

The Newsletter of THE AMERICAN INSTITUTE OF STRESS

Number 6, 1988

Caveats about Stress And Lowered Immunity

A variety of studies have demonstrated an association between stressful life events, depression and lowered immune responsiveness as well as increased morbidity and mortality. A number of zealous mind-body enthusiasts have seized upon this as hard evidence to support the hypothesis that stress can cause cancer as well as a variety of viral link disorders by lowering immune defenses. A landmark study in this area which is often cited is a report from Mount Sinai Hospital in New York demonstrating an increase in morbidity and mortality among older men following the loss of their wife. Concomitant with this was the finding that bereaved men showed lower immune responses to several types of lymphocyte stimulation after their wives' deaths when compared to results obtained several months earlier. In a recent presentation, however, the senior investigator involved in that research cautioned against jumping to conclusions that may be attractive but are not supported by hard facts. Measuring lymphocyte responses to stimulation during periods of stress is only one indication of immune system reactivity and its relationship to overall immune system function and health in general is still not clear. Factors such as coping ability and availability of social support systems

may be equally or more important. One California research study suggests that stressful events have less of an adverse effect than poorer coping styles as assessed by the degree of resultant depression. Individual differences in responses to life events and severity of depression were correlated with immune system function in women who were undergoing medical treatment, had recently died or were in good health. Immune function was also compared in wives before and after the deaths of their husbands. Both studies revealed that the severity of life change events had less effect on immune function than the intensity of the depression itself. Thus, how the individual was able to cope with stress, rather than the magnitude of stress was the important factor. The researchers believe that corticotropin-releasing factor (CRF) may play an essential role in this process. They had previously found a significant suppression of natural killer activity in men who were clinically depressed. They also discovered that they could reproduce this effect on killer cell activity by injecting CRF into the brain's lateral ventricles. It is postulated that naturally occurring CRF may be involved in the central regulation of immune function. Responsiveness to cortisol and CRF activity have also been used to diagnose and differentiate different types of depression. It is quite likely that other brain neurotransmitters and hormones are also involved because many have important effects on emotions, immune system function and responses to stress. While it is always tempting to link associated findings into cause-effect relationships, the conclusion that conjugal bereavement produces decreased immunity which, in turn, is responsible for increased mortality and morbidity may be premature.

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For further information on the original source of abstracts and other reprints available on similar subjects, please send a self-addressed stamped envelope to: Reprint Division, American Institute of Stress, 124 Park Avenue, Yonkers, NY 10703.

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The Newsletter of
**THE AMERICAN INSTITUTE OF
 STRESS**

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Female Hormones and Stress

Some preliminary studies suggest that metabolites of the female hormone, progesterone, may have tranquilizing effects. Researchers suggest that metabolites or by-products of progesterone act on receptor sites in the brain that control stress responses and influence excitability. Progesterone levels increase during the second half of the menstrual cycle but drop precipitously just before the onset of menses. Too much of a drop might decrease the amount of progesterone by-products resulting in increased anxiety and stress levels. The effect of stress on the female menstrual cycle is well recognized. Lowered levels of progesterone may be responsible for symptoms of anxiety and stress associated with the premenstrual syndrome. The researchers suggest that eventually it may be possible to develop drugs which might mimic the action of progesterone metabolites and relieve symptoms of anxiety associated with the premenstrual syndrome.

Menstrual Phase Affects Blood Pressure Changes During Mental Stress

There has been considerable research recently into biological and psychological factors which may influence cardiac hyperreactivity. Type A indi-

viduals, and those with a family history of hypertension, appear to show a positive correlation but most of these studies have been done in males. Females often exhibit marked irritability, anxiety, depression, and other stressful behaviors in the premenstrual period and in some, salt and water retention might contribute to an elevated blood pressure. While earlier studies showed no change in blood pressure or heart rate response to the cold pressor test during different phases of menstrual cycle, some reports suggested that mental stress produced greater changes during the second half or luteal phase. In a recent report close to 50 normotensive young adult women, with and without a parental history of hypertension, were tested during either the follicular (days 7 to 11 of 28-day cycle) or luteal (days 17 to 22) phase of the menstrual cycle. Measurements of affective states were determined by well accepted rating scales and blood pressure and heart rate were measured while the subjects were subjected to two experimental tasks designed to induce mental stress. The results were surprising in that they demonstrated that systolic blood pressure tended to rise more in the follicular phase of the menstrual cycle and that there was no apparent difference in patients with or without a family history of hypertension. Although hormone levels were not studied, the researchers postulate that increased amounts of progesterone during the luteal phase may somehow decrease vascular responsiveness to behavioral stimuli. This is supported by other studies which show that the administration of progesterone reduces vascular hyperreactivity in ovariectomized women and that metabolites of progesterone may have a tranquilizing effect (see above). Another surprising finding was that self report of emotional arousal or stress did not correlate with demonstrable increased cardiovascular responsiveness. In addition, those patients with a family history of hypertension tended to report reduced anger during mental stress. Since a number of researchers have suggested that hypertensive individuals tend to suppress hostility, it is suggested that this characteristic may be present even among normotensive young adults who may be at genetic risk for hypertension.

"Perhaps the most valuable result of all education is the ability to make yourself do the thing you have to do, when it ought to be done, whether you like it or not; it is the first lesson that ought to be learned, and however early a man's training begins, it is probably the last lesson that he learns thoroughly."

— Thomas Huxley

More Links between Stress Immune System, and Endocrine Function

Receptors in the brain for neurotransmitters and hormones are being discovered on almost a weekly basis. Now, researchers are reporting that similar receptors can be found throughout the body including the gut, peripheral lymphocytes, and spleen. Two of these, the sigma and PCP receptors have powerful effects on mood and can even produce hallucinations, suggesting that they may play some role in causing mental disorders, as well as changes in mood and immune system function. Other research indicates that there are also brain receptor sites for adrenal and gonadal hormones which may explain such phenomena as cortisone psychosis, and the effects of male and female hormones on mood and behavior. In short, the old adage about "venting one's spleen" or having "gut feelings" may have some scientific underpinnings. The question now is whether specific substances exist or can be created which will selectively improve both mood and immune function.

"Be a good listener cause you never learn much from talking."
— Will Rogers

Stress Induced Ischemia and Autonomic Activation

A variety of recent reports have demonstrated that emotional stress can cause severe and often asymptomatic ischemia in patients with coronary artery disease. Even simple mental arousal can produce significant alterations in some patients according to one report. Patients with stable angina off of medication were studied during cardiac catheterization. The mental stress was produced in the form of challenging mental arithmetic for 2½ minutes of serial subtraction. Half the patients developed transient ischemia during this task with a 50% increase in myocardial oxygen demand and a 40% rise in pulmonary capillary wedge pressure. Angiography revealed a dramatic constriction of all the diseased segments of the coronary arteries, especially at the sites of severe stenosis. These changes appeared to be due to increased activation

of the autonomic nervous system. It was suggested that coronary artery disease patients at risk should have ambulatory ECG monitoring to determine the extent and frequency of such reactions during daily stressful activities. Those at high risk might presumably benefit from beta blockade.

Bowel, Brain, Immune System Interactions

Investigators have previously demonstrated the presence of a number of brain neurotransmitters which influence mood and immune system function on receptor sites in the gut, and several such chemicals are also manufactured in the gastrointestinal tract. The significance of this is not clear but strengthens anecdotal observations of relationships between stress, emotions, and various gastrointestinal disorders. Recently, scientists have discovered that people with chronic inflammatory bowel disease such as ulcerative colitis have high numbers of receptors for Substance P in their intestinal walls. Substance P is a neurotransmitter which is released by peripheral neurons sending pain signals to the brain. This in turn results in a cascade of responses that help to regulate immune responses in injured tissues. However, in patients with inflammatory bowel disease, up to 2,000 times the normal bowel density of Substance P receptors have been noted with a somewhat irregular distribution. It is postulated that when a bacteria or a virus in the intestinal tract interacts with these sensory neurons, there is an excess release of Substance P into the tissues resulting in an exaggerated pain signal to the brain which in turn leads to an overactive immune response to reduce inflammation setting off a vicious cycle. "Normally Substance P receptors are just expressed on muscle tissue in the intestine. In tissue from chronically inflamed bowels, we found the receptors on blood vessels and immune cells too." It is also suggested that some cases of asthma and arthritis may be triggered by excess Substance P receptors in the lungs and joints. Investigators are now hoping to be able to treat such disorders by finding a molecule that can block the Substance P receptor and interrupt this exaggerated inflammatory response.

Exhilarating High Stress Jobs and Heart Attacks

The usual portrait of stress-induced cardiac death is that "of an anxious, withdrawn individual who feels trapped by heavy job demands." However, a study of stress-induced cardiac deaths in the San Francisco area, suggests that in many instances the prime candidate is an eager ambitious worker who outwardly appears to thrive on meeting difficult deadlines and the challenge of accomplishing several tasks simultaneously. Many of these individuals view their stressful occupations as exciting and fulfilling and have no wish to alter their pressure-filled work schedules. A retrospective analysis of those who suffered sudden cardiac death believed to be related to job stress revealed a predominance of two Type A traits: a "rush" response to almost any stimulus and impatience and hostility over any delay in reaching their goal. Such individuals are quite likely at risk for sudden death due to the release of large amounts of adrenalin which can trigger ventricular fibrillation, particularly in those with underlying heart disease. A similar "pure catecholamine" death can also be seen in marathon runners who exceed their limits of exertion in order to reach the finish line.

Landmark \$1.4 Million Reward for Stress in Divorce Case

For the first time a spouse has been awarded civil damages for pain and suffering in a divorce action. In the past, widespread so-called interspousal tort immunity laws prohibited civil suits between husband and wife, but these have been disappearing. While the laws do permit suits for property damage and alimony, charges such as physical abuse were always handled as separate criminal matters. Over the past two decades, divorce reform law has tended to eliminate the concept of fault in which blame for cruelty or adultery isn't assigned to either spouse. In this instance, the plaintiff charged that her 44-year-old husband, who was an alcoholic, subjected her to physical and verbal abuse, which was documented in secret tape recordings. She broke down completely when she visited her husband's office one evening and found him sprawled nude with a former company secretary. She was unable to recover from the severe emotional trauma of this incident, despite psychiatric treatment. Lawyers are concerned that this decision, which is being appealed, may start an avalanche of similar

litigation which will clog the courts. Although statutes vary in each state, it is generally felt that denying spouses the right to seek civil damages from each other implies that a married person has a "different standard of rights from someone that isn't married." Illinois, the last state to have such prohibitions, got rid of this statute this year. On the other hand, there are a lot of barriers such as the need to marshal conclusive evidence to support such charges. In addition, there are almost prohibitive legal fees, which in this case amounted to a total of almost \$500,000 for the two parties. The plaintiff, in addition to taping conversations, kept extensive diaries and held on to such things as lipstick-stained cigarette butts. In addition to establishing unequivocal evidence of guilt, it is also necessary to conclusively prove adverse consequences such as "physical pain, mental anguish, sleepless nights, depression, humiliation, nausea" and the other claims presented in this particular Texas suit. Although the landmark verdict may influence attitudes elsewhere, the legal climate in Texas may have been a factor. Texas is the only state that prohibits personal alimony. In addition, as one authority noted "jury trials are available here even for traffic tickets, and the state's reputation for gigantic jury awards is legend."

"The poet is the only true doctor, offering perhaps not bodily cure, but something equally important, moment(s) of revelation." Ralph Waldo Emerson

Stress and Dermatitis

Forty-four children with severe atopic dermatitis and their families completed questionnaires measuring life events, chronic daily stresses, and family environment support. The severity of their illness was assessed by a medical evaluation of the amount of body surface affected, medication usage, scratching intensity, and course of symptoms over time. Evaluation of the data indicated that both the degree of stress and factors related to family environment were powerful predictors of symptom severity. These findings persisted even when such factors as age, allergic predisposition as assessed by serum IgE and medical status were controlled. Atopic dermatitis may be a severe, disabling condition that is relatively resistant to treatment. It has long been recognized that emotional factors may have profound effects on skin resulting in hives, rashes, or the exacerbation of conditions such as psoriasis. The results of this study have important implications for health care professionals working with children suffering from atopic dermatitis.

Stress and The Pucker Factor

According to a well known New York Times columnist, "the pucker factor" is armed services' slang for the "stress that afflicts human beings on full alert. Low "pucker factor" persons react like robots, numb to sensitizing tension. If the factor is too high, the person crumbles or 'puckers' in panic." A recent example of the importance of "the pucker factor" occurred when the captain of the U.S. cruiser Vincennes made the decision to shoot down an unidentified aircraft which he believed was about to attack. According to the article, some second-guessers feel that he should have waited until "the suspected attacker turned on its firing radar, and then gambled on being able to hit the plane in the seconds before its missile was launched. Others say that if he went by the book, the captain should have fired minutes before the aircraft became such a direct presumed threat."

What could have been racing through the captain's mind, knowing that every ten seconds brought the unknown aircraft a mile closer as it ignored repeated warnings and sent conflicting signals? After all, only one year previously, the frigate Stark in the same waters was attacked and 37 American sailors were killed and the captain dismissed. It's relatively easy to make hindsight judgments when the pros and cons can be carefully and leisurely weighed. However, that is a lot different from having to make a split second life or death decision based on imperfect information. The President's "pucker factor" would be extremely important if faced with the prospect of approaching missiles. As the article emphasized, he may have only a few minutes to "evaluate their source and targets, determine whether they were fired accidentally or by design, and decide whether to launch our retaliatory missiles before the incoming missiles wipe them out." The article concluded that "in selecting our leader, we must consider experience, forethought and the 'pucker factor' " since the next President must remember both the Vincennes and the Stark and their consequences.

Touching Reduces Stress and Improves Memory

While longevity and aging are undoubtedly controlled by genetic factors, there is considerable evidence that stress accelerates the aging process. In addition, people who are able to manage stress

better seem to age at a slower rate. This appears to be confirmed by laboratory research demonstrating that adult rats with a better physiologic response to stress do not suffer as much from the characteristic memory loss that occurs with aging. The researchers also found that animals that were handled in infancy exhibited superior resistance to stress years later. This may be mediated by changes in the hippocampus, a portion of the brain which is crucial for both stress response and memory. When animals are subjected to the severe stress of extreme cold, shock, or infection, the adrenal cortex responds by secreting large amounts of cortisone-like hormones. These chemicals cause many cells, including those in the hippocampus, to decrease their absorption of sugar from the blood so that it can be more available for use by crucial organs such as the heart and liver. Cortisone receptors inside the hippocampus cells are thought to regulate the release of these stress hormones, but with aging, the number of receptor sites decrease, interfering with the efficiency of this finely tuned response. The researchers found that adult rats who had been handled for a few minutes a day during the first weeks of life tended to retain more of these cortisone receptors and also had better memories. Elderly (two-year-old) nonhandled animals took three times as long as those six months old in performing a memory task. However, two-year-old rats that had been handled were just as quick as their younger counterparts. Whether such findings apply to humans is not clear, although there is some evidence that a lack of touching and fondling in infancy interferes with growth, maturation, and possibly response to stress. Researchers are also investigating whether there is some connection with the ability to deal with stress and memory impairment in later life that could be related to overproduction of stress hormones. Studies are now underway in a group of 40-60-year-olds who received long term high doses of cortisone-like drugs for arthritis or asthma. Those findings may help to answer the question as to whether stress, in addition to speeding up aging, also interferes with memory and similar mental processes.

"I have yet to see any problem, however complicated, which, when you looked at it the right way, did not become still more complicated."

Paul Anderson

Stress and the Chemistry Of the Runner's High

Many runners report that their exercise produces a feeling of well being and relaxation. The "runner's high" is a feeling of euphoria and is more apt to occur after an intense marathon-type workout of 15 miles or more, but has also been reported after prolonged vigorous aerobic-dance activities. It's well known that intense exercise puts stress on the body sufficient to cause increased levels of the brain hormone corticotrophin-releasing factor or CRF. This, in turn, causes the release and breakdown of a molecule that contains beta endorphin, a neurotransmitter which produces effects similar to opium and heroin. Beta endorphin also has pain-killing properties which may explain why many runners can continue their activities despite severe injuries or even broken bones. Others believe that the primary effect comes from increased amounts of cortisol that are produced in the adrenal cortex in response to corticotropin stimulation. Animal studies confirm an increased level of a variety of chemicals in the brain after exposure to stress, but it is not possible to perform comparable experiments in humans. One way to investigate the problem would be to determine whether the administration of naloxone, a drug which blocks the action of endorphins, also blocks the development of euphoria and the "runner's high." However, such a study would be prohibitively expensive because of the need for double-blinding, review by an ethics committee, and problems in recruiting and screening appropriate subjects. Not all scientists subscribe to the endorphin hypothesis and it is likely that still other, yet undiscovered, brain chemicals may play an important role in this intriguing phenomenon.

"The power and the beauty of science do not rest upon infallibility, which it has not, but on corrigibility, without which it is nothing."

Howard E. Grober

Mental Stress and Forearm Blood Flow in Children Of Hypertensives

An increased flow of blood to the muscles of the extremities is one of the characteristic responses to acute life-threatening stress. Such automatic responses could be useful or even life-saving for

primitive man confronted by a ferocious assailant because of improving chances for life-saving "fight or flight." An increase in blood pressure and heart rate would also provide certain benefits in similar situations. However, the nature of stress for modern man is more apt to be mental or emotional than physical. These responses are now not only no longer useful but their repeated activation may contribute to a variety of disturbing symptoms and illness syndromes. In one recent study, 12 adolescents with a family history of hypertension were compared with 13 controls while exposed to a stressful mental arithmetic challenge. Changes in forearm blood flow, forearm vascular resistance, pressure, and heart rate were compared. There was no significant difference in any of these measurements between the two groups in the resting state. However, during mental stress, children with a family history of hypertension had a significantly greater increase in forearm blood flow than those with normotensive parents. Blood pressure and heart rate responses were not significantly different between the groups although those with a family history of hypertension showed a trend towards reduced forearm vascular resistance. Cardiovascular changes showed no difference in prolongation of effect or pattern of recovery between the two groups. Thus, despite similar increases in blood pressure, regional blood flow responses during mental stress appear to be different in adolescents with and without a family history of hypertension. The significance of these findings and their relationship to the future development of hypertension remains to be seen.

Self-Reported Stress Less in Hypertensives

Almost 1,500 San Francisco bus drivers were studied from 1983 to 1985 as part of an occupational health study. A stressor index was constructed based on a survey appraisal of work-related problems. The results were surprising in that they showed an inverse relationship between self-reported stress and hypertension. In contrast, highly significant positive associations were found between the stressor index and gastrointestinal, respiratory, and musculoskeletal problems. One possible conclusion from the study is that hypertensive individuals may have a strong sense of denial and that their subjective appraisal is an invalid measure of otherwise objectively, verifiable stressors.

Are Schools Causing Tense Tots?

"Some Schools Press So Hard Kids Become Stressed and Fearful" was the title of a recent Wall Street Journal article. In kindergartens, playtime is increasingly being replaced by reading, arithmetic, and computers. It's even possible to flunk kindergarten in Minneapolis and Georgia and many pediatricians and psychologists are concerned about an associated increase in stress-related problems in children. Fast-paced competition has been blamed for symptoms of "burnout" in kids as young as age 10 or 11. Factors contributing to this trend are an increased reliance on day care centers by working mothers which emphasize so-called "enrichment programs." As one nursery head noted, "We have a lot of parents wanting us to be teaching reading to two- and three-year-olds . . . they say, 'we're not paying \$2,000 for play. We want to see product.'" Textbook publishers also see preschoolers as a growth market, pointing out the accomplishments of the Japanese in this regard. There has been some backlash and, in Chicago, one institute has created a business out of teaching parents and children how to play again. The National Association for the Education of Young Children has called for an end to kindergarten admission tests and indeed any standardized testing before the third grade. Some parents are even keeping their kids out of kindergarten an extra year to keep them in play-oriented nurseries. One of the hotbeds of controversy is the growing use of a preschool readiness test developed by the Gesell Institute for Human Development which is used by almost 20% of the nation's school districts. Orders for Gesell test materials jumped 67% between 1984 and 1987 despite a federally commissioned study and several test reviewers who feel it is unreliable. In one New York school last year, almost two out of every three prospective kindergarten applicants were judged not to be ready and assigned to developmental kindergarten. Parents of one child filed a complaint with the state department of education and the school capitulated and agreed to put her in the regular kindergarten. Despite a widespread belief to the contrary, there is no good evidence that delayed entry to school results in better scholastic performance down the line. The move towards "let kids be kids" seems to be growing and parents are urging "blocks not books . . . more song and less software."

"The great tragedy of science—the slaying of a beautiful hypothesis by an ugly fact."

— Thomas Huxley

Identifying Stress Buffers

A considerable body of evidence exists confirming the relationship between life stress events and subsequent illness. Some individuals, however, do not seem to be as susceptible to the adverse health effect of stress, presumably because of the presence or development of adequate stress buffers. Such buffers might include a strong sense of personal control over one's activities, a good social support system, physical fitness, sense of humor, an optimistic attitude, high self esteem, avoidance coping techniques, etc. A recent study designed to explore such relationships was undertaken in 650 men and women with a mean age of 40 primarily employed in skilled, professional, or technical positions. Some 22 variables were evaluated to determine the relative value of each as a stress buffer. Seven strong and seven moderate buffers were identified and there were some differences that appear to be sex related. The four strongest buffers seemed to be: sense of competence, exercise pattern, sense of purpose, and leisure activity. Research in this area is complicated by obvious complex methodological procedures. The study suggested that an easy-going nature and avoidance-coping are primarily characteristics of stress resistance in males, whereas female stress-resistant groups were more apt to be typified by an easy-going attitude plus a strong family support. Prior studies of the "hardy" or stress-resistant personality revealed that the three major components were a strong sense of commitment and control of activities and enjoying challenges that might threaten others. However, one of the basic difficulties in evaluating all these reports is continued controversy over whether the adverse life event scale approach represents an adequate measure of stress.

First International Montreux Congress on Stress

11-30 - 12-2, 1988 — Montreux, Switzerland

State of the art presentations on the role of stress in cardiovascular disease, immune system dysfunction, stress reduction techniques, social support systems as stress buffers, non-drug treatment of hypertension based on stress reduction, role of personality and attitude in mediation of stress-related illness, electromagnetic influences on behavior and stress-related symptoms and much more. Leading authorities from the U.S. and Europe. Attendance limited. Unusual opportunity for faculty-audience interaction and informal discussion, and to combine business with a pleasure trip and Christmas shopping abroad. For further information write to Conference Director, The American Institute of Stress, 124 Park Ave., Yonkers, NY 10703 or call 1-800-24RELAX; (914) 963-1200 in N.Y.).

Book Reviews • Meetings and Items of Interest

Book Reviews

Stress and Breast Cancer, Cooper, C.L. (ed). Chichester, John Wiley & Sons, 1988, 219 pages, \$44.95.

This is a timely book that vividly illustrates the growing multidisciplinary interest in psychosocial aspects of cancer. Chapters are devoted to the role of stress and psychological factors that may contribute to the development of breast cancer, influence its clinical course and which should be considered as part of the therapeutic approach. It is suggested that suppression of anger, a passive, acquiescent attitude, and loss of important emotional relationships may predispose to the development of breast cancer. Similarly, an aggressive, fighting or "bitchy" spirit seems to improve prognosis. As noted in one of the frequently cited references, demographic studies reveal that breast cancer occurs more often in women who are single, widowed, or divorced as compared to married controls. Those who have higher educations and better socioeconomic status are also at greater risk. It was surprising, therefore, that neither the editor, who has published extensively on the subject of job stress, or any of the authors dealt with this possible connection. It is known that the older a woman is when she has her first child, the greater the risk of developing breast cancer. Working women tend to marry later in life, have their children at comparatively older ages, or do not marry or get pregnant at all. Many are also exposed to harassment, discrimination, and other environmental stresses that may depress immune system defenses against malignancy. The notion that malignant growth can be influenced by the way we think or feel has great popular appeal and even some scientific support. However, there is a great danger in going overboard. Nothing could be crueler than suggesting to cancer patients, many of whom are already guilt ridden, that their problem is self-generated, or that failure to respond to treatment is due to some deficiency of character. While not specifically stated, this important admonition is at least implied by various authors who objectively evaluate research reports that less discerning advocates accept as dogma. This book is highly recommended for all who are interested in the psychosocial aspects of cancer, and breast malignancy in particular. As in many multiauthored publications, especially in a fairly specific area such as this, there is considerable overlapping and reduplication but this is not a significant detraction.

The Encyclopedia of Neuroscience, Adelman, G. (ed.) Birkhauser Boston Inc., Massachusetts, 1987, 1,308 pages, 239 figures, \$150.

This two-volume set is long overdue. As noted in the Foreward, "An encyclopedia is generally considered to be a comprehensive work made up of systematically arranged articles broadly covering the whole range of knowledge available in one particular field." The discipline of neuroscience has exploded in the past two decades. It now covers so many diverse interrelated fields that there is a strong need for an integrative reference source

that could guide researchers through strange specialties which have now suddenly become important. The Scientific Advisory Board reads like a Who's Who of luminaries in basic research, as well as clinical practice and it is equally obvious that the authors of selected topics have been chosen with special care. The range of subject matter covered is mind boggling and the presentations are succinct but comprehensive and well referenced for those who wish to pursue specific items further. The art work and figures are of high quality and the appendices are replete with additional helpful, diagrammatic and background information obviating the need for a trip to the library to consult other reference resources. Space limitations preclude any attempt to give the reader any feeling of the breadth and, at the same time, detail of the various subjects discussed. These two volumes present state-of-the-art commentaries on every aspect of neuroscience that one might wish to investigate. This is a splendid achievement and well worth the price whether one's interest lies in the brain control of internal behavior or the mauthner cell of fishes. Indeed, it is hard to turn the pages without being attracted by the title of the next selection and an urge to read its contents before doing anything else. The article on the neurochemistry of stress is typical in terms of its comprehensiveness, conciseness, accuracy, and being on the cutting edge. This is an extremely valuable offering that is not likely to be equaled much less superseded for many years and is highly recommended.

Meetings and Items of Interest

Aug. 30-Sept. 3, Third International Interdisciplinary Conference on Stress Management, University of Edinburgh, Scotland.

Sept. 14-15, Endocrine Function and Aging, annual symposium. Contact Symposium Secretary, VA Medical Center, GRECC (111G-JB). St. Louis 63125.

Sept. 16-17, Pain Issues, Hyatt Regency Ravinia, Atlanta, GA. Contact Harry M. Binkow, Postgraduate Registrar, 1440 Clifton Rd., N.E., 104 WHSCAB, Atlanta, GA 30322.

Sept. 29-30, Stress and the Heart: Risks and Recovery, Atlanta, GA. Contact Henry M. Binkow, CME Registration Manager, Emory University School of Medicine, 1440 Clifton Rd., N.E., 108 WSHCAB, Atlanta, GA. 30322.

Oct. 13-15, Psychobiology of Human Eating Disorders, New York, NY, New York Academy of Sciences, (212) 838-0230.

Nov. 17-20, 35th Annual Meeting of the Academy of Psychosomatic Medicine. New Orleans, LA. (312) 784-2025.

Nov. 30-Dec. 4, First International Congress on Stress, Montreux, Switzerland. Contact American Institute of Stress, 1-800-24 RELAX in NY (914) 963-1200.

Jan. 8-12, 1989, Fourth International Conference on Psychological Stress and Adjustment in Time of War and Peace. Tel Aviv, Israel. Sponsored by the Society for Traumatic Stress Studies. Contact The Secretariat, P.O. B. 50006, Tel Aviv 61500, Israel. Tel. (03) 654571.

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