** in the world of artifacts (one book and television series was even entitled 'How Buildings Learn' – Brand, 1997). Enhancements of adaptability such as these are a good way of coping with the uncertainty of the design process. Designers, and design decision-makers in marketing or the company boardroom, may understandably hesitate to take the risk of incurring additional cost in their products if the risk of crime is uncertain (Ekblom, 1997; 2001d,e). Upgradeability allows the manufacturing and sales costs, if not the design costs, to be fine-tuned according to emergent or anticipated need.

The innovative capacity that supports the general approach of Level 2 and the specific strategies of **adaptability, variety** and **unpredictability** of Level 3 requires, at base, a fount of **creativity**. Here, we return to generic, or genotypic, principles. These cover far broader sets of circumstances – present and future – than piecemeal specific elements of realised design. They are also less prone to being left behind in the arms race. Our professional crime prevention consultants must be armed with a whole battery of these principles which they can mix and blend in combination to generate new designs to apply to new contexts and the changing 'fitness landscape' (Dennett, 1995) of what works.

A diverse range of ideas (discussed in Ekblom, 1997, 1999) can be drawn on to flesh out this view. In biological evolution, some theories of the survival value of sexual reproduction centre on the ability it confers to shuffle genes for disease resistance. This enables sexual organisms to keep ahead of pathogens – in effect, constantly changing the locks. (On the other side of the contest, malaria parasites apply exactly the same principle – they have huge numbers of genes which they shuffle to alter their biochemical disguises and repeatedly confuse the host's immune system.) A related vision comes from engineering

science (Hapgood, 1993), where the evolutionary pressure stems from industrial competition. Here, innovation comes from being equipped with sound, theory- and evidence-based principles capable of being applied combinatorially to many problems rather than fixed expertise in any one field of technology that could sooner or later be bypassed by commercial rivals. Another, more abstract, link is with linguistic competence in the Chomskian sense (eg Pinker, 1994). The concept of **generative grammar** contrasts with the classical view of language as merely a scaling-up of 'simple' learning or imitation. It envisages the capacity to produce infinite numbers of new grammatical utterances from a rich, but finite, supply of grammatical principles and combinatorial elements (words). (All these links exemplify the fundamental 'generative' view of causality espoused by Scientific Realists like Tilley.)

One important way of releasing creativity is the **design freedom** that comes from guidance and regulations based on **performance standards** rather than fixed specifications. An example could be 'door to withstand attack by currently available tools for 3 minutes', rather than 'door to be made of 5mm manganese steel'. The performance standards must of course reflect our knowledge-about crime risks in general, and 'take in' local and current information on the resources offenders are able to bring to bear in overcoming crime resistance (Ekblom and Tilley, 2000), whether this is a blow from a boot, a thermic lance or an elaborate confidence trick. They are an ideal embodiment of genotypic principles that can be 'programmed' with contextually-specific knowledge. They are a good example, too, of 'copy the instructions rather than copy the product'. The UK Loss Prevention Division of the Building Research Establishment adopts performance standards for housing construction, safes etc which acknowledge current methods of attack. The European standards system CEN, at least applied to housing and crime (van Soomeren 2000) takes the wider process-oriented approach even further.

Level 4 – Empirical Anticipation

Evolution is blind to the future and the genotype cannot itself anticipate specific changes in the environment to which it must adapt. If clairvoyance were possible, over the aeons of evolutionary time some animal would have evolved to exploit its tremendous adaptive potential. In fact, nearly all animals have. Biological evolution has managed to equip individual animals with a limited phenotypic capacity to **anticipate** in the short-term – through the widespread and repeated evolution of *eyesight.* Although not widely-appreciated, we already live partly in the future because the speed of the light we perceive is dramatically faster than the movement of matter. We can see the lion coming and make ready, rather than waiting till it jumps on us to try to fight back. In effect, the aim is not just to shorten the control loop by scanning, but to turn it into a mesh (in cybernetic terms), where we see the problem coming and respond before it happens. Any gazelle equipped with the natural equivalent of today's simplistic, 'wait till it happens' burglar alarms would not last long (Ekblom, 1997). And organisms can learn, and predict, cyclic trends in the environment, like the seasons, longer-term dry spells or perhaps shorter-term cataclysms like earthquakes and eruptions provided these are accompanied by reliable advance indicators.

In the human context, it is **know-about** which supports this predictive facility. Empirical knowledge of crime trends and cycles, and statistical techniques for filtering out chance fluctuations and incidental background influences, leads to **atheoretical predictions** – crime forecasts – which can be quite powerful (Pease, 1997). Leading indicators can also be used such as commodity prices (the elevated cost of computer chips post-Kobe earthquake was apocryphally responsible for driving theft of computer components) or predictions of artificially-imposed scarcity (as with the ivory trade, or trade in endangered animals –

apparently even tortoises in the UK are trading for £200 as opposed to £10 a generation ago, leading to theft).

Level 5 – Theoretical Anticipation

But it is wider knowledge of processes and indicators of social and technological change, linked to generic **theories** and principles, that help crime preventers to anticipate properly in an open-ended manner that ranges beyond simple projection. Such knowledge enables us to predict the qualitatively new crime problems which may appear over the next few years. We may be able to spot the likely targets of familiar crimes like theft (Clarke's (1997) concept of 'hot products' – those which are Concealable, Removable, Available, Valuable, Enjoyable, Disposable). At the very least, we can use these concepts to refine our leading indicators – for example, covering what's newly fashionable among 17-year-olds. But we can take it into the specifics of product design. This could involve making those items which look set to become valuable, harder to remove in one piece and hence harder to dispose of. By doing this we can hope to avoid or mitigate some of the sorry episodes of the control loop of 'naïve design leading to crime harvest and retrofit solution' (Pease, 1997; Ekblom and Pease, 2001), documented for mobile phones by Clarke et al. (2001). Ideally we again replace the loop or reaction with a 'mesh' of anticipation. In this respect, designers have a uniquely advantaged position to control crime risks, because unlike most professional crime preventers, they have one potential cause of crime under their own control from its conception – their own product. Of particular importance is the ability to predict the new **resources** (Ekblom and Tilley, 2000) that offenders may deploy to exploit opportunities, such as overcoming the crime resistance of targets with a new cutting tool or hindering more conventional attempts to enforce the law. Using knowledge of offenders' resources to anticipate their likely **countermoves** (Ekblom, 1997, 1999), including displacement is vital for the design of preventive methods that are **sustainable**. Beyond specific resources we can develop a higher-level understanding, and hence a predictive capacity, of the way offenders innovate, and disseminate those innovations among themselves. Finally, on the positive side of anticipation, we may even spot potential new technologies to *support* preventive applications and make them happen.

The first round of the UK government's Foresight programme (1993-97) did not explicitly or systematically cover crime (Rogerson et al., 2000). But it did produce a good example of efforts to anticipate, and respond, to the problems of fraud and identity theft. The Management of Information programme (www.dti-mi.org.uk) explicitly set out to correct known market failures in making the knowledge (and the knowledge-based technology, applications and services) come about. Round two of Foresight (1999-2002) contained a Crime Prevention Panel (DTI, 2000) which aimed to do just this more systematically.

Organising our knowledge bases of know-about and know-how can help us to make such predictions more routinely and systematically, and spread the capacity for accurate prediction to a wider range of crime preventers. For an example of an embryonic crime risk and crime impact assessment guide for product designers/manufacturers, which is also intended to help identify new crime prevention opportunities, see Ekblom (2000d). A similar approach could be developed for local practitioners.

Handling the Challenges of Prediction

But we must not get too optimistic about the capabilities of prediction – it remains a difficult game. We cannot be certain even of such apparently tight predictions as hot products. False positive and false negative errors are likely. 'Set-top boxes', to convert

televisions to receive digital signals, were predicted as a new hot product; but at a stroke this risk was removed when the television companies decided to give the boxes away free and recoup their money instead from service charges. Investment in developing and manufacturing security in the boxes would have been wasted. Inevitably, too, there will be some obscure technology in an unlikely field for which we have failed to make the connection with crime. Rogerson (eg Rogerson et al., 2000) notes this with reference to the first round of Foresight.

Unreliability of prediction can be coped with in two ways. Again, the biological equivalent is instructive. Short lifespan creatures such as insects die before they can learn much, so haven't found it worthwhile to invest in neurological structures capable of much learning. Investing their resources in a high reproduction rate is their strategy for coping with the many unpredictables and consequent performance failures the species consequently encounters – some genes always get through to the next generation. In ecological terms, this opportunist approach is known as an 'r' strategy (Colinvaux, 1980). With long lifespan animals the environment is more likely to change over their lifetime. They therefore have a greater requirement to adapt more closely to their environment by learning; and a greater opportunity to do so. They make greater investment in staying alive, and in supporting the fewer offspring they produce (the 'K' strategy). Back to crime prevention: with long-lived products such as houses, town centres or cars, the phenotype – the existing exemplars of the product – should be designed to be upgradeable as described above. With short-lived products – perhaps this even includes mobile phones – the product phenotypes can be written off and most design against crime effort spent improving the security of the genotype – expressed in future models. There are however limits to this strategy. In complex products like cars, the effort and cost of trying to squeeze in a previously-neglected security function once a model has been finalised or is being revised for the next version, is considerable. Even software solutions in complex systems need an immense amount of testing if they are not to have unpredictable and undesirable interactions. It is far cheaper to incorporate it when the fundamental architecture is being determined, and leave it lying dormant until and unless required.

There are more advanced approaches to improving practical predictions and minimising the harmful consequences of acting on the wrong ones. They stem from the quality and subtlety of the process which produces ideas and rejects unlikely prospects before we waste resources and opportunity in building them, or worse, mainstreaming them. Dennett's (1995) concept of the 'Tower of Generate and Test' supplies the fundamental idea here (see also Blackmore, 1999). This is an imaginary tower in which each floor has creatures that are able to find better and smarter moves, and find them more quickly and efficiently. In other words, the individual creatures are successively more intelligent; and creativity is increasingly amplified, but concentrated and chanelled. Note that all these processes use or contribute to evolutionary processes one way or another.

(1) Darwinian creatures, on the ground floor, rely only on inherited knowledge, and die when this fails to predict or avoid trouble in their environment. The faulty knowledge thus fails to be passed on.

(2) Skinnerians on the next floor are less likely to die but with simple trial and error learning kill off *behaviour* that doesn't work, and preserve behaviour that does.

(3) Popperian creatures on the next floor can imagine outcomes in their heads and solve problems by thinking about them. In Popper's words (1972:244), this ability 'permits our hypotheses to die in our stead'. Evolutionary pressure is not halted, but temporarily taken off-line from the real world and re-cast in acts ranging from intuitive imagination to research and development. In crime prevention terms, 'rational design' comes at this

level. Like 'engineering science' (Habgood, 1993) it involves seeking to get first attempts at solutions right, through a thorough knowledge of intervention principles and practical real-world fixes, simulation, and simulated attack testing, even before the first physical *prototype* is tried out (it thus combines know-about, know-what and know-how). But we can be smart from failure too. The knowledge of what didn't work during its lifetime would die with the individual Darwinian animal – although the gene pool of its species is less likely to produce that strategy in future. The Skinnerian animal knows only what is a waste of time attempting in the future. But the Popperian designer can learn much more from what designs did not work and how crime resistance was overcome. Interestingly, systematic failure mode analysis was pioneered by the late Leslie Wilkins to understand and prevent wartime air crashes, as part of a systems approach he then successfully applied to crime causation (Wilkins, 1997). This was one of the intellectual roots of situational prevention.

(4) The final level, the Gregorian, is named after the psychologist Richard Gregory who first pointed out (1981) that cultural artifacts not only require intelligence to produce them, but also enhance their owner's intelligence (and in the terms of this paper, performance). Such artifacts can include tangible things such as scissors, calculators, virtual reality design simulators or other tools; but as Dennett (1995) notes, they also include 'mind tools'. With these, Gregorian creatures (including crime preventers) can find good moves and evolve new behaviours much faster. One general purpose mind tool for helping crime preventers is discussed in the next section. But before that,we consider the wider set of mind tools for understanding, prediction and manipulation of crime – science and social science – and their limitations.

Wider Limits to a Purely Scientific Approach – How Much Smarter can we Get?

Much of the cultural knowledge transferred between people serves the obvious practical purpose of aiding survival in the physical world. This perspective has been emphasised particularly in American conceptions of culture. In contrast, some European approaches have focused on the more 'spiritual' aspects of culture in terms of identity, meaning and values (see for example Kuper, 2000). This is, however, an artificial dichotomy, because humans create their own niches for living to a remarkable degree (Laland and Odling-Smee, 2000). Those niches are not only material (such as cities) but intensely social and highly-differentiated (hence the significance of context in determining whether preventive methods will work and how they should be adjusted). To be a competent actor and survive and prosper (and perhaps reproduce our bodies and disseminate our ideas) in our own, socially-constructed world, individual members of a culture need to know an enormous amount. In materialist terms most of this is 'trivial pursuits' material – fashions, football teams, the rules of etiquette and so on. But it is not so much the specific content as the identity, solidarity and conformity that matters. As such, the content is free to drift. So the validity of what we can know in this social world is in important respects confined to specific times and places (Popper, 1972; Gergen, 1973; Tilley, 1982). Technologically-driven change makes this equally true in the material world. And with crime, as already stated, both technological and social change are further compounded by the deliberate counter-adaptations of offenders.

But despite this ephemerality some elements of knowledge are of much more durable and transferable value – they are intended to remain applicable over long spans of time and across diverse contexts. This comprises the knowledge and evidentiary methods of **science**. Paradoxically, science itself rests on *cultural* values of objectivity and rules of evidence and is an invented evolutionary process of generating knowledge that relies on

competition between theories and selection through falsification (Popper, 1972; Hull, 1988; Plotkin, 1993) and parsimony.

The Knowledge Base of crime prevention aims to be scientific and thus by default aspires to the durability just described. From this perspective, on the know-about side, criminologists of course seek to build and test theories of the causation of crime. On the know-what, 'engineering' side, knowledge is built up through scientifically rigorous evaluation that involves applying explicit fitness tests to filter those interventions that work from those that don't. (Ideally, the two forms of knowledge should come together: where interventions are firmly based on theories, evaluation can test these too (Farrington, 2000).) Here, fittest is deliberately defined as 'evidence-based, cost effective, sustainable and acceptable' etc rather than 'eye-catching or fashionable'. In another curious coincidence, many of the methodological fitness tests which scientific evaluation applies were developed and codified by none other than Donald Campbell (eg Cook and Campbell, 1979) – who therefore occupies a prominent position on the top, Gregorian, floor of the Tower of Generate and Test.

It is important to acknowledge the limits to the criminologists' aspiration to science and technology, in terms of the peculiarities of *social* science. Not only do criminologists have to track the 'here and now' aspects of knowledge just discussed; they have to do so in a world with a strong intersubjective content dealing in shared social judgments, meanings, beliefs and perceptions. Filtering all this out in the name of a spurious universality, permanence and objectivity would leave precious little to work on! Criminology and crime prevention must also work with higher-level emergent entities such as niches, markets for stolen goods and social climate which may well have significant causal power and practical significance (Ekblom, 2001f) but which are of course far more open to debate than the relatively rock-solid hierarchies like 'atoms-molecules-cells-tissues' in the hard sciences.

But this contrast should not be taken too far. Even the *harder* sciences such as biology have to extract information on enduring processes from a historical and local pattern of evolution (and mind-bogglingly, so might physicists and cosmologists – see Smolin, 1997). The nature of a biological gene or a species is debated every bit as intensively as that of a cultural meme. And particular technologies, of course, nowadays have only a relatively brief usable life-span in terms of support through availability of spare parts, expertise of service engineers, even retrievability and decodability of stored information. (Do you still own a record player for those old 45s from the Sixties? Contrast this with the durability of the various flint-tool technologies of the stone age, which sometimes lasted tens of thousands of years essentially unchanged.)

What can be drawn from this discussion for practical knowledge management? Basically, any attempt to develop a cumulative knowledge base must accommodate the social-research paradox of trying to build a science that can handle varied, complex and reflexive human perceptions and beliefs. It must further reconcile the evolutionary paradox of trying to be enduring whilst coping with social and technical change. Somehow, it may help resolve both paradoxes if we strive constantly to keep aware of working simultaneously from the two perspectives of generic or genotypic *principles*, and specific, phenotypic or real-world *methods*. It may also help if we ensure practitioners are empowered with *processes* and ways of thinking, because these endure and can act on whatever know-what material is currently valid.

The content of the subculture of crime prevention practice is evolving all the time. But many of the evolutionary pressures on the memes that make it up derive from fashion, market interest, ideology or untutored common sense. *All* of these may help a meme to survive and proliferate; but *none* of these guarantee progress towards greater and more

sustainable effectiveness. Only those elements of practice which are constantly exposed to the fitness pressures of scientific methods will evolve in the direction we want, whether these pressures act through the testing of theory, the evaluation of what works, the generation of evidence-based interventions targeted on carefully identified causes and risk factors, and the use of feedback to select and attune specific interventions to context. This is where evolution and science meet – squaring the circle of Donald Campbell's contributions.

THE ORGANISATION OF KNOWLEDGE: CONCEPTUAL FRAMEWORK NEEDED

I began this paper by referring to the important issue of knowledge acquisition. I then moved on to identify a whole range of issues concerning the transfer of knowledge to, and its application by, practitioners. The aim was to improve their performance in detecting, anticipating and tackling current, emergent and future crime problems. Throughout, I have aimed to put the distinct features of crime prevention content back into some fairly abstract models of performance and knowledge management. But now it is time to consider the state of crime prevention knowledge as a whole, which brings together issues of its acquisition and organisation that have emerged at various points.

Transfer mechanisms are not the whole story in the conveyance and application of knowledge: what is at the receiving end also counts. Anthropologists such as Bloch (2000) note that much of the efficiency of replication depends on there already being in the mind of the receiving party a substantial cognitive **schema**, or conceptual framework, primed to decode, interpret and assimilate the message. This suggests a further strategy for knowledge transfer in which an early, relatively protracted, 'foundation' training imparts the schema, and specific parcels of knowledge are then subsequently integrated with it – from knowledge bases, guidance updates, continuing professional development, and live collaboration with researchers possessed of the knowledge. Because the fundamentals of the message are already in place, the burden on the practitioners in ingesting this new information is minimised – they don't have to take it all in at once. This of course poses the question of what the schema should contain and how it should be structured. We can illustrate the wider significance of a schema by studying the transfer system in medicine, which centres on a know-what knowledge base like that to which the Campbell Collaboration aspires, but which goes far wider.

Lessons from Medical Knowledge – From Cochrane to Campbell

The Campbell Collaboration aims to be the lead international focus for the acquisition of reliable know-what knowledge of crime prevention. But from the various points raised in this paper, it is pretty clear that high-quality systematic reviews of impact evaluation and cost effectiveness, although entirely necessary and a high priority, are far from sufficient to get that knowledge transferred and applied in mainstream practice. It is evident from their writings (eg Farrington and Petrosino, 2001) that the leading lights in the Crime and Justice group of Campbell are aware of this, but developing the necessary approach is no small task. It is not merely a matter of finding the right connecting cable of content-free knowledge management and transfer media such as training to plug into a convenient socket already installed on the Knowledge Base. We have to build the socket, wire it up to the Knowledge Base, and reconfigure the content and structure of the Knowledge Base itself, so it is assembled, integrated, and structured ready for transfer.

Campbell's intellectual roots are in the Cochrane Collaboration, set up to document well-specified and -evaluated medical interventions. A closer look at medicine and medical science can indicate what else is required to make a whole system of knowledge acquisition

and transfer work. (The medical model is however far from perfect. Sherman (1998) and Laycock (2000a) discuss some of the difficulties of applying the medical approach to evidence and evaluation in crime prevention – the former in terms of medicine as a 'battleground between research and practice', where an evidence-based approach is far from well-established; and the latter in terms of the kinds of evaluation methods that best apply.)

(1) The Cochrane collaboration rests on a well-developed *process* model of medical diagnosis, prevention and treatment (which information is incorporated within the evaluations of medical trials).

(2) Cochrane also has in the background a schema or conceptual framework that is highly-developed, in the form of medical science. This gives it a common, well-defined, consistent and internationally-translatable terminology, clear analytical concepts, an understanding of levels of explanation (biochemical, cellular, tissue, organ, whole organism etc) and rich, well-tested and well-integrated theory deriving from the interplay between practice and fundamental scientific research. The frontiers apart, most knowledge fits on well-constructed scaffolding.

(3) The framework is organised so well that medical training empowers practitioners with a complete map of causes and interventions, which they can tap into at a level of sophistication appropriate to their job (consultant surgeon or paramedic). Onto the schema they can place, and through it assimilate, new items of knowledge as they come in throughout their working life.

(4) The medical science framework also supports storage and retrieval in any number of specific knowledge bases that are all recognisably part of the same schema, and can provide information in a form suited to replication and accurate reconstruction of procedures ranging from preventive medicine to drug treatments to open-heart surgery, combining formal teaching and with structured apprenticeship and supporting manuals. In the UK it was found necessary to establish a mediating organisation to transfer the results of Cochrane reviews to medical practitioners – the National Institute for Clinical Excellence, www.doh.gov.uk/mounice.htm .

(5) There are well-established (although still imperfect) know-about systems for disease epidemiology, including scanning for accident prevention and emergent diseases (and even anticipation of outbreaks for example, of new strains of influenza). There are also know-what feedback systems for routinely monitoring the effectiveness and side-effects of treatments in use (see Sherman, 1998 for proposed application of this to police case work).

(6) Systematic mapping of knowledge supports gap analyses.

(7) Many of the more recent advances in medicine and medical science are now coming from a deep theoretical understanding of how the body works, what causes disease and how interventions might interfere with those diseases. Rational approaches to problems enable the more rapid and self-aware design and simulation-testing of large numbers of potential drugs – which is vital, because medicine is in its own arms races with antibiotic-resistant bacteria (Ekblom, 1999) or mutating lineages of cancer cells.

Cochrane – know-what – is thus embedded in a wide, and deep, complex of know-about and know-how, that is integrated through a common schema or framework.

The Campbell collaboration on crime and justice in some ways faces greater challenges than Cochrane. Whereas most people respond predictably most of the time to most of the common medical treatments, as discussed above every replication of crime preventive action in fresh contexts is far more of an innovation. And we have not yet

developed a body of knowledge and theories which enable us to predict the interactive effects of different contexts, like the contra-indications on the side of medication containers. What does the Campbell collaboration, and crime prevention more generally, have that can fulfill the process and conceptual roles supplied for Cochrane by wider medical science?

We do at least have some fairly well-developed practice *processes*, including the Preventive Process and others documented above – although the occupational culture and climate are far from conducive to applying these processes in a full-blown problem-oriented way. But we have no universally-adopted *conceptual* equivalent to Cochrane's medical science to support reviews and syntheses of what-works evidence, let alone the wider connections to practice, except in isolated areas. Laycock and Tilley (1995) make a useful start in their strategic analysis of Neighbourhood Watch options. Phillips (1999) uses a Scientific Realist mechanism approach to integrate diverse findings from CCTV evaluations. Laycock (2001) describes a synthesis of context-sensitive knowledge on repeat victimisation, worked up from empirical beginnings into an entire strategic approach to targeting of preventive action, including multimedia approaches to transfer, and performance indicators to help and require the transfer to embed in practice. However, these are all separate 'rafts' of organisation rather than regions of a common framework that builds out from generics to specifics. Beyond the broad overview level described at the very beginning of this paper, detailed knowledge remains limited on all fronts, and that which we have is fragmented – a flotsam of free-floating items described in inconsistent and often vague terms. No wonder it is an uphill struggle to transfer this knowledge and apply it in the mainstream!

A Possible Solution – the Conjunction of Criminal Opportunity Framework

For some while I have been developing a framework for crime prevention as a whole which aspires to organise and synthesise knowledge. The *Conjunction of Criminal Opportunity* framework (Ekblom, 2000a; Ekblom, 2001b,c) was in fact first published in this series (under the less user-friendly label of 'Proximal Circumstances' – Ekblom, 1994). The framework (CCO for short) had its origins in attempting rigorously yet faithfully to describe and classify some 2000 diverse crime prevention schemes implemented under the Safer Cities programme, a requirement which ensured its robustness.

CCO is based on a definition of crime prevention as *intervention in the causes of criminal events to reduce the risk of their occurrence and the potential seriousness of their consequences.* This is deliberately theory-oriented, but not attached to any one theory; nor to any particular method of prevention. In its detail it is fundamentally an expansion and a filling-out of the Routine Activities nexus of Cohen and Felson (1979), covering 11 generic kinds of immediate causal precursors of criminal events ranging from offender-centred (such as offender's criminal predisposition) to situational (such as the target enclosure). Each precursor is matched by equally generic intervention principles. The exhaustive mapping of immediate causes of criminal events and non-events supports a Scientific Realist articulation of context and mechanism, although it is not confined to that approach. In fact, it has the potential to express any criminological theory in the same, consistent, molecular terms. The current version is briefly summarised in the Annex .

The aim of CCO has moved far beyond its origins as a structured classification and knowledge base (Ekblom, 1994), towards supporting the wider evolution of crime prevention as a professional discipline (Ekblom, 1996a, 1998). In fact, from the present perspective it could be considered as a Gregorian 'mind tool' of the universal, 'Swiss army knife' kind. By linking it to the Preventive Process, the aspiration became one of addressing the problems of transferring and applying crime prevention knowledge to practice described at the beginning of this paper. In effect, this means helping crime science and crime prevention move

towards something resembling medical science and the practice of medicine – or at least the idealised view of this portrayed above.

CCO can endow practitioners with an instrument that gives them wide-angle views of the generic causes of crime (Figure 1, Annex 2), and the full repertoire of preventive interventions in those causes (Figure 3, Annex 2). From this systematic coverage they are able to zoom in for a precision focus on specific interventions in specific contexts. CCO can equip practitioners undergoing training with a ready-made framework or schema which primes them to efficiently receive, and assimilate, individual items of knowledge transferred in the same terms at later points in their career.

More generally CCO aims to support practitioner performance in the shape of intelligent, principle-driven replication, reconstruction and innovation to cover both familiar, novel and anticipated crime problems and contexts. It fosters a 'consultant'-like, rather than a 'technician-like' approach and organises knowledge and knowledge retrieval to support creativity rather than strangle it. It can flip perspectives between analytic intervention principles on the one hand – theories and mechanisms – and real-world preventive methods on the other. This 'many-to-many' relationship can be visualised as a tree (principles) and a spider's web (methods); the webs themselves may be further cross-linked into synergistic packages of methods (Figure 4, Annex 2). Although fundamentally analytical CCO is not reductionist. From its criminal event perspective it can work outwards to more complex and remote causes. It supports a view of a holistic 'causal system' of intensely interacting components as the conjunction comes together in particular Context-Mechanism-Outcome configurations. The causal components it describes can support a 'combinatorial' approach to generating diagnoses and interventions.

On the knowledge-acquisition side the aim is to support the cultivation, accumulation and maintenance of further knowledge. By setting out a 'universal story of preventive action' (Figure 2, Annex 2) it supplies a scaffolding for management information systems linked to quality assurance of implementation, and for capturing know-how information in evaluation, feedback and adjustment, and failure mode analysis. This last can build on Rosenbaum's (1986) characterisation, diagnosing intervention failure (ranging from generic theory to specific mechanism), insertion failure (failure to mobilise and hand over responsibility and direction for a crime prevention task, using the detailed CLAMED analysis described at the beginning of this paper), and implementation failure. It can be linked up with the rigorous cost effectiveness language of the UK's Crime Reduction Programme (see Figure 5, Annex 2, and Dhiri, 1999).

CCO provides a language for partner professionals and practitioners in different countries to use for rigorous and explicit communication of crime prevention knowledge, for common understanding of diagnoses, and for collaboration on preventive action. In this, it connects with conventional knowledge management views (Macintosh, 1999) that an enterprise-wide vocabulary is necessary to ensure that knowledge is correctly understood.

CCO is well-placed to identify gaps in knowledge of causes and interventions. For example, during the development of the CCO framework the significance became apparent of offenders' resources. (Tools, weapons, information, MOs, courage etc are a generic consideration in the creation and restriction of criminal opportunities (Ekblom and Tilley, 2000).) CCO can also be used to support explicit predictive tools such as crime impact assessment and foresight (Ekblom, 2000d).

CCO has been taken further in practical ways, mainly in an education, training and support context, in collaboration with a range of professions. It now appears in the UK Crime Reduction website as a supporting guide to 'toolkits' of good practice (Ekblom, 2001c); and its use is currently being explored in several contexts. One example is in scoping an

international knowledge base for the prevention of organised crime (Ekblom, 2001f). Here, efforts are under way to extend the framework by identifying higher-level causal entities beyond the 'molecular' ones leading to the immediate criminal event – such as networks, markets and niches. Attempts are also under way to develop it as the framework for a computerised knowledge base to describe individual preventive schemes in explicit, reconstructable and principled ways (Ekblom and Tilley, 1998; Ekblom, 2000). Finally, there are plans under way to apply it in the preparation of guidance for those who design against crime (www.designagainstcrime.org).

CCO is deliberately positioned as a 'high investment in training, high yield in performance' approach. The framework is not based on simple 'aide-memoire'-type structures like the 'Problem Analysis Triangle' (Hough and Tilley, 1998). No other profession (public health, architecture, for example) would send its practitioners into the field and expect them to deliver with such limited conceptual resources! But the contest between simple and sophisticated frameworks is ultimately a question to be resolved by constructive criticism and practical development and evaluation work, trying simultaneously to maximise user-friendliness and added-value in improved performance.

Whether CCO has the potential to become *the* framework for synthesising crime prevention knowledge and the practice process and facilitating replication and innovation must of course remain an open question. (The answer to this, as with other successful universals like the VHS video cassette format, will turn not just on utility but on marketing.) But currently it seems the most coherent option, and one, moreover, which is capable of further evolution.

The Practical Importance of 'Know-Why'

The rational-spiritual distinction made by anthropologists is also important in a more immediately practical way. Freiberg (2001) makes the point that an entirely rational, scientific and technological enterprise of crime prevention will not work. This is not an attack on the science itself; more an acknowledgement that humans, and human society, have emotional, symbolic and communitarian needs when it comes to dealing with crime – blame, justice, revenge, condemnation of violation of norms, sympathy to victims etc. Failure to cater for these needs may leave 'civil' and causally-based approaches to prevention in a sidetrack every bit as limiting as that of the purely ritual side of criminal justice, which seeks to meet such emotional requirements sometimes without delivering much that is materially effective against crime. Gilling (1997) argues more broadly that it is pointless to seek to introduce greater rationality into what is an intensely political, fashion-driven and gesture-prone field, through frameworks such as CCO. Rationalists can make the strong rejoinder that it is precisely because of the lack of conceptual clarity, hard evidence and good theory synthesised into a sound knowledge base that crime prevention is especially prone to these features. When swimming in these waters without such aids, professionals are left struggling to make their case for particular courses of action to lay colleagues. Nevertheless, this does not let us entirely off the hook. Some kind of deliberate, systematic accommodation is needed between the rational 'social engineering' world of causation and intervention, and the world of meaning, blame and value.

Freiberg makes interesting recommendations about how modern prevention could extend into this dimension of emotion and symbolic meaning and gain cultural acceptability – one of the key aspects of improvement of performance identified at the beginning of this paper – *without* sacrificing its rationality. This is the reason I mysteriously included **know-why** among the K's of knowledge. Know-why would cover knowing what the symbolic and emotional requirements of preventive action are, knowing the means of satisfying them, and

of making the rational and the symbolic work together by giving problem-solving **value**- and **ethics**-dimensions of fairness, justice and deservingness, community involvement and participation. Freiberg offers restorative justice as a model (which can be said to have preventive dimensions as well as retrospective ones). Crime prevention can learn from the well-developed field of medical ethics. This reacts to, or sometimes anticipates, issues such as human cloning which require the development of new know-why ideas and norms; and proactively launches public debate to constantly redefine the link between the effective and the acceptable.

The move to extend links to the judicial side of prevention is also indicated in notions of 'community prosecution' (Scott, 2001) – where local prosecutors' offices take on the function of helping to solve local crime problems as well as prosecuting individual cases in isolation. In the former Soviet Union, too, courts not only denounced and sentenced the convicted criminal, but made recommendations for prevention. At the very least, awareness of the symbolic side should avoid the outrage often engendered by naïve rationalist schemes which appear to blame the victims, excuse offending or treat the offender to 'undeserved' sailing trips or the like for perfectly rational character-building purposes.

At a more strategic level, such knowledge would include **climate-setting** by attempting to change social norms relating for example to the acceptability of drink-driving or to the civil responsibility of manufacturers or designers for looking to the security of their products and environments (Ekblom and Pease, 2001). (Perhaps such climate-setting could also eventually extend to acceptance of 'sailing trip' type action, provided this was effective – but that is a matter for debate.) We also need to find ways of making detached, causal analyses less vulnerable to the charge that we are merely 'making excuses' for misbehaviour when, for example we attribute it to tempting opportunity or early childhood experiences – somehow we need blame and causation to articulate better, and to spread this understanding as widely as medical ethics people carry their debate and understanding to the media and the wider public. (If successful this may do more than help rationalist crime preventers avoid scathing newspaper headlines – it might actually get the public and the media, and hence politicians, more interested in civil approaches to prevention. At present, in the English-speaking world at least, there is almost exclusive focus on judicial approaches.)

A final point to note on the know-why subject is that scientists and detached administrators are not the only ones to risk ignoring the symbolic side of prevention. Commercial institutions are often seen as taking an entirely 'rational' approach to crime by staff or customers – reporting and responding to it only if it is in their calculated interests to do so. This stance sometimes collides, with serious consequences, with the image they wish to portray.

GENERAL CONCLUSION

The transfer, reception and application of crime prevention knowledge from the source, in research and development, to the mainstream of practice, centre on several key ingredients. These are: a rigorous yet practical conceptual framework for prevention; a problem-oriented, innovative and risk-taking occupational culture of practitioners well-connected to a network of practically-oriented researchers, appropriate organisational structures and processes; well-developed, multi-media training; and a well-structured and wide-ranging Knowledge Base itself. The Knowledge Base should be of high quality and reliability and should draw on general principles of knowledge management. But it should also be attuned to the distinctive nature of crime prevention. It should contain information of the right kind and in the right form to reconstruct and adapt successful interventions from generic principles attuned to specific crime problems in specific contexts, and to invent

entirely new ones. It should be capable of evolving to accommodate new research, the shifting background of technological and social change, and the adaptive offender. Much of this Knowledge Base should be communicated to practitioners in a 'foundation' course which represents a 'high-investment, high-yield' strategy that primes them to receive details and updates throughout their professional career.

We must complement this knowledge by establishing a climate where managers and sponsors of practitioners in their turn accept the risk and loss of total control that goes with innovation, and support the collective interest in evaluation, including learning from failure. And more broadly, we must try to establish a wider common ground of understanding and belief about causes and cures of crime, and find ways to connect this with collective values on blame and fairness so that rational attempts to intervene do not clash unproductively with popular expectation.

Knowledge transfer is not simply about cognitive, technical considerations and a conducive climate. As with all attempts to change culture, there is a political dimension in which we must actively recognise and accommodate diverse interests in how information is shared and knowledge defined (Guba and Lincoln, 1989; Bellamy, 2001). This is not, however, to advocate relaxed acceptance of cultural relativism in crime prevention practice – we are in the game of evangelism, but we must win it by making practitioners *want* the knowledge we produce, and want the quality of intervention that comes with principles that stem from tested theory, a what-works knowledge base and application of feedback. To achieve this we need convincing arguments, demonstration of mutual advantage, joint ownership of the knowledge collection and transfer tasks with practitioners and other stakeholders, and joint design of solutions. We must also understand sources of resistance to change and work transparently to motivate practitioners, and to alleviate practical and managerial constraints on the application of knowledge. We must also strive to develop and maintain cultural and collaborative links between practitioners and researchers.

These are not easy requirements to meet. But if we – practice-oriented academics and researchers – are serious about making crime prevention work on the ground there is no alternative but to try to re-engineer the Knowledge Base, the systems of transfer that convey it to practitioners, and the wider set of working relationships and climate. In this way the mainstream of practice *does* come to lie downhill from the source in research and evaluation. Surely that is smarter than struggling against the current?

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Annex : The Conjunction of Criminal Opportunity framework

This brief resume is intended merely to impart the flavour of CCO. Readers are referred to Ekblom (2000a) for a full version, and Ekblom (2001c) for a shorter, but more recent one. Since the framework is under continual development in terms of both content and usability, comments are welcome to the author.

The CCO framework is inclusive both of theories of crime, and of the range of practical methods of prevention – situational and offender-oriented, criminal justice-based and civil. It provides clear and logically-related definitions of crime prevention and reduction, and a whole body of key terms for systematically mapping out the immediate (or proximal) causes of criminal events, the interventions in those causes and the contextual conditions with which the interventions interact. (In this, it follows the spirit of the 'systems' approach advocated by Wilkins, 1997.) It has been designed to fit in with the know-how stages of the Preventive Process, aiming to organise know-about, know-what and some aspects of know-who. It seeks to:

(1) Help practitioners both to give a systematic description of the crime problem, as in crime pattern analysis or wider assessment of risk and protective factors; and to clearly specify the objectives of the operation to tackle that problem ('*problem space'*).

(2) Provide a generic map of the causes of crime to help practitioners systematically consider what factors might be causing their particular crime problem in that context ('*diagnosis space' – Figure 1*). The 11 generic, immediate causes are, on the offender side:

[Figure 1 about here]

- **Criminality** – longer-term, personality-based influences predisposing offenders to crime
- **Lack of resources to avoid crime** – eg for avoiding conflict or gaining a legitimate living
- **Readiness to offend** – shorter-term influences – motives and emotional states, as determined by current life circumstances, conflicts and influence of drugs
- **Resources for committing crime** – skills, courage, knowledge of targets, Modus Operandi, tools, weapons, access to networks of collaborators
- **Immediate decision to offend** – anticipation/ perception of low risk and effort, and of high reward, and absence of attacks of conscience
- **Presence** in the crime situation

On the situational side:

- **Target** person, property, service, system or information that is vulnerable, provocative or attractive
- **Target enclosure** – building, room, vehicle or container that is vulnerable to penetration and contains suitable targets
- **Wider environment** that is logistically/tactically favourable for offenders and unfavourable for preventers, and which may attract or motivate the offence
- **Absence of crime preventers –** people or organisations, formal or informal, who make the crime less likely whether deliberately or incidentally

- **Presence of crime promoters** – who make the crime more likely, whether unwittingly, carelessly or deliberately – for example by supplying tools, information or other criminal services before or after the crime

(3) Provide a generic map of intervention principles to help practitioners choose those which might work to block the causes of their particular crime problem, in that particular context (‘*intervention space’ – Figures 2 and 3*). The principles correspond to the 11 causes just identified. They can be cast at the very abstract, genotypic level (‘target hardening’), or can be further differentiated like the twigs of the tree (‘resistance to shearing force’; ‘resistance to drilling’ etc). In all cases these are ‘functional’ descriptions, expressed in terms of the cause of crime that is to be tackled – usually relating to an offender’s modus operandi.

[Figures 2 and 3 about here]

(4) Help in the clear specification of real-world, phenotypic, solutions – practical crime prevention methods, schemes and packages intended to bring about the chosen interventions (*‘solution space’ – Figure 4* – the spiders’ webs cross-linking the branches of the tree of principles and mechanisms). Method statements etc are linked to principles using a ‘by’ phrase. For example, ‘target hardening through resistance to shearing, *by* using swivelling anchorages’. This general clarity of what is being implemented and how it works makes for more reliable implementation, and supports monitoring for quality assurance and general project management. Both of these processes contribute to programme integrity – ensuring that what is delivered, and what continues to be delivered, is what was planned.

[Figure 4 about here]

(5) Characterise the dynamics of criminal events, whether through scenes and scripts (Cornish, 1994) or through processes such as displacement, diffusion of benefit, offender replacement and arms races (Ekblom, 1997, 1999).

(6) Help select and mobilise other agencies that can play an effective part in reducing crime – **insertion** (Ekblom and Pease, 2001). This includes replicating the knowledge within them.

(7) Help feedback, adjustment, evaluation and measurement of cost effectiveness (*‘learning space’ – Figure 5)*. If the operation was well-implemented, then it is also worth evaluating. Because the framework has already been used to map out the causes of crime and the interventions, it provides a firm base for attributing cause and effect in order to evaluate the operation’s impact on crime and the processes by which it achieved that impact.

[Figure 5 about here]

(8) If we combine a clear *description* of the methods that were implemented, and the results of a good-quality process and impact *evaluation*, we have the material for a knowledge base of ‘what works’. The framework gives us the structure for the efficient storage and retrieval of that information, and the synthesis of practical principles. It also facilitates the two-way flow of information between generic theory and specific practice – theory informs practice, and practice tests theory only if the one can be mapped clearly onto the other.

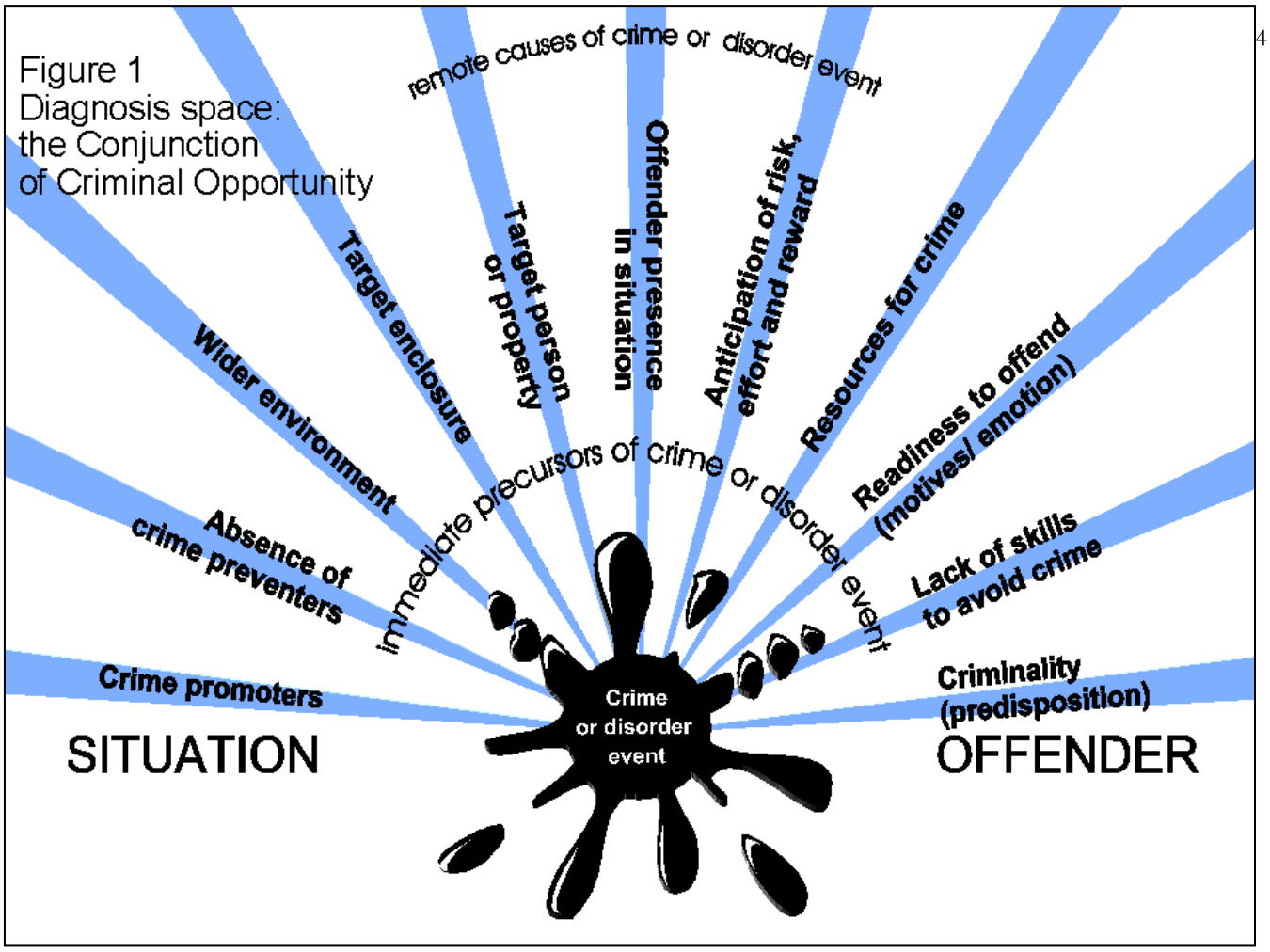

Figure 1
Diagnosis space:
the Conjunction
of Criminal Opportunity

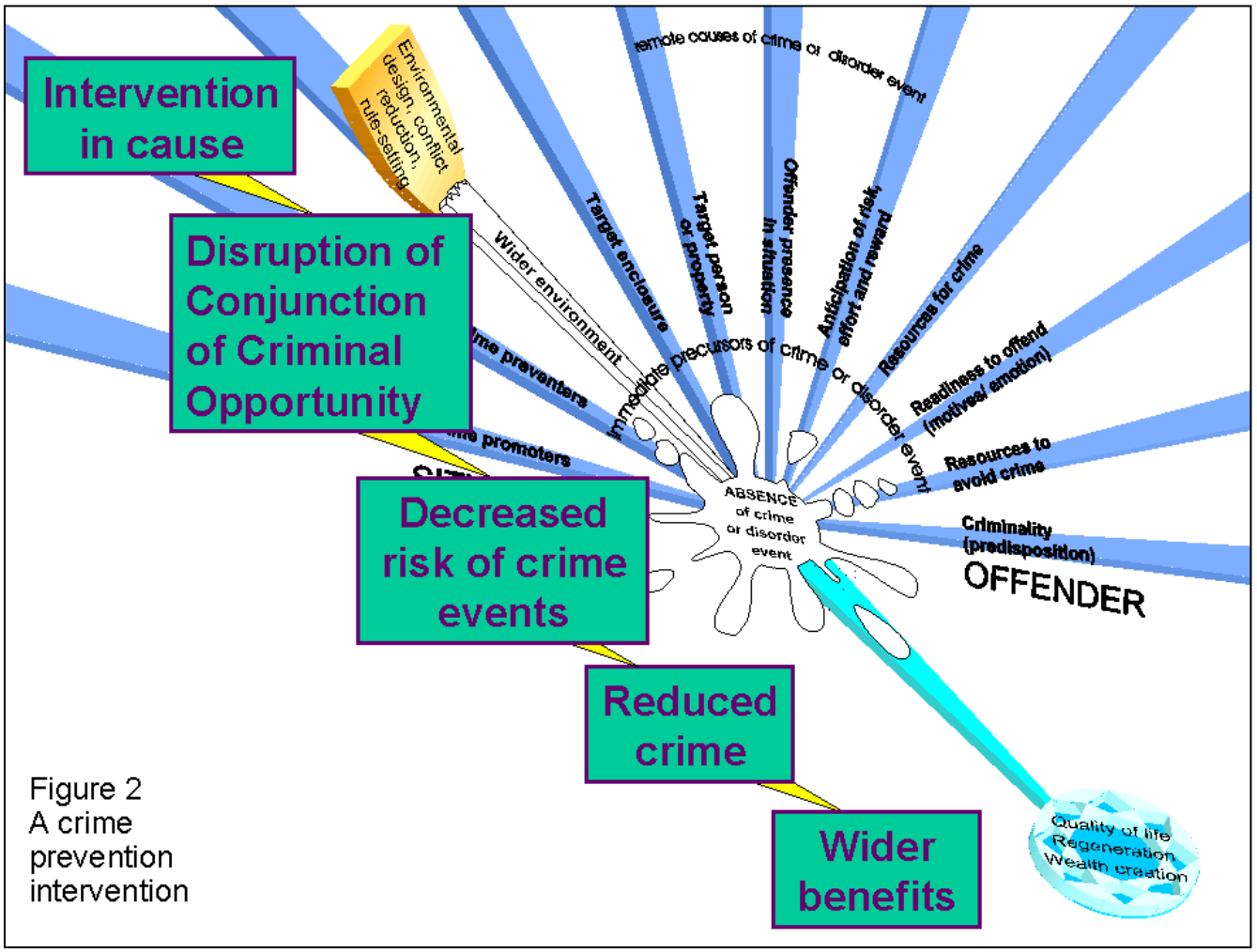

Figure 2
A crime
prevention
intervention

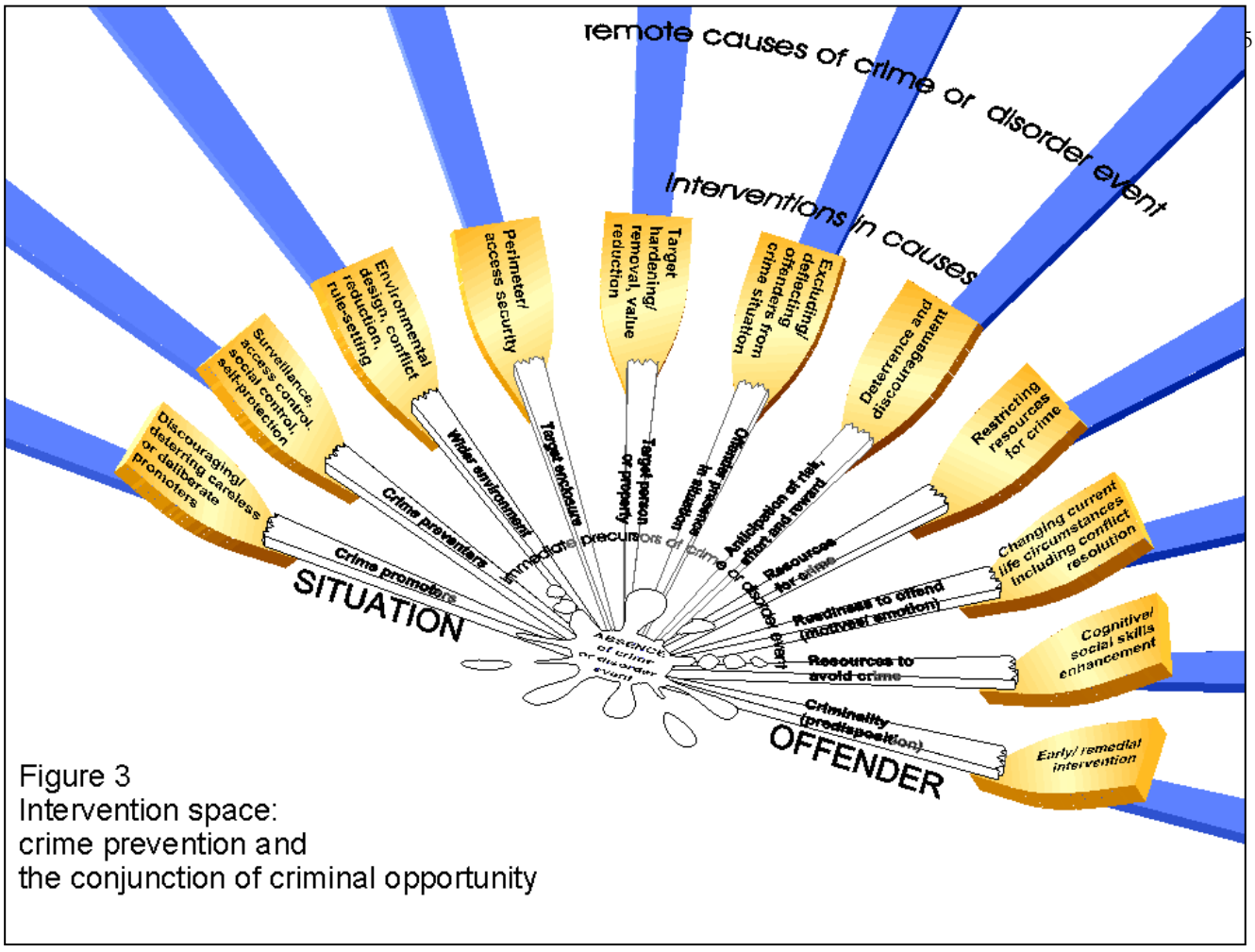

Figure 3
Intervention space:
crime prevention and
the conjunction of criminal opportunity

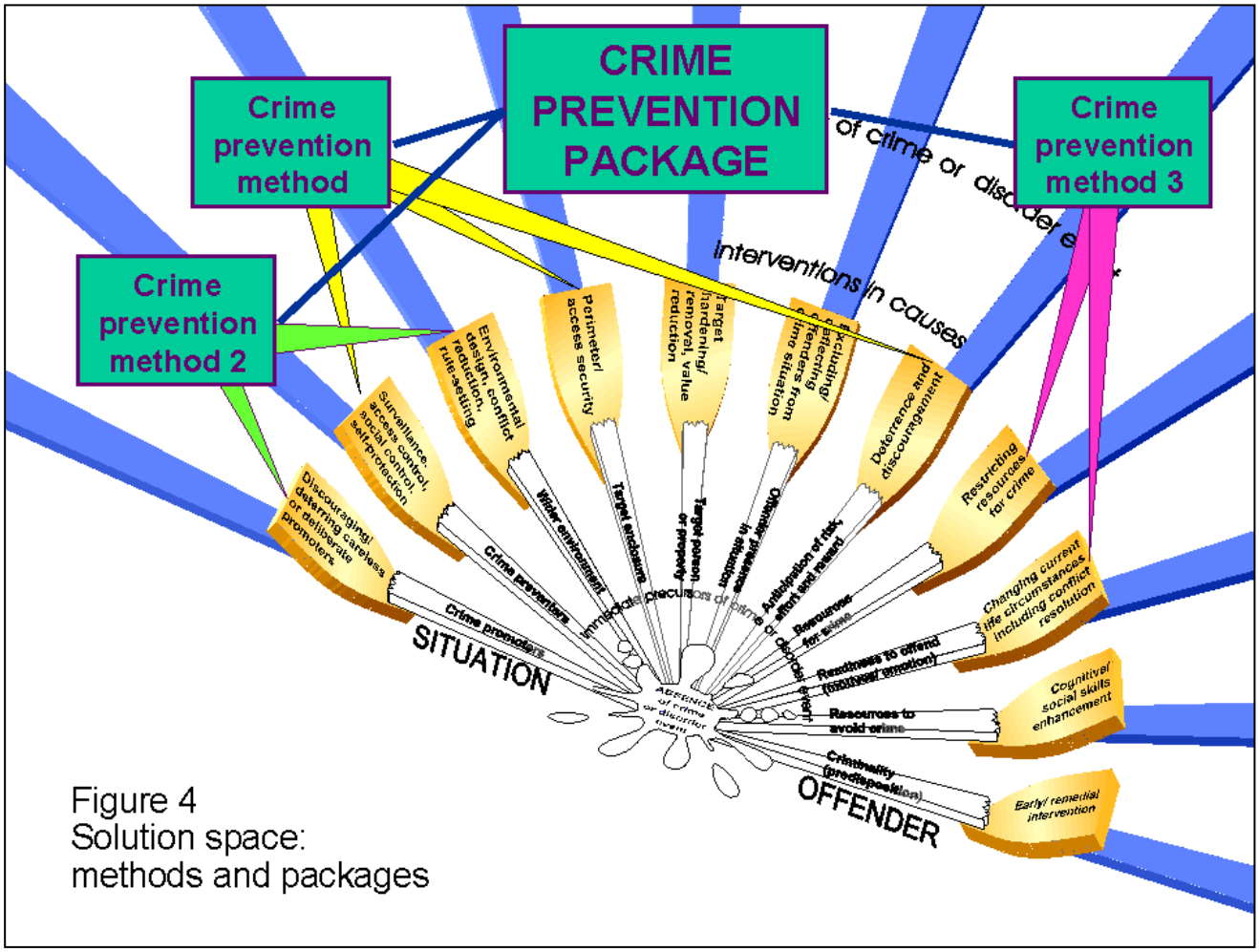

Figure 4
Solution space:
methods and packages

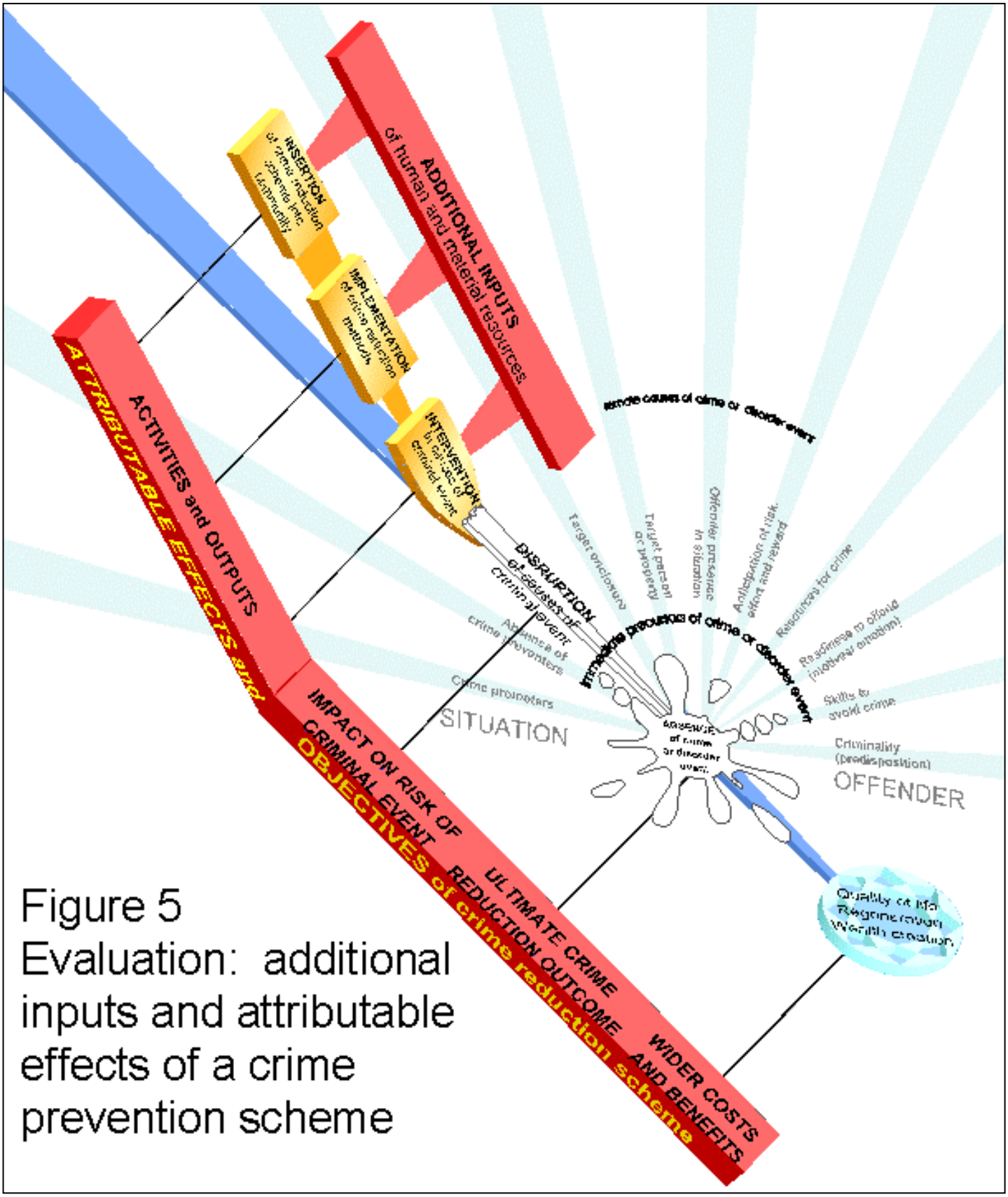

Figure 5
Evaluation: additional inputs and attributable effects of a crime prevention scheme