

Language representation in patients with left perinatal stroke and right hemispheric reorganization of language. Functional magnetic resonance imaging shows the activation of regions of the right hemisphere which are contralateral and homotopic to the regions of the language circuit activated in normal controls (group analysis performed on 8 patients and 10 normal controls).

transmission and detection of coincident activity and cortical networks can exploit the precise temporal relationship among the firing of inter-connected neurons, both for signal processing and induction of dynamic synaptic gain changes. Based on these various lines of evidence, as well as the observed correlations between oscillations and attention/memory related processes, a relationship between synaptic plasticity and oscillatory activity is discussed.

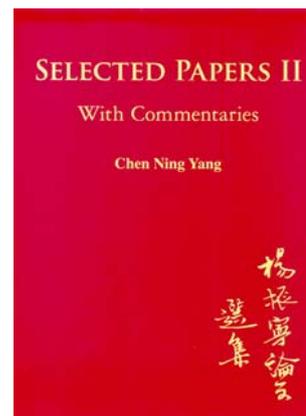
In chapter 21, Rizzolatti *et al.* do not directly deal with issues of cerebral plasticity in the usual sense of its definition; they attempt an evolutionary synthesis to explain the origins of the dual visual stream hypothesis. While the standard model holds that there are essentially two streams of vision – a ventral stream for object perception and a dorsal stream that communicates with different motor effectors, these authors suggest a further bifurcation of the dorsal visual stream. Drawing inference from anatomy, physiology and cognitive neurology, Rizzolatti *et al.* proposed that an evolutionary older dorsal stream that served to link vision with actions in invertebrates and lower vertebrates, needed to be elaborated to deal with more sophisticated actions that involved the manipulation of objects. This requires a specialized module in vision for processing object information, the manipulation of which became part of what they call the ventral–dorsal stream, which they suggest involves the inferior parietal lobule and the ventral premotor cortex. A loss of function in this stream is, thus expected, and consistent with clinical findings of a loss of skilled actions (apraxia), although in humans it is confined to the left hemi-

sphere. In contrast, the evolutionary older dorsal–dorsal stream is suggested to involve regions of the superior parietal lobule and the dorsal premotor cortex, the loss of which is consistent with deficits of reaching (optic ataxia). Despite the attractiveness of this model and impressive fit with data from different domains, a few anomalies remain. For example, according to the authors' own definitions the representation of visual space should be better understood as a function of the dorsal–dorsal stream; nevertheless, spatial neglect is most commonly seen in subjects with lesions in the SPL (a part of the ventral dorsal stream). In addition, this hypothesis does not address the highly asymmetric function of the superior parietal lobule subserving the representation of visual space in the right hemisphere, while representing skilled actions in the left hemisphere.

In summary, the book under review will appeal to the specialist who is interested in a distilled understanding of the field, as well as to the student interested in reading a broad range of reviews on plasticity in one place. For the innocent reader looking to settle the debate on nature versus nurture, this book will, as it should, gladly rid him of the futility of seeking binary answers. For while man proposes dichotomies, nature only disposes of them.

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**Selected Papers II, With Commentaries.** Chen Ning Yang. World Scientific Publishing Co Pte Ltd, 5 Toh Tuck Link, Singapore 5962240. 2013. x + 346 pp. Price: US\$ 98.

The present collection brought out by World Scientific, while being a sequel to the collection brought out in 1983, mainly contains articles published after 1980 by one of the greatest living legends of physics, Chen Ning Yang (also known as Frank Yang), Nobel Laureate in physics in 1957 for his discovery along with Tsung Dao Lee of parity violation in weak interactions. Named after him are the Yang's theorem for the decay of particles of certain spin into given daughters, the Yang–Mills theory, the basis of interactions of the strong and weak interactions which are the generalizations of Maxwell's theory of electromagnetism, the Yang–Baxter equations of integrable systems, the Lee–Yang theorem of statistical mechanics, as well as the Wu–Yang monopole. Mathematical objects associated with the quantum inverse scattering equations have now been named Yangian by the mathematician Vladimir Drinfel'd. So towering is the stature of the author of these papers, that it is a daunting task to try and cover the articles in this selection.

The task, however, is made easier because many of the articles are about the history of science and its personalities, speeches given, views on the nature of science and mathematics, in addition to scientific works of the author during the past little over three decades, along with the commentaries. The striking feature of the collection is that in the articles, the author reaches out to the reader in a gentle and completely welcoming manner, and impresses the reader with

his humility, and indeed what one may call his 'Confucian gentlemanliness' to paraphrase a coin that has been used repeatedly in this work. Yang takes the reader on a tour where the latter meets some of the most influential minds of the last century, which transformed the face of science and of the world.

Born in China to a mathematics professor, Yang went to the United States on a Boxer Fellowship to the University of Chicago. He obtained his Ph D under the supervision of Edward Teller, and later worked as an assistant to Enrico Fermi. Yang became a naturalized citizen of USA, but returned to China in 1971 soon after the Richard Nixon administration sought to restore ties, and in the recent past has moved back permanently to China where he has permanent resident status. Clearly, Yang sees himself a great son of China and in articles in this collection brings out the genius of that civilization. The book has a wonderful collection of photographs, including one where the author is seen with Mao Tse Tung. Yang speaks openly of his pride on the nuclear capability acquired by China in the article on 'Deng Jixian'. In his view, and possibly that shared by many, China had a century of shame and domination, which she needed to overcome.

It may be recalled that while electrodynamics was systematized by James Clerk Maxwell in the 19th century, the key building blocks for the weak as well as strong interactions had to wait until the second half of the 20th century. Indeed, both these come under the ambit of the Yang–Mills theory, discovered by Yang and a student Robert Mills. Central to Yang's considerations are symmetries which make repeated appearances in his work and also in this volume. In a fascinating panel discussion, when asked by Dyson how he chanced upon the Yang–Mills theory, his reply was 'Well, it is a rather straightforward generalization of Maxwell's equation!'

Broadly speaking, the collection may be divided into articles that are of human interest, and those of a scientific nature. The scientific articles themselves may be classified into those that concern features of the Yang–Mills theories and various properties thereof, as well as those that have to do with discrete symmetries, of which parity is one of the familiar examples; most of the rest have to do with statistical mechanics and phase transitions,

which allows one to go from concepts of physics to that of modern differential geometry. Many of these notions enter the articles listed above. Yang tries to find a thematic unity between gauge invariance, the phase factor in quantum mechanics and symmetries.

As stated at the outset, Yang was one of the discoverers of parity violation, a discrete symmetry associated with mirror symmetry. Thus, in his later years, he turns to the subject of discrete symmetries and related physics in the following articles 'Does violation of microscopic time-reversal invariance lead to the possibility of entropy decrease?' (with C. P. Yang) and 'The discrete symmetries  $P$ ,  $T$  and  $C$  symmetry and physics and spin of electrons, hadrons and nuclei' (with T. T. Chou). In the first of the above, Yang attempts to connect microscopic time-reversal invariance to the possibility of negative entropy decrease, which appears to have been an inconclusive attempt.

In the following articles Yang returns to some original problems and also to those inspired by his own early work: Generalization of Strum–Liouville theory to a system of ordinary differential equations with Dirac type spectrum; A one-dimensional  $N$  fermion problem with factorized  $S$  matrix (with C. H. Gu);  $SO(4)$  symmetry in a Hubbard model (with S. C. Zhang); Exact solution of the vibration problem for the carbon-60 molecule (with T. T. Chou); Pseudopotential method and dilute hard 'Sphere' Bose gas in dimensions 2, 4 and 5; Ground state of fermions in 1D trap with delta-function interaction; Spin 1/2 fermions in 1D harmonic trap with repulsive delta function interparticle interaction (with Z.-Q. Ma) and One-dimensional  $w$ -component fermions and bosons with repulsive delta function interaction (with Y. Z. You).

For instance, Speech about the great wall; C. N. Yang discusses physics in People's Republic of China; A de Gaulle-like trip; Modern physics and warm friendship; Reflections on the development of theoretical physics; Father and I; Speech after banquet; Banquet speech, June 2002; Thematic melodies of twentieth century theoretical physics: Quantization, symmetry and phase factor; The Klein–Nishina formula and quantum electrodynamics; Quantum numbers, Chern class, and a Bodhisattva (about the great mathematician S. S. Chern); My experience as a student and researcher; Fermi's beta-decay theory; On reaching ninety, are articles mainly on human aspect, but they are also about physics since they are interminably intertwined in the work of Yang.

Yang is a pioneer both in the study of discrete symmetries and continuous symmetries. The scientific articles in the collection, in which Yang returns to many of the ideas he pioneered during the heydays of his scientific work may be grouped together as: 'Condition of self-duality for  $SU(2)$  gauge fields on Euclidean four-dimensional space', 'Gauge fields, electromagnetism and the Bohm–Aharonov effect', 'Generalization of Dirac's monopole to  $SU(2)$  gauge fields', 'Gauge invariance and interactions' and 'Topology and gauge theory in physics'. Whereas modern mathematics is very much the language of theoretical physicists, it was not the case when Yang and his contemporaries entered the field. Rather, it is due to the work of Yang and other powerful minds, that this language became widespread. In this regard, indeed there is the Yang–Wu dictionary

which allows one to go from concepts of physics to that of modern differential geometry. Many of these notions enter the articles listed above. Yang tries to find a thematic unity between gauge invariance, the phase factor in quantum mechanics and symmetries.

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In the collection which is primarily about the great minds of the 20th century, one may list the articles such as: Einstein and the physics of the future (panel discussion); Joseph Mayer and statistical mechanics; Hermann Weyl's contribution to physics; Square root of minus one, complex phases and Erwin Schrödinger; C. Y. Chao, Pair creation and pair annihilation (with B. A. Li); S. S. Chern and I; Deng Jiaxian; Julian Schwinger; Path crossings with Lars Onsager; Writeup upon hearing of Mills' death; Enrico Fermi; Werner Heisenberg (1901–1976); Albert Einstein: Opportunity

and perception and Banquet speech at the Singapore Conference in Honour of Murray Gell-Mann on his 80th birthday.

Having lived through some of the most turbulent times in history, Yang came in contact with many great men. He is very frank indeed when it comes to assessing other scientists. Of Fermi he says, 'He did not practise one-up-manship. He exemplified, I always believe, the perfect Confucian gentleman.' He also notes about Zhou Guang-Zhou, 'His style of doing physics reminds me of that of Landau, Salam, and of Teller. But in personal relationship Zhou is a perfect Confucian gentleman, without aggressive edges...' On S. S. Chern he says that while Chern considered himself only a *luohan*, '...then Chern's creative extension of differential geometry will relate to a most fundamental structure of the physical universe. Would the future main hall of the temple of mathematics not welcome its new *bodhisattva*?' Yang has remarkable words of kindness for many of his peers. He often describes those he came across as 'brilliant'. The generous nature of Yang is pervasive in the book. His admiration for China and fellow countrymen is also apparent. A couple of stand-alone articles are: Flux quantization, A personal reminiscence and Journey through statistical mechanics.

Yang's quotations from many pieces of literature are also striking. He quotes the verse of Li Shang-Yin and Zhu Zi-Qing.

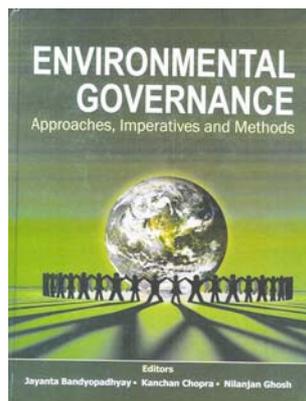
*Given the evening sun is so grand  
Why worry that twilight is close at hand.*

Thus, in conclusion, it is a rare privilege to have been able to review the stupendous collection of a remarkable mind. This book is a must for any scholar and any library of repute.

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**Environmental Governance: Approaches, Imperatives and Methods.** Jayanta Bandyopadhyay, Kanchan Chopra and Nilanjan Ghosh (eds). Bloomsbury Publishing India Pvt Ltd, New Delhi. 2012. x + 386 pp. Price: Rs 1200.

In the contemporary world natural systems are under anthropogenic pressure and there is an urgency to sensitize the society to manage natural resources judiciously to counter the unsustainable trajectory of development (from the human well-being perspective). Environmental governance is emerging as a means of evolving consistent legal, economic and ecological frameworks applicable across global, national and local levels, involving the public and private institutions towards well-informed decision making to preserve the natural environment for the benefit of future generations.

The book under review is a compilation of select papers from the Fifth Biennial Conference of The Indian Society for Ecological Economics on 'Environmental governance'. Being a vast subject with inputs from many fields, the contributions by the authors encompass a variety of areas such as climate change, pollution, ecological economics, judicial activism, forestry and Gandhian principles. The book comprises 17 chapters organized into three sections, namely (a) approaches and challenges, (b) imperatives and instances, and (c) methods and tools.

At the outset, the editors outline the scope of environmental governance along the lines of the triple bottom lines (measures of economic value, social responsibility and environmental care, propounded by John Elkington in 1994). However, in this regard, a broader connotation of governance goes beyond the realms of the government and calls for a

systems approach to understand and tackle complex problems. In the second chapter, Forsyth presents the role of stakeholders in knowledge generation to avoid application of generalized knowledge to local challenges. He propounds an approach of politically oriented epistemology to uncritical positivism. The contradictions and conflict resolution – arising from the relative valuation of stakeholder values to elucidate the priorities in solving environmental problems – are not fully addressed in this account. In the next chapter the dynamics of multi-stakeholder functioning is elaborated with the example of Millennium Ecosystem Assessment (MA). Norgaard juxtaposes the reductionist approach of scientific explanations to environmental questions with the deliberative approach of MA. A case has been made for a broader approach involving quantitative, 'softer' analysis and local knowledge. It is apparent that a rethink on institutional design, away from segmented functions, is called for.

In chapter 4, Desai dwells on two specific scenarios of climate change, viz. moderate temperature rise and catastrophic increase. Each of these entails some imperatives on governance institutions. Considering the predominantly economics-focused analysis of climate change ramifications, the difficulties in bringing about a collective response is highlighted. The author hints at movement towards a cooperative and equitable basis of governance by sovereign states; but the challenge is evident, as the world witnesses prolonged deliberations by governments in arriving at actions for moderating the anthropogenic contributions to global warming. A feasibility analysis for generating as-is energy, by substituting fossil fuels with renewable sources, would have been insightful. In chapter 5 the role of the Intergovernmental Panel on Climate Change (IPCC) in environmental governance is presented by Sundararaman. IPCC only gives information and suggestions to policy makers on the options available to rein in global warming. As the nature of climate change is global, actions to reverse the trend have to adopt a 'think global; act local' approach. Common but differentiated responsibilities (CBDR) dilute the intensity of the global mission by linking development to disaster prevention. An odd comment by the author on empowerment of women appears out of context.