

### The Grand Consilience

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Professor (Sophia) Chan, President (Giles) Maskell, Dr (Donald) Li, Professor (Hans) Ringertz, President Law, Founding President Leong, honourable members of the College Council, Presidents and Officers of the other Academy Colleges, fellows, distinguished guests, ladies and gentlemen,



First, a confession. *Mea culpa*, I have not prepared any slides.

Relatively young I may be but I belong to the old school. Orations are

meant to be heard, not seen. The mind is more focused when only Brodmann areas 41 and 42, i.e. the primary auditory cortex, are called to focused attention. A prepared speech also forces me to think through and articulate the arguments more clearly, thus hopefully more persuasively.

Generally though, to counter Hong Kong's high-intensity, all-pervasive, stimuli-saturated environment, I have been advocating for a deceleration in our thinking processes. Jennifer Roberts, a Harvard art history professor, characterises this approach as a productive form of skilled apprehension that can orient us in critical ways to how we think about the world. The Nobel prize-winning behavioural economist Daniel Kahneman describes in his recent magisterial volume *Thinking, fast and slow* two systems of thinking. System one is fast, instinctive, non-statistical, gullible and heuristic. System two in contrast is slow, conscious, statistical, suspicious and deliberate. During the next half hour, I beg of you to indulge me with System two immersive attention. So sit back, relax and feel free to close your eyes but just don't snore!

Rather than preach the applied art and science of public health medicine, my own field, I thought it might be interesting to take a more philosophical tack. I should like to share with you a few reflections on how we, as human beings, think about the world around us. There have always been different ways of conceptualising all things and beings great and small, of getting at the truth or even how we define truth. In short, there are different ways of knowing. Can we, and if so how do we find convergence from these separate ways? This is the central question of my sharing today, which I will call "consilience". As learned members of the medical camaraderie, we call on each of these disparate knowledge domains every day in response to the different types of tasks demanded of us.

Say for example, how do we make a diagnosis of myocardial infarction? Eliciting a history of precordial chest pressure radiating to the left upper arm, accompanied by shortness of breath, against a past history of angina and multiple family members suffering from the same condition, would be highly suggestive. Biochemistry would rely on the ratio of the two isoforms of creatine kinase MB1 and MB2, or troponins I and T. Electrophysiology would be looking for ECG changes such as ST segment elevation in STEMI patients. Your own speciality of radiology would much prefer to visualise the actual coronary stenoses *in vivo* by way of an angiogram. Each discipline-specific, inductive observation points in the direction of the same diagnosis – that of an acute cardiac ischaemic event.

Another clinical example concerns measles. The internist would see Koplik's spots in the buccal mucosa; the virologist a positive RT-PCR; and the immunologist IgG avidity or plaque reduction neutralisation. Any one of these would be pathognomonic for the disease but together they provide triple reassurance and diagnostic confidence.

Or perhaps take the public health example of how we assess the pandemic potential of emerging influenza viruses. The leading journals *Science* and *Nature* simultaneously headlined last week's issues with the US's moratorium on so called "gain-of-function" experiments that attempt to tease out genetic signatures that would make deadly H5 or H7 poultry influenza strains more transmissible between humans. Marc Lipsitch, a Harvard colleague, who has been leading the charge against such experiments have argued that there are other, better ways of addressing that same transmissibility question. They include *in vitro* studies involving single proteins or using replication-incompetent viruses, high-throughput comparative analyses of naturally-viable genetic variants with phenotypes, *in silico* dynamic modelling of the structural biology of the influenza molecule, computational sequence analyses of animal- and human-adapted viruses in GenBank, and so on. He contends that these different means would be safer and more efficient in arriving at the same ends.

Writ large, evolution as a theoretical basis for modern biomedical science is founded on the consilience of many different, albeit equally important and valid branches of enquiry. Paleontology, itself a convergence of geology and biology, lays the groundwork by studying the distribution and characterisation of fossils in time and space during the pre-Holocene age. Phenotypic observation by way of inter-species comparative anatomy and physiology directly informs phylogeny, or how one species evolves into another. Genetics explains phenotypic observations by deciphering the molecular code of life. Molecular biology vis-à-vis the epigenome, transcriptome, proteome, metabolome in complex dynamical interactions with the exposome and the microbiome is already more precisely specifying the individualised basis of disease aetiology.

So, to generalise, one can know by many different ways. In fact one can **only** know through the convergence of different fields. Without the overlapping buttresses of different domains of knowledge, human development becomes all but impossible. All roads lead to Rome, or perhaps more aptly in this day and age, Beijing.

Have you ever wondered why the highest degree of study is a doctor of philosophy or PhD, regardless of the actual field of study? Philosophy literally means "love of wisdom" in Greek – φίλος (*philos*); σοφός (*sophos*). [Quick mental note – the wise minister's first name is "Sophia", *ergo* she is the minister!] Taken broadly *sophos* or wisdom encompasses all fields and domains of knowledge. Implicit in this single umbrella definition is that there is ultimate consilience between the different ways of getting to the truth.

How then should we formally define consilience? The term comes from the post-Enlightenment polymath William Whewell who in 1840 wrote that:

*"The Consilience of Inductions takes place when an Induction, obtained from one class of facts, coincides with an Induction obtained from another different class. Thus Consilience is a test of the truth of the Theory in which it occurs."*

It is the unification of knowledge between the different branches of learning. There is thus convergence of the different ways of knowing towards a common truth as the ultimate destination of the different routes of enquiry. Of course this does not preclude the postmodern notion of relativism, save for a refined understanding of what "a common truth" may mean in different contexts.

More recently two giants in biology and natural history at Harvard, Edward O Wilson and the late Stephen Jay Gould have enriched the discussion on consilience. Wilson, in a 1998 volume entitled *Consilience*, traced the central idea from the "Ionian Enchantment" in 6<sup>th</sup> century BC through Descartes' unification of geometry with algebra in his Cartesian coordinate system, to Newton's unification of the laws of falling objects with those of planetary motion into his eponymous three laws, to Einstein's unification of Brownian motion with atomic theory into the general theory of relativity. Such consilient examples are not restricted to the sciences, starting with the Marquis de Condorcet's application of mathematics in the social sciences to Wilson's own controversial thoughts on the relations between genes and culture.

Gould on the other hand, in his 2003 posthumous treatise *The hedgehog, the fox and the magister's pox* took a serious swipe at Wilson's exclusively deductive-reductivist conceptualisation of consilience where different fields are deemed to need to be merged towards a higher theoretical order. In contrast Gould recalled Whewell's original steadfast defence of independent *magisteria* or fields of enquiry, where consilience should be taken to mean a literal "jumping together" of these differential knowledge domains that would remain standalone ways of knowing. No particular foundation should be hierarchically subsumed under any other. A union of equals in mutual respect should not be mistaken for a blended admixture of knowledge axes. My own humble view is that the two brilliant minds are both correct depending on the contextual level of focus and foundational affinity or philosophical bases between the different ways of knowing.

Ladies and gentlemen,

We have established the idea of consilience as **how** we know. Endowed with the means of knowing, and the wisdom to recognise the necessary convergence of the different ways of knowing, the next step surely demands that we apply these concepts to improving the human condition.

The old Sichuan saying 「不管白貓黑貓，能抓到老鼠就是好貓」 was made famous by the late paramount leader Deng Xiaoping first in a speech entitled 《怎樣恢復農業生產》 at the third general plenum of the Communist Youth League in 1962. Incidentally its roots could be traced to the Qing dynasty as 「黃貓黑貓，得鼠者雄。」. The phrase has generally been taken to mean that one should disregard preconceived notions of what might work, instead go with whatever really works in practice. As such this concept finds echo in the titular analogy of Stephen Jay Gould's *The hedgehog, the fox and the magister's pox*. The ancient Greek poet Archilochus noted that "the fox knows many little things, but the hedgehog knows one big thing". Since then the story of the fox and the hedgehog, or sometimes the cat, has become a fable with many interpretations. The immediate intellectual predecessor to Gould's adoption of the idea was perhaps Isaiah Berlin. In his essay *The hedgehog and the fox*, Berlin tried to categorise thinkers into those who hold on to a single defining idea *versus* those for whom the world cannot be boiled down to a single idea. Leo Tolstoy became a focus of the latter part of the essay in that he could not be so neatly characterised. Gould extended this dichotomous theme to explore the complex relationship between science and the humanities – the two cardinal ways of knowing. There is no right way of going about things, just ways that work regardless.

Let me illustrate these principles by way of an excellent think piece published in *Science* a couple of weeks ago by a global consortium of multidisciplinary scientists, representing a true consilience of different fields of study from biology, climatology, developmental genetics, ecology, entomology and environmental science. Through careful synthesis of the respective mostly separate literatures, these scientists have converged on a unifying organising principle around how evolutionary biology could contribute towards finding answers for the ever escalating anthropogenic impact on planetary health. The authors contend that possible solutions to these challenges to human health, food security and biodiversity can be found in "genetic, developmental, and environmental manipulations across the life sciences that either target the rate and direction of evolution or reduce the mismatch between organisms and human-altered environments." Here is how consilience can be put to productive use in addressing massive global problems.

To take a more familiar topic, on and off over the past decade, I have often wrestled with the question of how cancer care should best be delivered. My professional struggle began, as with many things, from personal experience. My grandmother was diagnosed with and later succumbed to cervical cancer more than ten years ago. My late father's brief but painful battle with gastric cancer during the time I was transitioning into government left a further indelible mark. These two dearest relatives followed in a long line of loved ones in the family who had been afflicted with this modern scourge that remains the number one killer in Hong Kong. Of course my current job requires me to seek and articulate greater clarity on the question across the various hospital teaching departments for which we are responsible. Surely there are myriad ways to achieve optimal cancer care outcomes. In different settings even just locally a diverse range of care models have evolved through time and with changes in technology. Indeed your esteemed College, along with the College of Physicians, train and accredit the bulk of the oncology specialist workforce, albeit not exclusively. Given the rapidly advancing treatment modalities, where is the convergence equilibrium, thus the point of consilience? When attempting an answer, we must take a patient-centred perspective, and only so. What do disciplinary boundaries in true consilience mean in this case? Should Wilson's view prevail, or Gould's or perhaps yet another way? How would Professor Ho Hung Chiu redesign cancer care writ large were he with us today? If his Nam Long model represented an ideal of the past, what is its modern reincarnation? But I suppose a first task might need be finding consilience between the different interpretations of "cancer" as a metaphor we have been hearing so much about in the past week from within our own profession.

On this point, it would be remiss and irresponsible of me not to speak a little of the Occupy or Umbrella conundrum, or whatever name one gives it, that has continued to perplex and vex. At the risk of alienating a significant proportion of you, my fellow practitioners in the art of healing, given the massive shear and stress that have torn Hong Kong at large, and the microcosm of our own medical community, further and further apart, I will brave the challenge. Many of you are students or alumni of HKU, therefore would have received seven open letters from me so far through email. In those missives I have tried to slow down the tempo of thought, so as to encourage readers to reflect on the ongoing conundrum and to give immersive attention to specific issues, at your own deliberative pace. Throughout I have remained steadfastly neutral, not only because I lead an institution that purports to nurture a community of freely enquiring minds, in which diverse views can and should be aired without fear or favour. My purpose has been to allow maximum unfettered scope for each member of our community to think and to find her own voice. Two questions which I have pondered often are: is there more than one way of achieving a good society? How should a good society be defined – by the instrumental features of a western democratic state or simply the desirable ends that such would be expected to produce, or both? Would the hedgehog and the fox, or the black cat/white cat analogies help in forging consilience, and reconciliation in our very divided society?

Distinguished colleagues,

You have indulged me for far too long. I have rambled on and digressed too much. If even the tiniest fraction of the ideas I have tried to put across find the faintest resonance, or provide a seed that might germinate in your mind, my task would have been worthwhile.

Thank you for having given me this privilege, and good evening.