

Background paper to a talk at the 2014 Conference of the Christian Academic Network
Revised (lightly) from a paper for circulation before a Workshop in August 2013 on the question
"HOW DOES OR SHOULD RELIGIOUS BELIEF HAVE AN IMPACT ON OUR SCHOLARSHIP?"

**Religious Roots to the Understanding of Information-Processing Systems:
an Illustration from Basic and Applied Research into the Human Individual (a Soul)**

by DAVID BOOTH

Autobiographical summary

From Roots to Shoots

The tap-roots of my academic scholarship grew from encouragement by devout Christian parents to study the Judeo-Christian Scriptures in order to understand God's view of humanity and to seek guidance on my own steps through life as a follower of Jesus as Saviour and Lord. At the abstract level, the Bible left no doubt of the importance of each human being and the reality of the battle between reasoning and emotions in each of us for good or evil in outcome. Yet I found it equally clear in the Bible that we individuals are created to live in (extended) families, that the rise and fall of rulers and nations are in the divine will, and that people are mortal representatives of God over a planet filled with animals and plants and the sunshine, air and rain on which they and we are all constructed to depend.

From the age of 10, I specialised at school in the physical sciences. This was out of a fascination by the discovery of nuclear fission and fusion and by the idea of rocketing to freedom from earth's gravity (finding peaceful uses for WW2 weapons). That led to study for a degree in chemistry but, in my first weeks as an undergraduate, a fellow student introduced me to the philosophy and the psychology that he was studying. These two distinct university disciplines were both totally new to me. Yet from those religious roots, I could see that each was at the cutting edge of our efforts to understand ourselves - a part of what I later learnt Francis Bacon had called God's 'second book.' The church tradition in which I had grown up was antagonist to (and frightened of) both philosophy and psychology, as hotbeds of atheism and worse. Nevertheless I felt a vocation to serve the Lord by gaining a serious grasp first of what each discipline had so far achieved.

So I began to read around in both contemporary 'linguistic' or conceptual-analytic philosophy and the science of experimental psychology. The key text in philosophy turned out to be Wittgenstein's posthumous treatise, then recently published (*Philosophical Investigations*, 1953). My induction into psychology was by working through the latest edition of C.W. Valentine's *Introduction to Experimental Psychology* (1954), investigating my own performance in tasks such as trying to remember different lengths of series of words and getting rid of the Muller-Lyer illusion (the difference in apparent length of a line generated by arrow heads pointing in opposite directions). After graduating, I took a second undergraduate degree, in both philosophy and psychology like my earlier friend, while working for a PhD in biochemistry of normal and dysfunctional brains, having moved towards the life sciences during my first bachelor degree and its associated research masters.

After 15 years of approaching the wonders of the creation as a scientist, I'd have been a dead loss as a concept-analysing philosopher.¹ So I thought that I should be looking for jobs as a scientist of human life. There were indications of some gifts in theoretical interpretation of psychological data. Hence I considered switching research field from the brain by itself to the mind in both its contexts, of the body and brain and of the culture and language.

An ideal setting for a segue from biochemistry to psychology was provided by an invitation to set up a biochemistry laboratory for a leading American psychologist, while learning how to look into an animal's not-so-tiny mind. Neal Miller was then a rarity in taking seriously ordinary language about mental processes like anxiety, hunger and thirst, as the later Wittgenstein had shown was necessary. Miller's search for physical mechanisms of the mental state of hunger got me looking at the biochemistry of the body as well as transmitter chemicals in the brain. I didn't realise then but, within a decade, research into hungry people and animals would get me into the chemistry and

physics of foods as well. In all of this, I looked first at the raw data produced by each individual (including myself but mostly others).

When I returned home to England, I got back to research into the human mind (having started with children as a new graduate), centred on what a person said and did in a situation that was specified both biologically and socially. That started coming together in a fundamentally new way in the 1980s. I'm still working full-time (at least!) to bring out the full implications for a psychological science that treats each person as a thinking and feeling, biological and social being.

Retrospect

At the start of this journey, my intention was solely to see if there was anything in philosophy or psychology that could be brought to the Christian Church. It turned out that others were better placed and/or equipped to do that. I still think that what I learned in philosophy of ethics (end note 1) has something to contribute, especially in now a much more diverse society, religiously and culturally. In psychology, the caring uses of the science matter most in the Church. I'm increasingly busy in the research validation of psychological care but the face-to-face delivery of psychological development and therapy to anyone who can get access to them is the role of a professionally dedicated and trained psychologist, not a mere academic.

As it turned out, the benefits of engagement in academic psychology have flowed the other way. In my teens I publicly dedicated myself to serve as a missionary anywhere God called me. From graduation in philosophy and psychology, as I moved academically from biochemistry to psychology, I was gripped by a conviction that Wittgenstein's insights into the "bio-social" and public nature of the mind had a fundamental role in progress in psychological research. The other part of my personal mission to psychology was full attention to 'raw data' from the individual 'soul' before moving on to broader ideas and analysis of lumped data. I can only say at this stage (a mere 50 years later!) that these underlying biblical themes have proved extremely productive in my own thinking and practice as a research psychologist, although (after various sorts of delay) I am only now beginning to demonstrate that in peer-reviewed publications.

As far as I can tell from decades-long and currently developing exchanges with research colleagues, my overall approach remains unique. Yet it is deeply rooted in the origins of psychological science from the 1830s and universally recognised key advances through to the 1960s, as well as chiming in a number of separate (?re)discoveries by others since 2000 or so, and being published this year and no doubt upcoming. As far as I can see, my understanding of a mortal human life from the Bible has given me a sensitivity to basic natural realities, a bulwark against both materialist and literary reductionisms, and a patient wonder at the gaps in our current understanding of the works of the divine Creator and Sustainer of us representatives on earth.

Religion and Science

The bio-socio-psychological unity of the human person

I have written and spoken to scientists who are Christians (or of other faiths) about the multiplicity in unity of the human individual, a human life or soul – having a body, a culture and a mind, or a member of a species and of a community who grows some autonomy to the extent s/he exercises options when they arise. [I regarded (and still regard) the human spirit as either a relationship to God (dead in sin or reborn into resurrection life) or the investigatable mind (e.g. converted to Christian faith or Marxist ideology), rather than another 'part' of a human person.]

These papers are in *Science & Christian Belief*. The most recent talks to Christians in Science and the American Scientific Affiliation are available in .ppt PDFs on the internet (epapers.bham.ac.uk or part of a biology Perspective on christianacademicnetwork.net.uk).

Back to the Bible

Outside my expertise as an academic psychologist and without any formal qualification in either historical/dogmatic theology or literary study of the biblical texts in their historical contexts, I have

sought to write about selected issues of public importance, in the Church at least, that I have studied in some depth. The writing that has been published ranges from letters to the *Times Higher Education* magazine to equally short and much longer pieces on various parts of the Christian Academic Network website. *THE* found the marvellous title “All Intents and Purposes” for a letter pointing out that a rabid neuroreductionist was ignoring his own writing to the *THE*. C-A-N's Forum contains a number of contributions on multidisciplinary. C-A-N- Publications or other contributions range from two short pieces, one on Christ's omniscience taking regard of the psychology of memory, and another on the effects of smacking, to two long pieces, one on a 'creationism' that is truly biblical (and consistent with “God's powers” in the Second Book) and the other (not involving any science) on the recent controversy over penal substitution.

The nature of psychology

It is vitally important to be clear that psychology is about the observable mental achievements of living/working systems, not about our private experiences - as is assumed by most people outside psychology (and still by some within). The ability to construct and to express subjective experiences is another set of achievements - highly sophisticated performance too, even at its most primitive such as a child sharing a dream with a parent on waking. Psychology is not primarily about the contents of consciousness (phenomenology), nor is it limited to The Conscious Mind of the philosophers. Psychology is concerned with the whole of the system of mental causation in each of us, whether we are aware of a process or not.

Rather than psychology being taken over by computing, neuroscience, developmental biology or cultural analysis, I believe that my distinctive approach to human (and animal) information-processing systems is equally (and usefully) applicable to a socially and physically competent robot that may one day be engineered, and maybe to a fragmentarily embodied and acculturated computing system that exists already – even perhaps to some universally available system with screen output and movement input of an extremely flexible sort.

Those last two sentences also indicate what I mean by “biosocial” psychology/'cognition'.² Without both human biology and human society, there are no human minds: this is a central tenet of my scientific approach - and of its religious taproot(s).

Multiple causation in one person's life

Philosophical theology remains deeply corrupted with the atomistic materialism initiated by Democritus and thought to have triumphed in the discoveries of chemistry in the 18th century, organic molecules in the 19th and the standard model of fundamental particles in the late 20th century. There is a pervasive presupposition that God's creative and providential acts put the atoms in their places and the atoms are all there is to cosmology, biology, economics, politics and individual living. A more biblical view, espoused by Calvin for example (and I believe by Aquinas), is that God created and sustains the various sorts of causation, in the material universe, in the workings of society and in the individual soul's 'heart' and 'mind' (Paul Helm, *The Providence of God*, IVP, 1993). [Note that this a totally different view of physics or sociology than as a search for “laws”.]

There is highly feasible scientific position that is consistent with that interpretation of Genesis 1-4, Isaiah 40-43, Hebrews 1:3 and many other passages in the Old and New Testaments of the Christian Bible. This position in its simplest version is that material event can have direct effects on other material events, communal events may direct influence other communal events and that mental events directly influence each other but material causation does not affect communal or mental causation, communal causation does not affect material or mental causation and mental causation is in the same way separate from material and communal causation. A human being's mind can relate to the material and communal environments because that person's mental processes have developed through membership of a species and of a society. There is a single reality of a human person and of the divinely sustained home for humanity but it is composed of different types of causal system.

[This is the “simplest” version of Systems Pluralism. It may well be the case that both material systems and communal systems are themselves separate types of causation. For example, living organisms are entirely physicochemical, having no non-material 'vital principle.' Yet an organism, with its cells and its species, may be a causal system that cannot be reduced to biochemistry or to species-ecology interactions. It might be argued that physiology and evolution run as distinct causal systems (although genomics may refute that). Similarly, human society may not be a single causal system: do the economy and polity ('civics') work in distinct ways? The economy may subsist within the social order, although Marx argued the opposite. Running computer programs may have multiple types of 'active virtual machines' that do not interact causally but have been developed by the programmer to treat the material and social environments realistically.]

The anti-mentalists in early 20th-century psychology managed to ignore the fact that causation in the 'behaving' organism transformed information extracted from a 'stimulus' into information put back out in a 'response'. This was achieved by equivocation in behaviourists' use of the word “stimulus” between physical stimulation of the senses and the achievement (or awareness) of sights, sounds, weights, aromas and other percepts, and in the word “response” between physical movements of the limbs and speech apparatus and intended acts in body and word. Yet defenders of the mind were trapped in incoherent theories such as that stimulation of the retina or cochlea causes sights or sounds (projected on a screen at the back of the brain) and decisions of the will (sitting at an interface between a ghostly consciousness and a neural network) cause contractions of muscles. The only causation between sensory stimulation and patterns of movement is processes in neural paths to, within and from the brain. Mental causation is entirely separate, between the informational structures (functioning content) of the percept and the intent (or affect), or between concept and concept in reasoning and between concept and percept in description. (These are not full accounts of perceiving and intending. They are my mathematically minimalist models of the distinctions among sensing, perceiving, conceptualising, inferring, describing, intending and 'emoting'.)

[Not dissimilarly, at least since the demise of compilers, the switchings in a computer's engineering do not cause, and are not caused by, the 'virtual machine' sustained by running a program (D.M. Mackay, A. Sloman). The physics Nobelist, Van Hooft (2003) claims that what lies beneath the fundamental particles is 'just' information.]

Scholarly Specifics

I should give concrete examples of the impact of my religious roots on my own professional discipline. A unified social, biological and psychological approach to an individual's life is illustrated in two ways in current 'flowerings' of initial discoveries by my research group in the 1980s. One example is the gathering of evidence on which habits described in a locality are most effective at improving personal (or familial) wellbeing, and what in the environment is most effective at supporting those habits. The other example is a fully general theory and method of measuring the different types and contents of what a person is thinking and feeling at the moment in a particular situation.

Both examples are innovative fundamental approaches that have wide potential applications. Neither arose from a specific personal motivation. In both psychology and Christianity, 'real life' is what matters. Hence applications can raise fundamental questions and fundamental discoveries can be practically relevant.

Improving wellbeing

The close attention to the workings of an individual's has produced a unique tool for working out what our habits do to us under present conditions. As a result, the intellectual preoccupation has led to a way of helping others to help themselves most effectively. Is this one way of updating the injunction to love your neighbour as yourself? If so, is this an illustration of the coherence of God's purposes in the mandate to rule over the creation as it actually is?

Personal wellbeing or good quality of life is (in my view – again, a twist on the mainstream outlook) an objective matter of satisfaction with the meeting of persistent wants, such as “health, wealth and happiness.” Getting better control of bad states may be sufficient for many – for

example, persistent discomfort or weariness, unhealthy weight, or deep gloom, anger or anxiety. Improving good states might be attempted in addition. Both the restraint of evil and the cultivation of good depend on the power of the Holy Spirit, guaranteed to the redeemed, but generously blowing where he wills, in common grace.

Outline of the technicalities of 'enABLE-r/s'

evidence-networking Apps for Better Life Education – research & services.

The first step in gathering evidence on what works in an individual's circumstances is to measure how far from the desired state the person currently is. Then local agreement is sought on descriptions of common practices that might affect that state. A number of individuals in similar circumstances then experiment with changes in how often they do each practice, one at a time for as long as it might take to have a monitorable effect. The measure of effectiveness of a practice is how much improvement in a facet of wellbeing is induced by a particular change in that habit's frequency.

Of course, influences on wellbeing may not be linear or additive. However there is very little hard evidence of this sort as yet and so it sensible to look first for simple causal relationships.

Once we know how effective a habit is, the issue is how much change can be sustained for how long. Individuals might be aware or unaware of external factors that can disrupt the better habit. The mind-reading technique can make a start on identifying disruptive influences and how strong they are relative to each other, whether noticed by the individual or not. Once there is enough evidence to generalise in those circumstances, individuals can be advised on what situations to avoid and/or local people and national bodies can reduce the disruption or widen the alternatives or access to them.

Once again, there is some serious but not complicated computation, this time operating on interactive interfaces on the internet that cycle services through research into better services. The approach centres of text agreed to be realistic by local members of the public. However the connection to physical and social surrounding can be made much more realistic by use of mobile sensors.

Reading a mind

There is a key distinction within patterns of information both drawn from and also put out to the environment. The sensing and the acting may be material or symbolic. Material information scales on ratios of physical measurement, while symbolic information scales on intervals of societal quantities, such as amount of money, discomfort or smile on a face. Both sorts of quantity are measured in the same unit of number of discriminations between the environmental quantity and the standard automatically established in an individual's memory.

One other basic principle suffices to calculate how a person is processing a situation in perception and action. Information in from two sources or out to two sinks is configured as the same in a third signal if the two distances from standard summate. The incoherences between signals are transmitted over different channels (as in cable-sharing protocols). In the simple arithmetic of personal mentation, the two processes are orthogonal.

What we observe are variations in distinct sources and sinks of information available to the individual. As in any other science, what we can infer using a well evidenced theory is the structure of the mental causation that delivers output to one of those sinks from other output and the array of sources.

There are some technicalities in the above approach that are major scientific novelties. I suspect that the religious root of these is the closest possible objective attention to every single 'datum' as it comes in from one individual. Furthermore this it not an elevation of that or any other individual above all else in God's creation. Each datum is a pair of events in the social and biological universe of which the individual human being is ineluctably a member, alongside many others

One such technicality is the identity of differential acuity (the so-called JND) and the causal strength of a mental influence on a mental effect. I am happy to expand on that without getting into

the tortuous history and mathematics of Psychophysics.

Another technicality is of fundamental importance to the information sciences (and industries). Hence it may be of more interest to some in this Workshop. Claude Shannon insisted from the start that bits (now terabytes!) measured only the amount of information (reduction in entropy) in a signal or memory store, not the structure, content or meaning of a message or memory. Some information scientists have found this very distressing and/or highly inconvenient. The same limitation applies to the increasingly popular Bayesian probabilities, and indeed to any statistical quantity. [Donald Mackay acknowledged the problem by arguing that the “metron” (a measure of information, like the bit or partial eta squared in ANOVA) needed complementing by the “logon” - a unit of the meaning generated in the receiver by a signal. Unfortunately, “log-on” came to mean something quite different!] The best fit to data on a receiver's responses to a string of signals by a mental model (structure; contents) of the receiver's standard (norm) is a measure of the meaning of that message within that physical and societal context.

The above paragraphs are not meant to be operationally instructive or satisfyingly clear. They are meant only, in the briefest possible space, to give some flavour (albeit at the abstract level) of the biosocial cognitive approach to an individual's organisation of life.

Recent reports and reviews of such research into individuals' mental processing of both material and social situations has provided opportunities to state (very briefly so far) the view of a human person as a partly autonomous unity developing from genomics and education by social and material environments, neither reducible to neuroscience nor deconstructible into any number of anti-realist interpretations, as a novel or other artwork might be. Is that a recognisable 21st century scientific version of Genesis 1:28a and 2:24?

Endnotes

1. One of the most important philosophical ideas I learnt was that there is a formal ethic that cannot be argued away but also substantive options within that framework a variety of widely used approaches to life, including major historical religion or ideologies. The formal framework is that the making of a distinction between people (including oneself and others, or human beings and a personal God) can be challenged for a justification. Differences in moral traditions that are compatible with that framework (not all are) depend for example on relative weightings of oneself (prudence) and one's life, family and friends and other living people (altruism) with the imponderable future living, including other species, or for the committed believer duty to God and duty to humanity in circumstances where they conflict. I'm not interested in classifying this position as natural theology, rationalist, Kantian, or whatever (it is neither utilitarian nor deontological). The point for me is that one can be at ease working with those of other faiths and none (professed) on broad common ground (without digging it up when there are more urgent issues), while bringing to the table where relevant an adequately tested personal position as a Christian (since on many ethical issues there is no single position agreed by Christians, nor could there be for the entirely new problems we face individually or communally). Indeed, often it's not principles that are needed but insights and sensitivities.

Of course, philosophy of mind was also vital to me, especially the later Wittgenstein's refutation of the still popular idea that the way things seem to me, while I disregarding what I believe to be so, is a whole other world from the one we share. *A fortiori*, no science can be built from introspective study of the contents of consciousness.

Similarly, philosophy of knowledge (epistemology) has rejected foundationalism, of both empiricist and rationalist varieties. Since sensory impressions or a conceptual ideas cannot be wrong, they cannot be right either and so they are certainties on which truths by inductive logic. Rather, we can get closer to mundane by evidence or argument for and against deductions from theory that has so far met other challenges.

At another level, the most important lesson has been (for any scholarly enterprise) to engage with the argument and the evidence (both), rather than trying classify positions, either with abstract titles or persons' names.

²The original meaning of the word 'cognition' was changed by American psychologists of the 1960s in their belated repudiation of behaviorism. They left out two of the three traditional 'faculties' of the mind, namely cognition, emotion (or affect) and conation (deciding, the will or motivation). Cognition (from the Latin for knowing) encompassed reasoning, perception, beliefs, thoughts and the like. Indeed for some decades, self-termed cognitive psychologists were concerned mostly with perception of physical objects and thinking about them. The importance of 'hot cognition' in addition to that 'cold cognition' eventually began to be recognised and nowadays social cognition, the emotions, and perception and action are among the fastest growing areas of psychological science.

Another view that exploits the success of psychological science, while ignoring what it has succeeded at, is to put the label 'Cognitive Science' on anything to do with brain imaging or computing.