logy to areas of biology and medicine interfacing in psycho-neuroimmunology, and spreading into the area of anthropology and sociology.

The interactions between the 'mind' (cognition and learning) and the 'brain' (biological/physiological), and the role each plays with regards to stress has been debated for decades.

How an agent cognitively processes a particular situation and the manner in which he can bring about the so called 'cognitive restructuring' of the situation may result in changing how the agent behaves in that particular situation, i.e. 'behavior modification', 'biofeedback' which uses 'operant conditioning' to alter involuntary responses. The early work on stress and coping (e.g. Seyle, H., *The Stress of Life*, McGraw-Hill, New York, 1956) was primarily psychological.

Some other studies (e.g. Lazarus, R. S. and Folkman, S., *Stress, Appraisal, and Coping*, Springer, New York, 1984) refer to the level of appraisal (e.g. primary and secondary) that determines the level of stress and the unique coping strategies that the individual is involved in. A level of appraisal is called 'primary' when the agent makes a conscious evaluation of the matter at hand, whether it is a harm, loss, threat or a challenge. The secondary-level appraisal takes place when the agent raises the question 'what can I do?' by evaluating the available coping resources around him, such as physical resources – how healthy one is, or how much energy one has; social resources – family or friends one has to depend on for support in the immediate surroundings; psychological resources – self-esteem and self-efficacy, and also material resources – how much money the agent has.

These theories assume that the body has its distinctive way of coping with stress. Any threat or challenge that an individual perceives in the environment triggers a chain of neuroendocrine events.

M. Frankenhaeuser, *A Psychobiological Framework for Research on Human Stress and Coping* (Plenum, New York, 1986, pp. 101–116) conceptualized these events leading to two separate responses: sympathetic/adrenal response, with the secretion of catecholamines (epinephrine, norepinephrine) and pituitary/adrenal response, with the secretion of corticosteroids. The sympathetic/adrenal response takes the message from the brain to the adrenal medulla via the sympathetic nervous system, which secretes epinephrine and norepinephrine.

According to W. B. Cannon (in his *Bodily Changes in Pain, Hunger, Fear and Rage: An Account of Recent Research into the Function of Emotional Excitement*, 2nd edn, Appleton, New York, 1929), this is the basic 'fight or flight' response, where the heart rate quickens and the blood pressure rises. In the pituitary/adrenal response, the hypothalamus is stimulated and produces the corticotrophin releasing factor to the pituitary gland through the blood veins. Then the adrenal corticotropic hormone is released from the pituitary gland to the adrenal cortex. The adrenal cortex in turn secretes cortisol, a hormone that will report back to the original brain centres together with other body organs to stop the whole cycle. Since cortisol is a potent hormone, its prolonged secretion will lead to health problems such as the breakdown of cardiovascular system, digestive system, musculoskeletal system, and the recently established immune system. Also when the organism does not have a chance for recovery, it will lead to both catecholamine and corisol depletion, and result in the third stage of the general adaptation syndrome of exhaustion.

Understanding how these two approaches (viz. 'mind'/cognition/learning and 'brain'/biological/physiological) integrate is fundamental to developing a new theory in understanding the process of stress and coping. The present reductionist model of stress either emphasizes a purely physiological perspective, where the brain is the sole determinant of the presence of stress, or claims that the mind affects the body and follows a uni-directional path from the mind to stress. A new transactionist model is being suggested which will follow a bi-directional path, where stress and its reduction in turn influence both the brain and the mind. Thus, by way of stress, the brain and the mind both mutually affect one another.

Hariharan and Rath suggest, through their analysis of the Indian experience, new modalities of coping such as the practice of Pranayama, deep breathing, progressive muscular relaxation, etc. although longitudinal studies are crucial and need to be carried out. Once such studies are done, this can develop into a new transactionist model and provide a novel perspective in coping with life stress.

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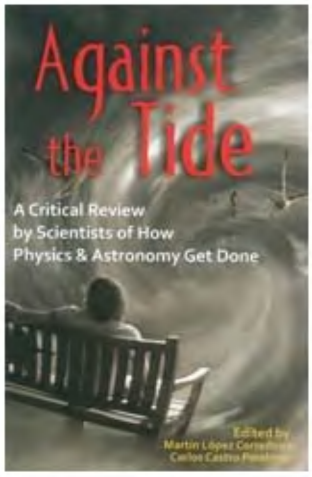

Against the Tide: A Critical Review by Scientists of How Physics and Astronomy Get Done. Martin Lopez Corredoira and Carlos Castro Perelman (eds). Universal Publishers, Boca Raton, Florida, USA. 2008. 265 pp. Price not mentioned.

This book deals with the tension between the scientific establishment of a given time, and scientists with radical or heretical ideas, who work outside the mainstream, and have difficulties in having their ideas accepted or even seriously critiqued. The book is a collection of essays edited by Martin Lopez Corredoira, who is an astrophysicist and philosopher, and Carlos Castro Perelman, a theoretical physicist. The book is available on sale, and can be ordered on the Internet, but is also available in its entirety for free download from http://philsci-archive.pitt.edu/archive/00004046/.

The general theme of the book is that much of the scientific activity at the present time confirms to a set of ideas and paradigms which are unquestionably accepted by the vast majority of practising scientists. Most work is done within this framework, and those who disagree with it find it difficult to survive academically, because they are denied grants, positions, research facilities like observing time on telescopes, invitations to speak at conferences, the opportunity to publish in the best research journals, and even to post their papers on open electronic archives heavily used by the community. These difficulties make it impossible to air radical ideas, or glaring inconsistencies in experimental or observational data, which challenge the very foundations of mainstream science. This suppression of dissent and challenging new ideas, without examining them carefully

for correctness and applicability, prevents progress in human knowledge, and the vast resources expended on science go in vain, merely perpetuating unqualified beliefs and dogmas.

Progress in physics and astronomy mostly happens in a rather sedentary way. New experimental discoveries are made as technology develops, and these are interpreted in the framework of prevalent and accepted theories. Occasionally, theoreticians make assumptions and derive predictions which can be central to a whole theoretical structure, but can only be tested and verified many years after they become generally accepted. An example of current feverish interest in the media is the Higgs boson, which it is hoped will be discovered in the coming years through experiments on the Large Hadron Collidor, vindicating the faith which has been placed in it for about four decades.

The slow but valuable progression in physics is interrupted from time to time by the sudden emergence of completely new ideas. These are motivated by experimental results which simply cannot be interpreted satisfactorily within the existing framework, or by the recognition of basic deficiencies in the theoretical structure, or even some curious combination of these two factors. The special theory of relativity and the quantum theory, which emerged at the beginning of the 20th century, are great examples of such paradigm shifts. Both theories introduced ideas considered to be weird and unphysical at that time, and yet their basic simplicity and beauty, the extravagant generalization of special relativity to successfully include the gravitational field, and the ability of the two theories to correctly predict previously unexpected entities like antiparticles, led to their near universal acceptance. The most distinguished dissenter against the quantum theory famously was one of its creators, Albert Einstein. The example of these two great theories should encourage those who wish to change the thinking of a solidly entrenched scientific establishment. But the great intellectual leaps which are required to bring about the change, and the examples of the many competing theories which have fallen by the wayside, should caution one against believing that every change which is advocated will be warmly embraced, and that it will necessarily lead to progress.

The book under review has essays by a number of astronomers and physicists, some of whom are rather well known in their fields, and a lone chemist. The writings vary widely in scope, style and depth of content. Some address general issues mentioned towards the beginning of this review, while others are more personal, recounting difficulties which the authors have had with the scientific establishment in pursuit of their professions. An excellent summary of the various contributions and general remarks which are later elaborated in the book are provided by the editors in their Foreword.

Among all the personalized accounts in the book, the most compelling is the one by Halton C. Arp, a distinguished astronomer who was for long at the Carnegie Observatory in Pasadena, California. His troubles began when he started finding extragalactic objects, which appeared to be very close together on the sky, but had different redshifts. It has long been observationally established that our universe is expanding, and that all the galaxies are moving away from each other. A consequence is that the wavelengths of emission and absorption features observed in the spectrum of distant galaxies appear to be longer than their laboratory counterparts. The fractional change in wavelength is known as the redshift and it provides a calibration of the distance to the source. Distances measured in this manner are at the basis of our quantitative conception of the universe. Arp has many amazing examples of two or more objects, including galaxies as well as quasars, which are at very small angular separation on the sky, and the objects are sometimes observed to be connected by physical features which can be observed over a wide range of wavelengths. If these objects are physically related, and therefore are at the same distance from us, then the redshift cannot be a universally trustworthy distance indicator, thus undermining the basis of cosmology as it is understood today. Most cosmologists are reluctant to see their cherished models crumble, and have therefore refused to accept Arp's observations. The argument is that the objects with discrepant redshifts are at vastly different distances from one another, but are located along the same line-of-sight approximately, so that they appear to be close to each other when projected onto the sky. Since Arp's observations were not accepted as correct, he was denied access to the 5 m Mt Palomar telescope, which was then the most powerful optical telescope in the world. He had to resign his position, and move to Germany on a fellowship. Arp describes in his article some examples of his discoveries, the indifference and hostility of the establishment, and also makes general comments on the way in which science is done and administered.

One may ask here why cosmologists and astrophysicists are so indifferent to Arp's startling observations. Do they ignore them because they feel it in their bones that these are mere artefacts, and simply not worth spending time on? Or is this a cosmic conspiracy to deny, without specifying objective reasons, the correctness of data which could prove fatal to the standard model? If this is indeed a conspiracy, for how long can it be sustained, without the whole structure crumbling under the weight of contradictions? Could the new ideas which emerged at the very beginning of the 20th century have been similarly suppressed, protecting humanity from the horror of atomic weapons, but at the same time denying it the joy of owning cell-phones? It would have been helpful and interesting if the book had addressed such questions.

Wolfgang Kundt is an astrophysicist who is known for his sharp intelligence and great enthusiasm for the subject, but I found his article rather disappointing. He lists the names of many great and good people he has met over the years, and several people that he has fallen out with, and finally discusses some of his ideas, which he believes have been unfairly neglected by the establishment. These include, for example, his beliefs about the famous Tunguska event in Siberia in 1908, which led to much destruction. It is generally believed that this was due to a visitation from space, either a large meteorite or the core of a comet; even mini black holes have been mentioned in this context. But Kundt believes that the destruction was actually due to a giant outburst of natural gas at the site of an ancient volcano. All the examples that Kundt discusses are, same way, alternative explanations within the usual framework for various phenomena. It is difficult to see how any one of these scenarios being correct or wrong could lead to major upheaval in our world view, or why a general issue should be made of the reluctance of the scientific community to take serious note of them. The same point could be made about T. Van Flandern's unhappiness with astronomers for not accepting his idea of one or more exploded planets being the ex-

planation for several solar-system phenomena. Carlos Perelman (one of the editors) recounts at great length the difficulties that he has had in posting his articles on the open electronic archives, while M. Apostol describes the difficulties encountered by scientists in Romania.

Several articles in the book are of a more general nature, with their common theme being criticism of the establishment for organized neglect of innovative ideas, which go against the prevailing fashion and establishment thinking. It is clear that these problems do exist in science, as in all forms of organized activity, but it is difficult to say what the remedy should be. There are some suggestions made in various essays, and several are listed in a systematic manner like the one by D. Rabounski. Many of these involve measures which may be viewed as impractical by the establishment, like the exhortation that everyone who wishes to do scientific work should have the basic right to publish and be heard in conferences, without the interference of an onerous refereeing system. It is not clear how one would then handle the nearly infinite number of requests for publication and speaking time that would then arise, how one would separate signal from noise in the bedlam, and how the effort would get funded. One suggestion which has been made in the book is that the youngest people in an institution should have the responsibility to generate ideas and problems, since they would have the freshest approach, while their senior colleagues should occupy themselves with the routine calculations and processing, which are normally left to the graduate student.

One could ask whether it would be indeed be practical to set aside sometime at least for non-conventional ideas in every meeting, and some space for them in research publications. But then surely there would be overwhelming demand for making contributions through these channels, and some regulation would be necessary to decide who speaks and who writes, and on what subject, and this would best be done through anonymous refereeing by people chosen from those with non-conventional views. Needless to say, we would then be back to square one.

The book should be read by everyone working in science, to become acquainted with the anguish that some people feel at the way they have been treated by the scientific establishment, and their outrage at being denied the opportunity to publish their ideas and have them criticized or accepted in a normal way. It is possible that readers may find in these thoughts echoes of the dissatisfaction which they may have felt from time to time, even while working within the system. Or better still, some may be prompted to ponder over the injustice they may have meted out to those in their charge.

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The Chennai Snake Park Trust (CSPT) has brought out a slim book for laymen entitled *Snakebite: A Book for India* (July 2008, Occas. Pap. No. 4). The author B. Vijayaraghavan is the Chairman of CSPT. At the very outset, there is a disclaimer that the views expressed in the book are those of the author himself and not of the CSPT.

The book is informative and is composed of 12 chapters dealing with all aspects of this fascinating yet awesome reptile.

In the very first chapter the author explains why he felt the need for writing such a book – he feels that herpetologists who have a professional interest in the study of snakes, do not know enough. What a vast majority of us know about snakes is usually a bundle of unfounded beliefs inculcated from childhood and handed down from generation to generation as 'received wisdom', myths, superstitions, folklore, grandma's tales and so on.

Snakes have from the earliest times of the human race, evoked a profound sense of wonder bordering on reverence and unspeakable fear in us. Their habit of silently appearing in unexpected places and disappearing equally suddenly; their ability to move at great speed despite being limbless; their unblinking hypnotic stare; their forked tongue darting back and forth menacingly; their ability to hear in spite of having no earholes; the capacity of some snakes like the python to swallow whole animals larger than themselves; their habit of shedding skin periodically and emerging to a new life, as it were, every time; their presence in all types of terrain on earth and in all kinds of climates; their ability to go without food for months on end; their 'psychosexual' body imagery – all have been a source of wonder, bewilderment and awe. And more than anything else, fear! Irrespective of age, it is a very rare person who does not shudder at the word 'snake'. The paradox about snakes appears to lie in the way people perceive them. On the one hand, they invoke fear and hatred and on the other, they are worshipped across the world and held in awe and respect. No other reptile combines so much within it. No other animal can lay claim to such appealing contrariness.

A substantial number of deaths and long-lasting complications or life-long disabilities caused by snakebite could be avoided by some knowledge of the precautions against snakebite and its proper mode of treatment. Even though snakebite has been viewed with the greatest dread from the time our earliest hominid ancestors reared up on their hindlegs more than five and a half million years ago, we do not to this day, have a decidedly safe and totally reliable protocol for treatment of snakebite. Preacautions against snakebite and first aid are discussed exhaustively in an exclusive chapter in this book.

Other chapters deal with various topics. One defends the snake and states that it is not an enemy of humans. 'Kill the snake!': this very much sums up the ordinary person's reaction when a snake crosses his or her path. Other chapters are on the principal venomous snakes of India and how to recognize them, an annexure for a rough identification of the major kinds of venomous and non-venomous snakes of India, and a checklist of the poisonous snakes of India, including an erratum to it. An entire chapter is devoted to snake venom and venom apparatus, symptoms of snakebite, traditional cures for snakebite and antivenin. The final chapter is for the attention of the authorities and targeted audience in the government and outside.

This book priced reasonably at Rs 65 has 96 pages and includes a reference list of other books that herpetologists might want to refer.

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