## Table of Contents

President's Column 12

*Obituary: Eugene Aserinsky, Ph.D.* 13

Editor's Column 15

**Letters to the Editor**
- SRS Recruits New Members 15
- SRS Should Split From the ASDA 15
- WFSRS Call for Proposals 17
- WFSRS Third International Congress 17

Useful URLs 18

**Student BITS**
- Do Today's Trainees Have a Future in Sleep? 19

The NEW SRS Training and Education Program:
- Fostering the Career Development of SRS Trainees 21

**SRS Essay Award Program Winners**
- "Death and Taxes are not the only certainties of life; sleep must be included as well..." 24
- The Effect of Sleep Deprivation in the Modern World 26
- Exercise and Adolescent Sleep 27
- Power Naps: A Solution for Teenage Grogginess? 28
- Teenagers and Sleep 30
President’s Column

I would like to take this opportunity to communicate to SRS members who were unable to attend the annual business meeting at the 1998 APSS meeting in New Orleans the highlights of my President’s report. My goals for the society have been to democratize society decision making, to expand participation of membership in the society’s business, and to plan for the future by proactively addressing the society’s needs. As to future planning, the Vision 2020 Task Force held a series of meetings in the spring and presented an interim report to the business meeting. A Financial Planning Task Force has also been formed and will begin its function this fall. The charge to this task force is to establish an annual budget process for the society, to assess the future financial needs of the society, to project the future income of the society and explore additional revenue sources, and to establish a stable funding basis for the training of future sleep scientists. Future planning is critical to the long-term health and viability of our society. The training activities of the SRS have been organized and expanded extensively by the Trainee Chair. Early this fall you will receive (or have already received) two requests, the first an invitation to nominate persons for open positions on the Executive Committee. The offices open for 1999 are the four Section Heads, President Elect, and Secretary/Treasurer. Two persons will be offered for each position on the ballot. The second item will be a request for a bylaw revision, which is to change the term of office from January to January to an annual meeting to annual meeting term (or July if the meeting occurs later). This is to facilitate transfer of duties between outgoing and incoming officers. To facilitate wider membership participation in the society’s business a number of committees and task forces have been established, for example the two mentioned above. We must establish and maintain a strong, active society that is fostering communication and training in sleep science (the two primary objectives of the SRS) and that is prepared for the challenges of the year 2000 and beyond. I believe we are making positive steps to reach these goals.

Tim Roehrs
The sleep research community lost one of its early pioneers when Dr. Eugene Aserinsky was tragically killed in an automobile accident in Carlsbad, California on July 22. Dr. Aserinsky was buried with full military honors at Eternal Hills Memorial Park in Oceanside, California. He was 77.

Dr. Aserinsky was born in New York City in 1921, and after attending Brooklyn College, the University of Maryland, and Baltimore College he earned his doctorate at the University of Chicago in 1953. From 1942 to 1943, Dr. Aserinsky while attending college did social work for the Department of Public Welfare in Baltimore. He was stationed in England from 1943 to 1945, where he served as a high-explosives handler for the Office of Strategic Services. After World War II, he was an employment supervisor for the U.S. Employment Service in Baltimore.

While engaged in graduate studies at the University of Chicago, Dr. Aserinsky was given a teaching fellowship. In 1954, he was appointed a physiology instructor at Jefferson Medical College in Philadelphia where he remained until 1976. The students at Jefferson Medical College voted him Best Teacher of the Year in 1972.

In 1976, Dr. Aserinsky accepted an appointment as Chair of the Department of Physiology in the School of Medicine at Marshall University in Huntington, West Virginia. He was named Professor of the Year by the medical students at Marshall in 1984. Upon his retirement in 1987, Dr. Aserinsky moved to San Diego.

He is survived by his wife Angela, daughters Jill A. Buckley and Iris Carter, son Armond Aserinsky, and grandchildren Jeffrey and Melanie Carter and Jennifer Aserinsky.

Mark R. Opp
Dr. Aserinsky Remembered

I first met Eugene Aserinsky in 1952 when he was a graduate student at the University of Chicago working in the laboratory of Nathaniel Kleitman in the Department of Physiology and I was a medical student. I had become interested in sleep as a result of a Kleitman lecture and had asked if I could work with him. I was immediately assigned to help Aserinsky complete his thesis research which was on the topic of eye motility during sleep. At the time, Gene was observing eye motility in infants to document the basic rest-activity cycle. He was also carrying out EEG and EOG recordings at night in adults using the venerable four-channel Grass Model III ink writing oscillograph. Probably my most vivid memories from that time involved our continuing battle to get rid of 60 cycle artifact generated by the old vacuum tube amplifiers and preamplifiers.

Gene had just succeeded in convincing himself and Kleitman that the rapid potentials were truly eye movements, not electrical artifacts, by using two channels (LOC/A1 and ROC/A1) arranged so that potential changes generated by eye movements would be “out of phase.” However, Kleitman remained concerned that others would be very skeptical. Gene had the idea of making a movie of the rapid eye movements because they were so easy to see with the naked eye. I thought this was a great idea until I was assigned to carry it out. The movie equipment was primitive back then, and the noise of the camera would more often than not awaken the subject. Editing the black and white film was also difficult mainly because more than 95 percent of the footage had no eye movements. Finally, I managed to produce a three minute documentary which was reasonably convincing if viewers believed the subject was really asleep. Aserinsky used the film at least a couple of times, and I have a copy in my possession. I mention this because I have often wished I had turned the camera on Aserinsky and Kleitman so we would now possess a visual record of those pioneering nights and days. Unfortunately, we don’t often realize we are making history when we are in the act of making it.

Gene was friendly, helpful, intelligent, and energetic. He was very pleasant to work with. However, he was also a husband and father and rather urgently needed to graduate and get a job. Once I knew enough to be on my own, he gratefully left much of the night work to me and spent the days working on his Ph.D. thesis which was titled, “Ocular Motility During Sleep and Its Application to the Study of Rest-Activity Cycles and Dreaming.” I have always had a copy of his thesis, and I had the presence of mind to carry it with me to Nashville in 1995 where Gene befuddledly but happily autographed it.

It is widely agreed that the discovery of rapid eye movements during sleep was the breakthrough observation that triggered a major course change for all subsequent sleep research. Although new concepts of the nature of sleep did not develop over night, the fact that these sleeping eye movements were highly coordinated and binocularly synchronous with a rotational velocity equal to waking eye movements simply did not fit with older notions of sleep as a state of brain inactivity. This discovery did, in fact, initiate a paradigmatic crisis.

Eugene Aserinsky will always be known for the discovery of rapid eye movements during sleep. It is not impossible that had this work not been done in Kleitman’s lab, we might still not know about REM Sleep. Even though anybody who thought sleep sufficiently important to make the effort could have discovered rapid eye movements at any time in all previous history, it hadn’t happened. I see no reason to think that the general disinterest in sleep would not have continued for a few more decades.

I did not encounter Gene again until the 1965 meeting of the APSS in Bethesda, Maryland, hosted by the late Fred Snyder. He reported a study of eye movements as indicators of sleep satiation, if memory serves me. He seemed a little put off by the excitement over REM deprivation and speculation about REM sleep and psychosis, and perhaps a tiny bit chagrined that he had not been able to exploit his discovery. I did not see him again until the historic 100th birthday celebration for Nathaniel Kleitman in Nashville. I was pleased to find him very happy, healthy, and enjoying his retirement from Marshall University. His death was unfortunate and very untimely.

William C. Dement, M.D., Ph.D.
Sleep Disorders Research Center
Stanford University
dement@leland.stanford.edu
Editor's Column

"The future of sleep research is only as bright as the students currently being trained". Although this statement is cliché, it is a truism for a small society such as the SRS. One could argue that a distinction must be made between the health of the SRS and the future of sleep research. This argument is supported by the findings of Michael Perlis: in 1997, there were more than 400 individuals actively conducting sleep research, as evidenced by funding and publications, that were not members of the SRS. Since this list has not been distributed, it is not clear how many of these individuals may be members of sister sleep research organizations. Nevertheless, these numbers suggest that the health and the vitality of "the field" may be separated from that of "the society". However, it is equally evident that as established investigators begin to contemplate retirement, well-trained sleep researchers must be ready to take their places. Based on feedback from trainees, a structured framework for training, as a supplement to the day-to-day experience obtained in individual laboratories, is extremely beneficial. This issue of the SRS Bulletin focuses on training in sleep research, and provides perspectives from the SRS Program Chair for Trainees, a current SRS trainee, and five high school students; we hope these students will one day be trainees. I invite your comments and suggestions concerning the role of the SRS in training those individuals that will be the future of our field.

Mark R. Opp

Letters to the Editor

SRS Recruits New Members

Dear Sir:

The membership of the Sleep Research Society has grown steadily but slowly over the last five years as reported at the Business Meeting of the society at the New Orleans meeting in June. During this same time period, support for research in this field has grown dramatically through NIH. At the meeting it was suggested that we reach out to invite those who have received grant support in 1997, as well as those who have recently published articles in this field, to join the SRS.

Michael Perlis offered to prepare a list of such names and turn them over to the Membership Chair. This list has now been generated. It contains 403 names of people who are active researchers in the field but not members of the SRS. A letter of invitation has been written to each of them and will be mailed after Labor Day to get the maximum attention.

Meanwhile, our application forms are being updated to reflect the reduced fee structure for full members decided on at that meeting, and scheduled to begin with the new year, Jan 1999. The dues will be $125 for SRS and only $95 for members of ASDA who wish to become members of SRS as well. Those who join new before Jan 1999, will pay $145 and get 16 months of membership for that price. After January 1, dues will be $125 for the year. In either case they will get a lot for their money: SLEEP, the SRS Bulletin, the membership directory, reduced fees at the annual meeting, and the pleasure of our company. Such a bargain!

Rosalind Cartwright, Ph.D.
Membership Chair, SRS
Rush Presbyterian St. Luke's Medical Center
rcartwri@prslmc.edu

SRS Should Split From the ASDA

Dear Sir:

I have been a member of professional organizations for nearly 60 years. The most relevant of these have been the Sleep Research Society (formerly the Association for the Psychological Study of Sleep), which I joined in 1951 (circa) and the American Psychological Association (APA) which I joined in 1943. Both of these have grown from scientific organizations into combined scientific/guild organizations

A scientific organization has a single purpose: communication among members having a common scientific interest. This is accomplished by two means: meetings and publications/bibliographies. The APA and the APSS were successful in accomplishing their purpose. (There is also a to-be-hoped-for goal of scientific organizations; more research money. However, individual grant seekers primarily accomplish this goal).

With growing knowledge and societal changes, a commodity often emerges. In psychology this was clinical psychology, and in sleep this was Sleep Disorders Medicine. As practice involves services for money this inevitably involves turf wars, Licensing, Certification, Practice and Training Standards, reimbursement issues, etc. These, in turn, require new membership services such as lobbying, governmental and regulatory agencies, and politics. These extra-scientific activities are
expensive, time consuming and require extensive staffing.

A combined research/guild organization has a split membership with antithetical interests. Although the separate interests swear loyalty to each other, the functional relations are uncomfortable. There are inevitable complaints about "tails wagging dogs" (with the tail and dog being defined from different perspectives). In the APA, after prolonged reexaminations, the scientists formed a separate society. The new society (The American Psychological Society) has approximately 10,000 members and the APA has about 90,000 members. The SRS continues in a troubled relationship with the ASDA. Because of their resources, the APA and the ASDA are the primary "power" bases of psychology and the sleep community. They run the public relations programs and are the primary governmental lobbyists.

So much for perspective. What does this say about the future of the SRS? The history of the APA suggests that the SRS will eventually split off from the ASDA. How would this effect the SRS?

Mary Carskadon divides the issues of the future into four categories: membership services, intersociety relations, training and development, internal governance. Let us consider them in turn.

Assuming that the SRS will be a scientific organization, the membership services are simple: meetings and publications. The SRS may continue to meet jointly with the ASDA. This would enhance the image of the ASDA and not inconvenience some of its membership. However, if the SRS wishes to reduce the "circus effect" and meeting costs they may wish to meet separately. This should be decided by a membership poll. Anyway, separate meetings pose no barrier.

As for publications the journals Sleep and the Journal of Sleep Research will undoubtedly continue. However, I believe that publication in non sleep journals can solve some of our isolation from other specialty areas. Sleep research has long since legitimized itself to the point that sleep articles are now welcomed in "nonsleep" journals. Hopefully, we can find some solution to the need for an annual bibliography.

Intersociety relationships, in this fragmented world, are crucial. First, it is unlikely that relations with the ASDA will be problematic. The ASDA will continue their present public relations efforts and lobbying for additional funds and the SRS will benefit therefrom. The ASDA continues to need a research base as both an ideological validation and fact.

I am in hearty agreement with Jim Krueger that our research future is dependent upon interactions with other disciplines. First, as noted above, these interactions can be improved by publications in non sleep centered journals. (A historical footnote: the development of the journal Sleep was hotly debated. It was argued that we should publish in specialty journals rather than isolating our papers in a separate journal.) Krueger's other suggestions are appropriate: development of symposia at meetings, invited speakers, etc.

I am not very sanguine with regards to training and development programs other than training facility surveys. My own experience was that, at least in my area, there were few academic jobs for a person narrowly trained in sleep research. Most departments wanted someone in cognition, developmental psychology, psychobiology, with a research area in whatever. Undergraduates also want to go to a good (or less good) college in a general area not in sleep. The best that can be done is that those in academic positions must seek out good students and train them broadly or send them to facilities that can give them such training. I would note that very few of my generation of sleep researchers were specifically trained as sleep researchers.

And I know that we are proud of our student travel grants but typically this is just saving some investigator travel money. I would rather the money be applied for by anyone (including students) who needs the money.

As for governance, I don't think by-laws and sections and open governance structures make much difference. As you may know, for the first decade, the APSS had no govenance structure. There was an Executive Secretary (a member who was willing to serve) and a Local Arrangement Chairman. Obviously, something better than that is needed. The problem with the organization of most professional societies is that they traditionally elect inexperienced members to office for limited terms. Occasionally, a "green demon" will attempt to completely reorganize things but, fortunately, doesn't have time to. Most live out their term.

I would propose a small advisory board (three to five) comprised of the three most recent presidents and two members at large. This board would be advisory to an executive secretary (hopefully a member of the SRS) who would be paid a stipend (as substantial as possible) to devote him (her) self to the "running" of the organization. The Board would serve in an "advise and consent" role to the executive secretary. Major (?) actions would be ratified by the membership. As a result, I suspect, the SRS would be as good as its executive secretary.

In short, I would recommend that the SRS split sooner rather than later from the ASDA and focus on being a scientific society.

Wiise B. Webb, Ph.D.
Professor Emeritus
University of Florida
wbwebb@psych.ufl.edu

WFSRS Call for Proposals

Dear Sir:

As you already know, all members of your society have been invited to make high quality proposals for symposia, workshops, and focus groups for the Third International Congress of the World Federation of Sleep Research Societies.

Forms for proposals were mailed together with the First Announcement and the Congress Poster earlier this year. The forms are also available on the Congress Web Site (http://www.wfsls.org).

According to a well established procedure, the members of your society were asked to submit the proposals to the office of Dr. Roehrs. This enables Dr. Roehrs to check them for quality and formal completeness before they are forwarded to Dr. Hartmut Schulz, Local Congress Organizer. The deadline for submission of proposals is October 15, 1998.

As Chairman of the Scientific Committee I fullheartedly invite you to encourage members of your society to submit excellent and timely proposals. The proposals will be rated for originality and quality by the members of the Congress Scientific Committee. The final selection of proposals will be based on the pooled ratings to guarantee a program of highest scientific standards.

We are striving hard to make the Third International Congress an outstanding scientific event.

Pier Luigi Parmeggiani, M.D.
Chair, WFSRS Scientific Committee
University of Bologna
plparm@biofarm.unibo.it

World Federation of Sleep Research Societies
Third International Congress, October 5 - 9, 1999
Dresden, Germany

Dear colleagues:

Welcome to the Third International Congress of the World Federation of Sleep Research Societies, which will be held in Dresden, Germany. The Board and the Members of the German Society of Sleep Research and Sleep Medicine (DGSM) are deeply honored that the WFSRS has accepted our invitation to host this Congress. We will do our best to prepare an excellent scientific Congress that is also as pleasurable as the Founding Congress which was held in Cannes, France in 1991, and the Second International Congress which was held in Nassau, The Bahamas in 1995.

Dresden, the capital of the Free State Saxony in Germany, is one of the world's most famous cultural centers of Europe. We have selected Dresden as our Congress venue because this city looks back on more that 800 years of history, and represents all aspects of the fall and rise in the recent past. It is well situated in the heart of Europe, and it will be rather easy for our colleagues from Eastern Europe and Russia to join the Congress in great numbers and have the opportunity to meet colleagues from all over the world. The city of Dresden is famous for its characteristic baroque architecture, art, music and theaters. Over the years is has been proud to be called the 'Florence of the Elbe' because of the architecture, galleries, churches and the lovely city silhouette.

In 1999, only a few steps away from the Congress Palace, you will see the impressive reconstruction of the great Frauenkirche (or Church of Our Lady) with its 311 feet high dome, which is currently a work in progress. Those of you who prefer music should visit the Semper Opera House, and for those fond of mountain climbing, there are fascinating opportunities near the city in the most beautiful valley of the river Elbe. Visits will be arranged to the famous porcelain manufacturing city Meissen as well as a post-Congress tour to Prague, capital of the Czech Republic, for those who are interested.

In short, Dresden offers a fascinating frame for this important quadrennial Congress of sleep researchers and clinicians from all over the world. We hope that you will join us in this important event, which will occur just three months before the millennium.

Hartmut Schulz, Ph.D.
Chair, Third International Congress

Pier Luigi Parmeggiani, M.D.
Chair, WFSRS International Congress
Program Committee

Michael Chase, Ph.D.
President, WFSRS

Useful (or simply favorite) URLs

Editors note: The internet has clearly redefined the meaning of “information services”, and we now are subjected in many cases to information overload. Several have asked if we would print in the Bulletin the URLs of resources that are useful to sleep researchers. The following URLs should be well known to all sleep researchers. I invite members of the SRS and readers of the Bulletin to send your favorite URLs with a short description of what the site contains and why it is so useful.

Brain Information Service  http://bisleep.medsch.ucla.edu/  For several years, this has been the place to start for links to sleep research resources on the web. There are links to organizations, to SRO, and information about the NAPS listserv.

Claude Bernard University  http://ura1195-6.univ-lyon1.fr/  An extensive listserv (sleep-waking) provides a large and frequently updated sleep bibliography. This site was started by Prof. Jouvet, and now contains all papers published by this group.

Sleep Research Zurich  http://www.unizh.ch/phar/sleep/  Profs. Borbély, Tobler and colleagues web site includes information about a new sleep CD Rom resource. There is also a description of the Two Process model, and an extensive bibliography of papers published by this group.

Neuroscience on the Internet  http://www.neuroguide.com/  A searchable and browsable index of neuroscience resources available on the Internet. Including: Neurobiology, neurology, neurosurgery, psychiatry, psychology, cognitive science sites and information on human neurological diseases.

Student BITS (Brief Insights for Training in Sleep)

Hello again!

I am pleased to introduce the second submission to the new Student BITS segment. Although quite different in content from the first article, Monica Eiland’s article “Do Today’s Trainees Have a Future in Sleep?” sorts through the potential job market for current Ph.D. students and post-docs and describes these positions in a succinct and informative way.

As a reminder, the Student BITS segment will be an ongoing forum of concept and insight for issues pertaining to sleep from a sleep trainee’s perspective. The articles found here will vary in subject-matter and allow pertinent sleep-related questions and topics to be addressed and brought to the forefront of discussion and thought in the sleep community. Submissions are currently being sought for the Fall and future issues of the SRS Bulletin.

Timothy Hays

If you are interested in submitting an article for Student BITS please contact Timothy Hays: e-mail hays@ucla.edu, tel (818) 891-7711 ext. 7576, fax (818) 895-9575 or VAMC 151A3, 16111 Plummer Street, North Hills, CA 91343.
Do Today's Trainees Have a Future in Sleep?

by Monica Eiland
UCLA & Sepulveda VAMC
meiland@ucla.edu

In the last issue, Sally Wurts discussed the sense of wonder that brought most of the present trainees into the sleep field. In a time when our field holds so much promise, and so many incredible discoveries lie ahead, the question of the hour for most trainees seems not to be “Will we find answers” but “Will I find a job that allows me to look for those answers”?

In reality, it is very difficult to forecast the future of sleep employment, for a number of reasons. First of all, sleep research is not usually funded as a separate entity, but as part of science and medicine. As such, it is tied to general scientific funding, which is, in turn, strongly influenced by the economy. Right now, the U.S. economy is very strong and science funding is the highest it has ever been. In 1995, total estimated government support for research was $33.8 billion. According to the Society for Neuroscience, the current funding bill making its way through Congress could lead to a 9.1% increase ($14.862 billion) in NIH funding for next year. The present Presidential administration has placed science funding as one of its top priorities, seeking to double the present NIH funding over the next ten years. However, this could change at any time. Because of the increasing globalization of economic structures, combined with the globalization of science itself, the job market for researchers in sleep must be viewed within a much more complex global context. Many nations with strong contingents of sleep researchers are facing stagnant or falling financial markets, which could increase the number of researchers seeking work worldwide, not to mention the possible effect of a worldwide downturn on the U.S. economy and science funding. On the other hand, almost all sleep research has medical relevance, human interest, and even military importance. Such funds are almost always the last cut. In short, linear extrapolations of present trends are bound to deceive because we do not live in a linear world, historically or economically.

That said, a number of trends in the academic environment in the U.S. will affect the immediate future of trainees. According to the National Science Foundation’s "Science and Engineering Indicators 1998," full-time positions for those with doctorates decreased between 1991 and 1995, from 173,100 to 171,400. This contraction was mostly due to the decline in Full Professorships, and in fact, fewer than 45% of all science and engineering Ph.D.s have regular faculty appointments. On the other hand, job opportunities in life sciences occupations are projected to grow by almost 23% (41,000 new jobs) between 1996 and 2006, while positions in the biological sciences are expected to increase by 24% (20,000 new jobs). Though salaries are lower and tenure-track jobs are harder to find in the biological sciences, unemployment rates and the level of involuntary employment outside the field are relatively low.

I believe that these statistics point to an organizational shift within science, which trainees may view as negative but which could actually work in our favor. While the old expectation for the newly-minted science Ph.D. was to move as quickly as possible to a tenure track position, research has been moving to a more hierarchical structure. Though security in research is apparently shrinking, this shift has made available more diverse positions for a population of trainees with more diverse talents and priorities. Here are just a few of the possible research roles that we trainees may have as options when we emerge into the permanent job market:

**Full Professor with Tenure:** The full professor typically has at least some teaching responsibilities, many institutional administrative responsibilities, a lab which he or she administers as primary investigator, and within the limits of what will be funded, intellectual autonomy. In addition to full professorships in traditional academic departments, many sleep researchers may have the often-overlooked option of appointments in medical schools.

The increasing administrative burden of running a laboratory, getting grants, and fulfilling other professional and personal responsibilities has led to a situation in which the primary investigator often does not have the time to fully supervise all aspects of the lab. Achieving some security in funding also requires that several large projects be run concurrently, necessitating a sort of fragmentation into sub-laboratories. Much or all of the day-to-day experimental work is done by undergraduates, graduate students, postdoctoral students, technicians, and research associates. In modern scientific research this has always been the case to some degree, but the situation is being reinforced by the trend of universities away from the classical tenure-track Full Professor positions toward a higher percentage of lower-paid and less secure Staff, Assistant Professor, and Associate Professor positions.

**Assistant and Associate Professor:** These professorships usually involve more teaching responsibilities, lower pay, and
less security. However, these are the entry level positions that can lead to promotion to full professor. They are also accompanied by some lab space and lab money. These professors may also work closely with full professors who serve as mentors or leaders of lab groups.

Research associate: One deterrent from entering academic research has been that high levels of grant writing and administrative responsibilities take the primary investigator away from the bench work, technical details, and even some theoretical concerns that brought the investigator into research in the first place. The associate has a Ph.D. and open-ended employment involving hard-core bench work and publication. Though the general subject matter is typically decided by the primary investigator, varying levels of intellectual autonomy can be obtained depending on the laboratory and the degree of shared interests between the associate and the primary investigator. The associate usually has no teaching responsibilities, perhaps even few grant writing responsibilities, and makes more money than a postdoctoral student.

Research at a government institution: The National Institutes of Health have laboratories whose research is essentially academic in nature, though related to basic health interests. These positions are much like full professorships, except that they rarely require teaching responsibilities beyond the mentoring of postdocs. The United States Veterans’ Administration Hospitals also sponsor health-related research, and many prominent sleep researchers have joint VA and academic appointments.

Industry: In the past, industry jobs have been shunned somewhat by academia, on the grounds that industry research is somehow not "real" science. Having worked briefly in industry, I have to wonder, if I wasn’t doing real science, what was I doing? Certainly, the structure of the enterprise is tailored to meet a specific need, but the answers are arrived at in much the same way. The lack of openness in industry, one of the major scientific criticisms of industrial research, is necessarily present to some degree; however, on the whole basic science eventually benefits from research that might not have otherwise been funded. The industry scientist benefits from higher funding, relief from grant pressure, and lack of teaching responsibilities, albeit at the price of some intellectual autonomy. However, if one’s interests already lie in sleep disorders or other related disease processes, this may be little or no sacrifice. In addition, positions similar to the research associate or the associate professor do exist in large, hierarchical industry labs.

Ultimately, this shift to a more hierarchical organization and a wider range of research venues means that many present trainees can expect to work, perhaps for an entire career, as research associates or assistant professors under the supervision of other Ph.D.s, or in jobs outside academia. This will be a hard step for those trained to believe that the tenure track should be their only goal, but even the tenure track has never carried with it complete intellectual autonomy. Science is by its very nature a collaborative effort, and increasingly it is an effort that crosses the lines of job titles, laboratories, and countries. Though no one can be guaranteed a successful research career in sleep, we are nonetheless being trained in exciting times. The climate has never been better for sleep research and employment.

Finally, if there is one thing that will warrant a future for sleep research, it is academic and public enthusiasm about the quality of the enterprise itself. We have in our hands a question that cuts to the heart of brain evolution and function, from the subcellular to the computational level. Never in the past history of humanity have we had research tools so powerful or so accessible to so many. Given these tools, the brightest and most creative minds of our generation can hope to hold the answers to an ancient mystery within their grasp.

---

13th Annual APSS Meeting
June 19 - 24, 1999
Marriott World Center
Orlando, FL

Abstract Deadline: December 1, 1998

The Call for Papers for the 13th annual APSS meeting will be mailed within the next few weeks. This mailing will include abstract forms. Additional forms are available from the ASDA National Office (507-287-6006). It is never too early begin thinking about abstract deadlines! For additional information, call the National Office. We have been informed that if Mickey can’t make it to the meeting, Goofy definitely will!
The NEW SRS Training and Education Program: Fostering the Career Development of SRS Trainees

Dale M. Edgar, Ph.D.
SRS Program Chair for Trainees
Sleep Research Center
Stanford University
dmedgar@leland.stanford.edu

In the previous issue of the SRS Bulletin several of our colleagues expressed both their optimism and their concerns about the future of the SRS, with emphasis on the organization’s infrastructure and key programs. A fellow member of the SRS Executive Committee, Dr. James Krueger, expressed an especially provocative opinion — that the SRS Training and Education Program should be eliminated. Less drastic measures were proposed in a letter by Dr. Allan Pack, who’s critical concerns focused on the need for fair administrative processes, and the importance of impartial member access to SRS-sponsored training events. Like many SRS members, Dr. Krueger and Dr. Pack genuinely care about the future of our society and undoubtedly formed their opinions from impressions that evolved over several years. Although old impressions are hard to change, seeing the value of our new and improved SRS Training and Education Program first-hand has elicited enthusiasm in many senior investigators. This year Drs. Krueger and Pack were key faculty participants in the Trainee Day educational program at the APSS Meeting in New Orleans. By direct involvement they could see first hand how recent efforts to markedly improve the effectiveness of the SRS Training and Education Program are making a real difference in the professional development of trainees in our field. Unfortunately, their critical comments were published before either of them could personally witness recent procedural changes and the program’s positive impact on our trainees. Therefore I will not offer rebuttal to their comments and concerns. Instead, I will use this opportunity to inform the SRS membership of the many steps we have taken to improve the SRS Training and Education Program.

Has the SRS Training and Education Program Made a Difference?

Evaluating whether past SRS Training and Education efforts have been effective is a prudent, albeit difficult process. The fruits of such programs can take many years to realize; likewise for programmatic improvements. The Sleep Research Society spends a large portion of it’s annual operating budget on the Training and Education Program. As a relatively small society, our future depends on a stream of highly competitive trainees who, despite a generally difficult job market, will expand the base of dedicated sleep investigators. In light of the number of senior investigators who are approaching retirement, fostering the professional development of our trainees is absolutely vital to the survival of our field. This does not mean however, that we need a trainee “entitlement program.” Indeed, we must critically evaluate how Training and Education resources are used to assure that every dollar spent makes a real difference in trainee career development.

In written surveys and letters, SRS trainees unequivocally say that the SRS Training and Education Program has better prepared them to face the realities of a career in sleep research. Some senior sleep faculty have recently asked whether this program has directly led to new jobs for young Sleep Researchers. This, however, is a very different question that does not necessarily reflect on the effectiveness or value of SRS Training efforts. Certainly jobs are the bottom line and the SRS Training directorate, the VISION 2020 Task Force, and the SRS Executive Committee are all seriously examining what we can do to create job opportunities. Unfortunately, the availability of jobs is limited by the number of faculty billets issued by Deans to their departments, and by departmental chairpersons who ultimately determine if billets should go to sleep researchers, or some other focus area. In medical schools these decisions are often linked to matters pertaining to patient services, the likelihood that those services will bring in a large and steady stream of revenue, and complex local politics. Thus, it is unclear to what extent the SRS can directly influence the job market. From what I have been able to determine (in my brief experience as SRS Program Chair for Trainees), excellently trained young sleep researchers are having no more difficulty finding faculty positions than trainees in other areas of clinical neuroscience. Admittedly, it is difficult to find a tenure-line faculty position in any biomedical discipline. Senior sleep faculty can help, however, by enthusiastically advocating sleep faculty positions — especially in expanding departments. For example, Dr. Krueger recently hired two SRS Trainees into his department as junior faculty, and Stanford has hired three sleep faculty in recent years. There are many other success stories across the country. With improved NIH funding on the horizon, I think there is good reason for optimism.

Recent Changes to the SRS Training and Education Program.

I began my term as Program Chair for Trainees in January of 1997 with a straightforward philosophy – that if the SRS is to have a meaningful and respected Training Program it must not be based in trainee entitlements and “feel good” awards – the program must make a difference in the career development of graduate students and recent post-doctoral fellows. In the relatively short time since accepting this office, I have instituted several changes in the programmatic content of the SRS Training and Education Program and the process through which these activities are implemented. For those of you who attended the SRS Business Meeting at the 1997 APSS meeting in San Francisco, you will recall that I described a list of major changes that I planned to implement – all of which serve to make the Training and Education Program more effective and democratic. Each of these recommendations received unanimous and enthusiastic endorsement from the SRS Executive Committee before they were announced to the membership. As promised, all of the changes I proposed have been implemented. I reported this progress at the SRS business meeting in New Orleans, but given the relatively low attendance at the business meeting, I suspect that many people are still unaware that considerable improvements in the Training and Education Program have been implemented and others are in the works. Below is a summary of changes to the SRS Training and Education Program structure, awards, and funding processes implemented last year:

The position of “Assistant Director of Training” was created.

As significant and time-consuming changes were implemented in Training and Education policies and administrative procedures, the SRS Executive Committee recognized the need for a dedicated and energetic Assistant Director. This individual is appointed on an annual basis by the Program Chair for Trainees and plays an important role in the development and oversight of the Trainee Day educational program held at the APSS annual meeting. This appointee is not a member of the SRS Executive Committee. Dr. Michael Perlis is the current Assistant Director of Training.

The term of the “SRS Trainee Representative” (a.k.a. the elected Trainee Member at Large) was increased from 12 to 18 months.

The duration of this post was increased to help assure the smooth transition of knowledge. The Trainee Representative is responsible for leading the Trainee Day Organizing Committee, which develops and implements the Trainee Day educational program at the APSS annual meeting. The Trainee Representative serves on the SRS Executive Committee for 12 months as an active member, and then serves for 6 months in an advisory capacity to the incoming Trainee Representative. The current and past SRS Trainee Representatives are Tim Hays and Sean Drummond, respectively.

The SRS “Training and Education Advisory Council” (TEAC) was created to advise the Program Chair for Trainees on a wide range of training issues.

The original idea of creating an advisory council to help make objective decisions about SRS training initiatives was first offered by Dr. Chris Gillin during his term as President of the SRS. TEAC consists of the current Program Chair for Trainees, the Assistant Director for Training, and 3-4 additional members. It is the responsibility of the SRS Program Chair for Trainees to nominate highly objective and non-partisan individuals to participate on TEAC. The SRS Executive Committee must ratify all TEAC nominees. TEAC members serve for a period of time not exceeding that of the Program Chair for Trainees. They are responsible for the final selection of Trainee Research Excellence awards, they evaluate the annual Trainee Workshop proposals and make funding recommendations to the Executive Committee. They also participate in the selection of trainees to attend the annual Trainee Workshop. The current members of TEAC are: Dr. Dale Edgar (Chair), Dr. Michael Perlis (Asst. Director of Training), Dr. Sonia Ancoli-Israel (Past-Program Chair for Trainees), Dr. Robert Greene, Dr. Timothy Monk, and for APSS annual meeting TEAC deliberations, Dr. Rochelle Goldberg (ASDA Training Director).

The majority of travel awards to assist trainees to attend the annual APSS meeting are now bona fide merit based SRS awards, with travel support levels tiered based on the judged level of research excellence.

To receive a merit-based travel award a trainee must be first author on an abstract accepted for presentation at the APSS meeting. “Trainee Research Excellence Awards” recognize the best 10 trainee abstracts submitted for consideration. “Trainee Research Merit Awards” recognize the top 40-50% (budget permitting). Other types of travel support are not awards per se, but nonetheless help offset trainee travel costs. “Trainee Travel Stipends” are issued to a limited number of trainees who are first authors on an abstract, but were not selected for a merit-level award. There are also a limited number of “First Time Travel Stipends” for trainees who have never attended an APSS meeting. Trainee Research Excellence Awards are $500 each. Other awards and stipend levels are less (Excellence>Merit>First Time>Stipend).

The Training and Education Mission of the SRS has been more clearly defined.

I believe it should be the mission of the SRS Training and Education Program to actively foster trainee career development: i) by fulfilling education in areas that are critical to professional growth, but are usually not addressed in a typical University-based graduate or post-doctoral training
program, ii) by fostering collegial communication and advocacy among trainees (who will one day be peer reviewers), and iii) by creating opportunities for trainees to gain from the wisdom and practical experience of mentors across many sub-disciplines of sleep research. To achieve these three goals, we surveyed the SRS trainee membership and, based in large part on their feedback, made substantive changes to the APSS Trainee Day educational program. For example, at the 1998 APSS meeting, interactive workshops, on-line computer assisted demonstrations, and noon-time educational luncheons (tailored specifically for trainees) were included in the program.

The process of assigning funds for SRS-Sponsored Training Workshops has been overhauled.

Prior to my appointment as Program Chair for Trainees, the SRS issued $25,000 a year to Dr. Michael Chase in support of the annual Trainee Workshop on Basic Sleep Research, which he organized annually at Lake Arrowhead, California. For those of you who are not aware of this workshop, it is truly an outstanding education and training experience for sleep trainees. Politics aside, I am unaware of any knowledgeable person who will dispute this fact. For many years this workshop has been the de facto standard, and given the superior results achieved by Dr. Chase’s efforts, there was little impetus to deviate from something that worked so well. Recently, however, some members of the SRS expressed interest in developing alternative training workshops. Members also expressed concern about the lack of proactive training funds utilization oversight, which would help assure that Trainee Workshop funds directly benefit all interested SRS trainees. In response to these important concerns I recommended the following policy changes that were unanimously approved by the SRS Executive Committee:

1. The SRS now has an annual call for Trainee Workshop proposals from the SRS membership. Proposals are evaluated by TEAC who makes a recommendation to the SRS Executive Committee for funding ratification.

2. Training and Education funds are used exclusively to support trainee travel, lodging, and meal costs to participate in SRS-sponsored Trainee Workshops. These awards are paid directly to trainees or lodging facilities that provide trainees with room and board. Trainee Workshop organizers are responsible for all other costs associated with workshop organization and implementation.

3. The SRS Training Director and TEAC select the trainees who will receive SRS funds to attend a Trainee Workshop.

4. Trainees who are already funded to attend a workshop under an existing Training Grant are ineligible for SRS travel support.

A Reasonable Timeline for Change

The SRS Training and Education Program has changed substantially over the last year – hopefully for the better. Of course, there is always more work to accomplish. Many of the changes described above have been phased in gradually so that the Trainees are not inadvertently disadvantaged by major policy changes. The New SRS Training and Education Program does take a new path – one in which entitlements are rare, but recognition for research excellence by trainees is abundant. The policy of the Training Program under my directorate has been to establish administrative processes that are fair and create new and exciting opportunities for our trainees. Our goal is to make a real difference in terms of a promising trainee’s financial ability to attend the APSS meeting, and in the trainee’s career path.

Last year the SRS Executive Committee authorized policy changes so that Trainee funds no longer go to the workshop organizer(s), but rather, to the trainees themselves. In addition, I worked with TEAC to select 30 trainees to attend the 1997 annual Trainee Workshop. This new policy and process assures that trainees across clinical, human and basic research can participate in SRS-sponsored Trainee Workshops (not just the basic research trainees, as in the past). This year, we implemented the first annual call for Trainee Workshop Proposals. Although we received only one application this year, we genuinely hope that there will be competing applications in future years. If competition stimulates excellence, then we should continue to have fantastic trainee workshops for many years to come.

For the APSS meeting in 1999 we are implementing a new application process for Trainee Awards. Trainees who wish to be considered for a merit-based award will need to indicate this on the abstract form and submit all supporting application materials along with the call for abstracts packet (e.g., application will be part of the abstract submission process). In addition, the Call for Trainee Workshop Proposals mechanism will be fully implemented in 1999. This means that the call for these applications will be very early and everyone should have ample time to prepare an application.

Dreams for The Future

I have recently asked the SRS Executive Committee to consider establishing a Training and Education endowment that is separate from the SRS general fund. This endowment would help to solidify the Training and Education budget process, providing a mechanism for financial growth and security for the program. Combined with active endowment development efforts, I envision a variety of new programs that could help post-doctoral fellows make the transition to faculty positions. For example, a limited number of dollar-matching
first-time junior faculty awards could be used to entice department chairpersons to dedicate new faculty billets for sleep researchers. Funds could also be allocated for pre- or post-doctoral fellowships coupled with the visibility and/or interests of other larger societies. Before we can establish any new award mechanisms, vigorous fund raising efforts will be needed (a major undertaking). Nonetheless, the potential benefits could create unprecedented opportunities for trainees in sleep research.

Participating in the Process of Leadership

While serving as a member of the SRS Executive Committee, I have been struck by the genuine desire of every committee member to serve the interests and needs of the SRS membership. Some members work extremely hard, devoting literally hundreds of hours to the SRS annually. I have found that the SRS Executive Committee members care deeply about the future of sleep research and seek a rational democratic structure for our society. In academia it is often the squeaky wheel that is lubricated first, but this is not usually the best strategy to take when running a society. The greater good of the society must be considered and this sometimes makes change seem slow. The leaders of the SRS are actively seeking ways to improve our society and need to hear from you. Indeed, your opinions and your new ideas are quite valuable. I encourage you to attend the SRS business meeting at the APSS annual meeting so that you are informed about SRS programmatic changes and plans for the future. Also, contact your SRS Section Head (see page 153 of the 1998-1999 APSS Directory for the list of section heads) to see how you can make a difference in the future of our society.

SRS Essay Award Program Winners

This is the fourth year of the SRS Essay Award Program for high school students. This year, 170 essays were submitted. The following essays were judged as the five best. We congratulate these high school students, and hope that the readers of the Bulletin enjoy reading these essays. We also convey many thanks to the following individuals that served as judges: Christine Acebo, Julie Carrier, Mary Carkadon, Kimberly Cote, Hawley Montgomery-Downs, Jodi Dickstein, Sean Drummond, Monica Eiland, Phil Gehrman, Tim Hays, Wendy Hunt, Bryan Jones, Clete Kushida, Carol Leotta, Tom Maloney, Jennifer Martin, Melanie Means, Janna Morrison, Tim Murphy, Geoff Ott, Michael Perlis, Katie Sharkey, Chris Sinton, Ken Wright, Sally Wurts, James Wyatt, Shawn Youngstedt, and Blenda Yun. Information about the contest may be found at http://www.websciences.org/trainee/Essay.htm, and a list of previous winners and their essays is located at http://bisleep.medisch.ucla.edu/SRS/activities.htm.

"Death and taxes are not the only certainties in life; sleep must be included as well..."

Rosalind Bustamante, 17
High School for the Performing and Visual Arts
Houston, TX

For many people, sleep is something that occurs on an irregular basis: catching a few hours of sleep upon coming home, sleeping the weekend away. The majority of the population has little or no idea about the workings behind their sleep habits. There are many existing ideas as to why we sleep, the most popular one being the restorative theory. This theory states that we use sleep to "replenish the processes of our mind and body that are depleted" during the waking hours of our everyday lives (Benjamin 130). While it is understood that sleep is a prerequisite for a healthy mind and body, there are literally legions of people who do not get the proper amount of sleep each day, for varying reasons. Scientists have studied sleep deprivation in both controlled environments and field studies in order to discover more about its physiological and psychological effects.
Some researchers attempt to deprive people totally of sleep by keeping them awake 24 hours a day. Technically, total sleep deprivation is a misnomer, as after two to three days of such deprivation, the person engages in microsleeps, "brief two to three second bursts of sleep that intrude into wakefulness" (Benjamin 138). Other studies, called selective sleep deprivation studies, involve depriving subjects of certain kinds of sleep while leaving other kinds of sleep intact. These studies usually involve the induced lack of REM (rapid eye movement) sleep, which is where the most vivid of the night's dreaming takes place. Studies are often done using an electroencephalogram (EEG), which records the brain's electrical activity (Lazerson 292). Readings taken during sleep show that the pattern that occurs during REM sleep resembles the pattern of the waking state; many other physiological patterns resemble those of being awake, such as the increases and irregularity in heart rate and breathing, elevations in blood pressure (Lazerson 293). However, REM sleep is generally regarded as being a very deep sleep, as people are often very difficult to wake and do not readily respond to stimuli. Because of these contradictions, one researcher, Michel Jouvet, used the term paradoxical sleep to describe REM sleep: people seem to be awake and yet deeply asleep at the same time (Lazerson 293). If people are awakened each time they enter REM periods, but are otherwise allowed to sleep a normal length of time, they tend to make up those lost periods whenever they have the chance (Lazerson 293). They also begin to display abnormal behavior when they are awake. "When people are deprived of REM sleep for several consecutive nights, many of them suffer from anxiety and irritability, difficulties in concentration and in some cases hallucinations and ravenous appetites" (Lazerson 293).

One study that used cats as test subjects found that deprivation of REM sleep could produce more serious and dramatic results. It was discovered that:

“If a small portion of the brain was removed, the cats no longer experienced REM sleep, although they continued to experience non-REM sleep. [Over the course of] several days, the cats began to...periodically show agitation, would stare fixedly and swat at nonexistent objects. Some cats exhibited greatly increased eating and sexual activity. In some cats, the REM sleep eventually returned, and these abnormal behaviors disappeared, but the cats that showed no return of REM sleep became increasingly agitated and finally died in a state of extreme hyperactivity.” (Lazerson 293).

It has been found that some commonly used drugs, such as alcohol and sleeping pills, suppress REM sleep; consequently, habitual use of these drugs produces REM deprivation (Lazerson 294). It is known that these drugs can cause chronic insomnia. The insomnia in these cases would occur when people stop taking these drugs, because they would immediately begin to experience more REM sleep in order to make up for the REM sleep they lost while taking the drugs. This increased REM activity causes them to sleep fitfully and wake often, sometimes with nightmares. After several nights of fitful sleep, their bodies gradually make up the lost REM activity and they begin to sleep well. However, in some extreme cases, long-continued suppression of REM sleep can produce hallucinations and other bizarre behavior, suggesting that the individual is essentially dreaming while awake (Lazerson 294).

Not all victims of sleep deprivation are study subjects; students are notoriously under-rested, which has dramatic effects on their academic performances as well as their general health. One sleep researcher at a well-known college recently conducted a study that showed that only about 1% of students at this particular university were fully awake all day long (Unknown). Similar studies show the correlation of amount of time students spend sleeping to their academic success. Nor surprisingly, students who get more sleep during the week have better grades and are better able to concentrate then their sleep deprived counterparts. Students also tend to experience delayed sleep phase syndrome, which means that when given the opportunity (i.e., non-school days), they show an inclination towards sleeping for longer periods of time (Ancoli-Israel 2).

Sleep is an important factor for sound health, but it is often overlooked in today's busy society. With people constantly trying to get use out of every hour in the day, they are bound to be somewhat deprived of sleep. Most people are given a chance to reinstate their lack of sleep, on weekends and so forth, and by doing so avoid many unnecessary problems. Perhaps if people become better able to control their sleep habits, the experience of sleeping will become as common place as the inevitable "taxes and death".

Works Cited

Ancoli-Israel, Sonia, and Stacie C. Link, Sleep and the Teenager, research paper.


25
The Effect of Sleep Deprivation in the Modern World

Peter Davio, 18
Hesperia Christian School
Hesperia, CA

We live in a society today where technology has allowed us to vastly improve our efficiency and work around the clock. Beginning with the invention of the light bulb in 1879, and leading up to the advent of modern sophisticated communication tools such as the cell phone, fax, and pager, the work force has been urged to continue working well past traditional hours, while still allowing time for family and social interaction, resulting in a sacrifice in the one remaining area of everyday life - sleep.

As sleep expert Harvey Moldofsky has commented, Western civilization has “done everything possible to eliminate sleep” (Dotto 16). And yet, it is a proven fact that humans cannot do without sleep for little more than a few days at a time. Although scientists cannot say for sure why humans need sleep, they have been able through research, to discover some important characteristics of our sleep/wake cycle.

At the forefront of these findings is the establishment of circadian rhythms that dictate a 24-hour alternation between wakefulness (which peaks in the morning and again at 5:00 or 6:00 p.m.) and sleepiness (which peaks between 3:00 a.m. and 6:00 a.m. and again during mid-afternoon). During these same periods corresponding changes in body temperature, metabolism, heartbeat, respiration, hormone secretion, and brain-wave activity also occur. Together these biological processes function as an internal clock to instruct the body when to rest and when to remain active (42).

It is, however, this very same physiological clock that workers are often forced to contradict when faced with a shift that requires activity and alertness for extended periods of time during a circadian “low” in the sleep cycle. As a result, the worker naturally becomes more sleepy, less observant, and drastically less efficient while on the job, and, upon returning home, is forced to once again fight his/her circadian rhythms by attempting to sleep when the internal clock dictates one be awake. Although the circadian system can eventually adjust to such changes, more often than not the shift worker has to adopt a completely new time schedule within a few days, throwing the body into yet another physiological state of confusion. Just as a traveler may experience “jet lag” when he/she journeys through several different time zones, the shift worker is forced to endure the same arduous transitions leading to the phrase “blue-color jet lag” to describe this chaotic lifestyle.

A human being, though, can continue in this manner for only so long before the repercussions begin surface. Take for instance, the situation that occurred in August 1988, when the U.S. Nuclear Regulatory Commission took actions to shut down a Pennsylvanian nuclear reactor when operators were found sleeping on duty. A similar event occurred in March of 1979, when a near meltdown took place at the Three Mile Island nuclear plant in Pennsylvania. Unsurprisingly, the circumstances that lead to this near tragedy transpired just after 4:00 a.m. (during the peak of the circadian rhythm sleep cycle) when a crew of already sleep-deprived shift workers was assigned responsibility of keeping the radioactive core of the facility adequately cooled. Fortunately, disaster was averted in this instance of accident related fatigue, however thousands upon thousands were not so lucky when, in the summer of 1986, a complete meltdown came to pass at the Chernobyl nuclear reactor site. Once again, things began to spiral out of control around 1:23 a.m. due to human error caused by lack of adequate sleep, until the unimaginable happened, and radioactive waste was spread throughout a large area of Europe (234-5).

Even in industries such as an electrical utility company, where mistakes are not so nearly pronounced, it has been noted that "Half of the supervisors said they'd observed operating errors or near accidents that were attributable to worker fatigue" and "69 percent believed the shift schedule impaired their work performance..." (232). In fact, an article in The Wall Street Journal estimated the cost to U.S. industry from reduced alertness in the workplace at about $70 billion a year.

There is more than simply money at stake here, as this sort of shift work has a detrimental effect on the performance of an individual at home too; straining the family to adapt to an irregular schedule just to spend time with an individual who relinquishes most of his/her free time in regaining lost sleep. This is, of course, a major contributing factor to the high turnover rate of such workers, and the subsequent lack of personnel in many fields.

What are businesses that rely on shift workers to maintain production in a 24-hour a day, 7-day a week world-wide economy to do in order to reduce on the job accidents and fatigue without putting themselves out of competition? Well, thankfully, sleep researchers have been applying their expertise in devising circadian rhythm friendly shift rotations and are
encouraged by the results. In corporations where three week clockwise rotation (that is, from day shift, to evening, then to night) schemes have been introduced, marked improvement in worker performance and satisfaction has been observed. Also, in situations where rapid, two day shift changes have been instituted so as to prevent the circadian system from adjusting to an unnatural cycle, remarkable improvement is also evident in worker effectiveness and morale.

These practical implementations of scientific knowledge about the human sleep/wake cycle have started to inspire changes in business that will only grow evermore important as our civi-

lization advances toward an entirely around the clock mentality. For the future holds not an age of tiredness, exhaustion, and dissatisfaction for the worker, but rather one of anticipation for future advances riding the heels of discovery from the study of sleep.

Bibliography


---

**Exercise and Adolescent Sleep**

Rumya S. Putcha, 16  
Clear Lake High School  
Houston, TX

Sleep is considered to be a mechanism for conserving energy and restoring body functions that are believed to deteriorate progressively during wakefulness. Recent reports suggest that sleep helps rid the brain of adenosine, which builds up during Wakeful hours. Everyday experience, as well as scientific evidence, indicates that people function best at different times of the day, and that these times vary from individual to individual (in an idiosyncratic manner). Some (i.e., night owls) function best at night, while others (i.e., larks) work best in the morning.

During adolescence, teenagers are reported to require a relatively long duration of sleep (i.e., approximately 8-9 hours) (1). However, recent studies of adolescent sleep habits demonstrate a pattern of decreasing total sleep time, a tendency to delay the onset of sleep, and an increased level of daytime sleepiness (2-6). The principal reason for these sleep decrements in adolescents is their daily schedule of required activities. For instance, school schedules in the U.S. often require earlier start times for teenagers than for pre-teens. Research shows that adolescents confronted with an earlier start to their school day do *not* adjust by advancing their time of sleep onset and undergoing a circadian phase advance. Instead, they maintain their normal time of sleep onset, resulting in a net decrease in total sleep time.

In an earlier study conducted with students from my high school, I observed that student-athletes have better sleep habits and daytime alertness than their peers. This finding suggests that regular exercise may contribute to better sleep habits and thereby offset some of the detrimental effects of inadequate sleep in adolescents.

In this project, I examined the effect of both the timing and type of exercise on (1) sleep hygiene, (2) circadian rhythms and (3) self-assessment of sleep quality and mood. Data was collected for 48 hours from nine students: 6 athletes with two different schedules for exercise (i.e., morning and afternoon) and 3 non-athletes without a daily exercise regimen. I assessed sleep quality and alertness using Monk's mood logs for self-assessment of mood. Lastly, I measured salivary levels of cortisol and melatonin, hormones whose levels peak during daytime (wake period) and nighttime (sleep period), respectively.

Results from my survey indicate that the average sleep duration for both exercise groups was similar (mean = 6.5 h for morning group, mean = 6 h for afternoon group). However, students who exercised in the morning recorded earlier bedtimes than those who exercised in the afternoon. While both groups rated their sleep quality as good (mean = 7.38 and 6.38, respectively, on a scale of 10), the subjects who exercised in the afternoon reported less alertness in the morning (mean = 3.0) than did their morning counterparts (mean = 5.5). These results correlate well with their self-assessment of mood: the afternoon exercise group reported greater weariness than the morning exercise group. Self-rating scores for calmness and happiness were similar for both groups. Interestingly, the sleep scoring data from actigraphy clearly indicated that, by contrast to both groups of athletes, the students who had no regularly-scheduled exercise regimen had the lowest sleep efficiency the longest sleep latency and the highest frequency of sleep interruptions (i.e., episodes of wakefulness during sleep).

With respect to hormone levels, athletes who exercised in the morning had higher daytime cortisol and nighttime melatonin levels than those who exercised in the afternoon. Melatonin levels peaked later in the morning (9-10 am versus 2-3 am) for
the morning exercise group as compared to their afternoon counterparts. Notably, these peaks occurred during school hours. Based on the times of their peak melatonin levels, the circadian rhythms appear to be delayed for the morning exercise group vis-à-vis the afternoon group (11.6 hours versus 2.1 hours after midnight, respectively). Due to small sample size, the contribution of age and gender to these differences could not be determined.

The effects of exercise on resetting circadian rhythms are poorly understood (8-10). Recent reports suggest that exercise and physical fitness may have beneficial effects without resetting circadian clocks. My results suggest that the timing of exercise (i.e., morning or afternoon) rather than the type of exercise (e.g., swimming, track or tennis) influences circadian rhythms and peak hormonal levels. Although students who exercise in the morning report greater alertness in the morning than those who exercise in the afternoon, the latter group maintains a wake-sleep schedule that correlates better with their hormone levels. This synchronization of schedules may benefit both their health and their performance in school activities, academic and extracurricular. Therefore, afternoon sports schedules may promote healthy sleep habits - and improve performance in school - by matching their circadian clocks to their daily schedules. This information may help students, parents and school administrators modify activities at home and school in a manner that will promote health, safety and performance/productivity, thereby improving the quality of life for adolescents and adults alike.

Bibliography


Power Naps: A Solution for Teenage Grogginess?

Jason Rusten, 15
Richard Montgomery High School
Rockville, MD

It is a common scene throughout the country, bleary-eyed high school students stumbling into first period classes after only sleeping for seven hours or less. Even by second period, many are still only half-awake and unable to concentrate and learn well. This early morning fatigue has prompted much discussion and research about sleep deprivation among high school students. Many people have suggested that teenagers should simply go to sleep earlier. However, the situation is far more complicated than it seems, and it cannot be solved by just an earlier bedtime.

Considerable research on the sleep patterns of teenagers has revealed some surprising facts. One of the most important is that melatonin, a hormone that regulates the body's circadian rhythms, is released about an hour later in teenagers who are 15 years old and older than it is in younger people (Weiss, 1997). This means that most older teens do not begin feeling sleepy until about 10:30 p.m. In contrast, younger adolescents
usually become drowsy at least an hour earlier. As a result, older teens complete their sleep cycles about an hour later in the morning than teens in their earlier years. Research also shows that one of the most important phases of a person's sleep cycle occurs in the final hours of dreaming, a stage called REM (Rapid Eye Movement) sleep. This cycle often ends about eight to nine hours after most older teens first fall asleep. Scientists say that completing this final stage of sleep is critical to feeling rested and alert in the morning, and for functioning at an optimal level. Therefore, if teens do not get to sleep till after 10:30 at night and wake up at 6:00 a.m. or earlier for school, it is likely that they will not get sufficient REM sleep and suffer the symptoms of sleep deprivation. One of the reasons that high school students are so groggy in the morning is that school schedules prevent them from completing the final stage of sleep.

Other research demonstrates that contrary to popular belief the amount of sleep needed by teenagers does not decrease as they get older, but remains fairly constant (Lombardi, 1997). Experiments carried out by Dr. Mary Carskadon that allowed high school students to sleep as much as they wanted showed that they slept for an average of nine and a quarter hours. Dr. Carskadon concluded that, while getting that much sleep is impossible for most students, they should at least be allowed to sleep eight hours a night. Unfortunately, eight hours of sleep a night is a luxury that high school students who seek to do well in school cannot afford, and most school schedules conflict with their natural circadian rhythms.

These findings have prompted school districts to consider changing their schedules to allow high school students to get more sleep. However, rearranging schedules raises several problems. If high schools and middle schools start later in the morning, students in elementary school may need to catch their buses while it is still dark. Parents of these younger students may find this arrangement objectionable. Furthermore, many high school students participate in extracurricular activities or have part-time jobs after school, and may find it difficult to keep these schedules if their schools ended later in the day. These issues make it unlikely that most school districts will rearrange their schedules any time soon, leaving the problem of teen-age sleep deprivation unsolved.

One solution that may help teens contend with getting less sleep is napping. Most high school students may laugh at the thought of taking naps and dismiss it as babysish. However, naps are becoming increasingly popular in the modern workplace (Markels, 1995). Many workers feel drowsy in the mid-afternoon, and scientists have discovered that the body's sleep cycle includes a period of mid-afternoon sleepiness. Several studies have concluded that mid-afternoon naps can be very beneficial in restoring alertness, creativity and productivity (Bohner, 1994). Some sleep scientists are now advocating power naps, short naps from 10 to 30 minutes in length, as a method of coping with sleep deprivation.

Some employers have even gone so far as to offer their workers a place to take short naps, and consultants say that this increases productivity and creative energy (Curry, 1997). In fact, several prominent people through out history, including Thomas Edison and Winston Churchill, used power naps to compensate for lack of sleep. Research has shown that short naps can greatly increase reaction time, which is critical for certain professions such as airline pilots (Markels, 1995). Improved reaction time could also be very beneficial to high school students who drive. The benefits of power napping are such that it could be used to help teenagers cope with sleep deprivation. Through effective education programs about the importance of getting enough sleep and how to cope with insufficient sleep, schools may be able to encourage students to take power-naps after they arrive home from school. By emphasizing that professionals in high-tech workplaces practice napping, students may be more willing to make powernapping a habit at an early age. Such education programs, however, should stress that even though naps can restore short-term stamina, power naps are not a substitute for sufficient sleep. While power naps do not solve the causes of sleep deprivation, they can become a way for sleepy teens to cope with a lack of sleep when homework demands and difficult schedules do not accommodate their biological clock.

Bibliography


"Good Monday morning! Rise and shine sleepy heads! It's 5:30 and time to get up and start another week," the radio broadcaster cheerfully reports.

"It's too early!" I whine to myself after rolling around on my fluffy, cozy bed for a few minutes. Slowly I drag myself into the brightly lit kitchen. Squinting my eyes from the glow, I see my mother.

"Good morning, Sunshine!" she almost sings in an annoyingly joyful voice.

As I sit down at the table I ask myself, "Why are my mornings so miserable? Why can't I get up and be as cheerful as Mom?"

At school it isn't much better. The 7:30 bell has just rung, and students are settling into their desks getting ready for first period. Already some classmates have their heads down on their desks. Throughout the morning at least two students in each of my classes have begun to nod. What could be the cause of their sleepy behavior? Even I have found myself drifting off in a few of my early classes. It's not that I intend to close my eyes; I love to sleep but not during my classes. Some of my classmates who strive to maintain a high academic record have found themselves struggling to stay awake in Calculus and Chemistry, classes in which we can't afford to fall asleep. So why are teenagers having so much trouble waking up and struggling to stay alert during the day?

With my school's science fair coming up, my project and question became "Sleep and School Performance: Is There a Connection?" Using Webster's definition that sleep is "a natural, recurring condition of rest for the body and mind" as a basis, I engaged in research. A review of the literature shows that some studies support the presence and impact of teenage biological clocks (Herzog); others compare alertness and ability to comprehend at different hours of the day (Lawton). Yong and Ewing report that the preferred learning time for culturally-diverse, gifted students internationally is later in the day and evening. Student columnnist Ari Behar writes that

"about half of all students sleep five to six hours per night. About 43% sleep seven to eight hours, and 9% sleep four or less hours. Overall, approximately 78% of high-schoolers get less than seven hours of sleep on school nights. Only 23% of the students are satisfied with the amount of sleep they get! Eighty percent of the students who sleep seven to eight hours or less find this to be insufficient. The result is that students cope with insufficient sleep on school nights by oversleeping on weekends."

Can "binge sleeping" really be healthy? Numerous scientific studies have concluded that poor sleeping habits are unhealthy for teenagers. It disturbs their biological clocks and can even stunt growth. Even more problematic, when students are tired, they cannot comprehend well. It's hard to concentrate at school after several nights of only five or six hours of sleep. As students progress through high school the problem only gets worse. The amount of homework and responsibilities increase. After-school jobs and extra-curricular activities take up the majority of afternoons and evenings, and when teenagers get home, hours of homework await them. These factors contribute to a decrease in sleep, and studies indicate that a problem lies within such a schedule. Adolescents, by their biological nature, go to sleep late and wake up late. Beginning school at 7:00 or 8:00 in the morning cannot change that nature. Five o'clock is just too early to wake up for teenagers who manage to go to sleep at midnight. What would happen if adults were required to wake up by 5:00 in the morning in order to be at work on time? In reality, the public mandates that high school students do just that! It sends them to school on buses at 6:45 to start classes at 7:15 in the morning! Teenagers go to school extremely tired, and educators give them trigonometry by 7:30! Learning style researchers suggest that high schools could start later -- 9:00 or 10:00 A.M. instead of 7:00 or 8:00 A.M. -- to better address the physiological factor of time of day for optimum learning (Dunn; Greigg and Dunn). In fact, scientists concur that lack of sleep can lead to loss of creativity, lower test scores, inability to focus, irritability, and depression.

Following my investigation of the literature, I designed a survey (Appendix A) and conducted my own behavioral science study by randomly surveying 100 high school students to determine if there is a correlation between sleep and school performance. Students define sleep using positive terminology (see Appendix B). The data show that 66% of students polled think that school starts too early. Of those who believe school is too early, almost 20% are not involved in any school activities. However, over 80% are involved in after-school and work activities, so sleep suffers, with 91% of those surveyed stating that they are able to get less than eight hours of sleep.
per night. There is a positive correlation between more hours of sleep and involvement in school activities.

In conclusion, commonalities exist between the scientific research and my study. High school students need nine or more hours of sleep each night, but present conditions make the necessary sleep impossible. Further, since performance is affected by lack of proper rest, attention should be given to flexible school schedules to accommodate optimum learning opportunities for teenage students.

Since completing this study, I still dread the radio broadcaster blasting away my dreams into a sluggish reality each weekday morning, but I harness all my energy to focus on the school activities ahead. I know that the weekend will have to provide sweet, essential sleep, for as Homer eloquently expressed, "There is a time for words, and there is a time for sleep".

Bibliography


Appendix A: Sleep Survey

Please fill out completely and return to your teacher.

1) Circle one: Male  Female

2) To me sleep is ...

3) I am involved in ___ school activities (sports, clubs, etc).
   a. 0   b. 1-2   c. 3-4   d. 5+

4) I need ___ hours of sleep a night.

5) On the average, during a school week, I get ___ hours of
   sleep a night.

6) I usually get to sleep at ___ on a school night because ...
   (time)

7) I think school starts ___.
   a. too early   b. at the right time   c. not early enough

8) I think school should start at ___ because ...
   (time)

Appendix B: Selected Responses

Sleep is ...

"the best thing in the world"
"something I like to do"
"a blessed event - when it occurs"
"vary rare"
"one of the important things in life"
"important - VERY important"
"VITAL!!!!!!"
"the BOMB!"
"essential - I learned that in psychology class"
"what you get during government class"
"GRAND!"
"something I don’t get enough of"
"just something you gotta do!"
"more important than money, less important than my Nintendo 64"