Dr. Michael J. Sateia, Director of the Sleep Disorder Center, is commonly known for his research regarding sleep and sleep disorders. He joined the clinical staff at Dartmouth-Hitchcock Medical Center in 1979 after receiving his degree from Duke University and completing his residency at DHMC. Dr. Sateia has studied a variety of sleep related issues, including insomnia, disruptive sleep apnea, and, more recently, education about sleep disorders. DUJS sat down with Dr. Sateia to discuss the Sleep Disorder Center, his personal research, and other matters of sleep.

SAH: What was the intended purpose of the Center for Sleep Disorders when it was first founded? Was it supposed to be more clinical or research based?

MJS: It was both. The person who founded this was my mentor, Peter Hauri is one of the grandfathers of sleep medicine and started the clinic here in 1971. At that time, there was almost nothing happening in sleep outside of the University of Chicago. He had a great interest in insomnia and insomnia research. So he began the clinic as both a clinical evaluation service and a research program. At the time, insomnia was sort of the “big ticket,” and we had not even identified the disorder that we know see most often, which is sleep apnea. Gradually, the clinical element of the clinic grew. I came on board when I was finishing my training in 1979, and in those days if we saw 2 or 3 clinical patients a week, it was a big deal. Now, we can run up to 40 or more studies per week. It’s become a large clinical enterprise and continued to foster research in different areas as well.

SAH: What about sleep apnea draws you to its study?

MJS: Well, sleep apnea is a very common condition and it really was not identified for all intents and purposes until the last couple of decades. At least that’s the period of time in which we’ve begun to recognize what a common clinical problem this is, and to treat it. This affects 4-5% of middle aged males and probably 1-2% of females. It is a very debilitating problem in that the people that we see can be profoundly sleepy. It’s like you’re dragging yourself through quicksand 24 hours a day, or whatever your waking time is. They often are depressed, they’re irritable, it affects their relationships, they sometimes lose their jobs, they are at major risk for motor vehicle accidents because of falling asleep at the wheel, they are at risk of killing other people through that mechanism as well. They also are at risk for some serious heart and circulatory system problems that can complicate sleep apnea. The other thing that’s exciting about sleep apnea is that we have some treatments that are not the most comfortable treatments, but they are very effective treatments, and you can almost overnight have an enormous impact on the lives of these people, and so it’s a very gratifying problem to treat. One of the areas of scholarly pursuit that I’ve been most involved with in the last 5 years is education and educational research. My interest in that comes from the fact that we are a relatively new discipline. Sleep has been splashed on the cover of Time and Newsweek more than once, but still physicians who are in practice today, by and large, did not gain exposure to sleep apnea or other sleep disorders, and therefore their level of recognition of these problems in the patient population is not what it should be. So we are looking at ways of trying to improve education, to develop new educational technologies that will be effective in training both medical students and practicing physicians, and of testing those technologies.

SAH: Do you find that most of your treatments are more symptom- or problem-based?

MJS: We are always trying to treat the underlying problem. In the case of sleep apnea, we are looking to correct the obstruction that is occurring. Specifically, most of these people have apnea because their airways close during sleep. Another area in which this is important is insomnia. Symptomatic treatment for insomnia is still the most commonly applied treatment, in the form of sleeping pills: you don’t sleep so you get a pill that makes you go to sleep. The problem is that that really doesn’t address the underlying mechanism, because insomnia is a symptom, not a diagnosis.

SAH: How can students who expect to be fatigued due to lack of sleep tell the difference between chronic excessive daytime sleepiness and just regular fatigue?

MJS: We want people to distinguish between sleepiness and fatigue because fatigue is a very broad concept and people get tired for a lot of reasons: psychiatric illnesses are fraught with fatigue as a very common complaint, medical illnesses, the same, neurological problems, the same. And so when somebody says “I’m fatigued”, the explanation for that are as big as the great outdoors. Whereas, if someone specifically has sleepiness, and what we mean by that is the tendency to become overwhelmingly drowsy and/or
involuntarily doze off, usually in relaxed or sedentary situation, then there is a much more well defined and specific set of causes for that. In the college population, by far, the most common cause is sleep deprivation. When you look at the population from late adolescents through early adulthood, from 15 to 25 or 30, that population of individuals, when you put them in the laboratory and you test them, are extraordinarily sleepy. Even as a normal group, we’re not talking about people identified with sleep disorders. We still are not entirely clear on why that is, but it’s probably the combination of the fact that the sleep need in that population has not gone down as much as one might think. Once you get into adolescence, usually sleep time drops down to the usual average adult time or less, but in fact the sleep need may still be higher than that. The way that you can tell whether it’s true sleepiness is the specific tendency to get drowsy and to involuntarily doze off or to require frequent napping. And the way that you can put to the test whether or not that is simply a matter of sleep deprivation is to extend your sleep time for a period of a week or two weeks, which is incredibly difficult for people to do.

**SAH:** Is it okay for sleep for longer periods on weekends to make up for sleep deprivation during the week, or is it more important to keep a fixed sleep schedule?

**MJS:** The ideal, of course, is to get enough sleep on a fixed schedule every night. Having said that, and recognizing that that isn’t going to happen for a lot of people, of course, making up for lost time on weekends is better than not making up for it. Napping can be a helpful behavior. Napping is restorative if you are sleep deprived. Napping will improve your cognitive and motor functions for at least a period of time. One danger we see with the schedule business, though, is that we see some individuals, in which staying up late and then sleeping in runs amok, and then what happens is that these individuals may develop what’s called a delayed sleep phase syndrome, in which their biological clock is shifted toward a delayed time, and they are no longer able to fall asleep even when they would like to.

**SAH:** Is it unhealthy to use sleep aids to help fall asleep and then using stimulants to help stay awake?

**MJS:** We would consider that to be not a very viable long term approach. That would be one of the worst examples of symptomatic treatment. At an over the counter level, people can get into the over-the-counter sleep aids and then the Red Bull in the morning, that just is not a satisfactory approach. You are running fundamentally contrary to your biology, there is a price to be paid.

**SAH:** Is there a long term effect for a prolonged sleep debt? Does it come to a point where you cannot make it up anymore?

**MJS:** I don’t think we know the answer to that question. In general, we do believe that sleep debt can be made up and in fact can be made up within a couple of days. There are bits of evidence that suggest that there may be some long range health consequences. For example, there is evidence that individuals who chronically sleep significantly less than average, or those who sleep chronically more than that have increased mortality rates. So there is a sense out there that chronic undersleeping or oversleeping can be bad for your health. However, there are a couple of things to keep in mind. One, in this population, motor vehicle accidents are a significant cause of death, and sleepy students are at risk for this, and certainly death in a motor vehicle accident is a pretty irreversible consequence of sleep deprivation. Also, there is no question about the fact that concentration, attention, learning, retention, physical/psychomotor function are all impaired with sleep deprivation.

**SAH:** Does that mean people who chronically do not sleep enough can actually shorten their lives by years?

**MJS:** Yes. This is based on very vague epidemiologic studies. This came out last year, it was published by a colleague of ours who has done decade long epidemiology research, looking at the mortality rates, specifically this was done in relative of cancer victims through the American cancer society. One of the things he did simply
was to divide the population into three groups: those who slept in the average window, those who slept chronically less than that, those who slept chronically more than that, and the two extremes had higher mortality rates, I mean, their life expectancy was less than the middle group. Again, there are many, many complicated variables there, so exactly how one interprets that statistics is still open to much debate.

SAH: A lot of sleep disorders are caused by physiological problems, and a lot are psychosomatic in nature. How do you decide which ones are more relevant to study?

MJS: It depends on the disorder. When we are talking about obstructive sleep apnea, we are very obviously focused on the physiological problems, because it is in many respects a mechanical problem: it’s an airway obstruction. Whereas in insomnia, for example, we know that probably about 40 percent of chronic insomnia is associated with depression and other psychiatric illnesses. We know that another 15 or 20% is related purely to the sort of learned or conditioned insomnia, and so there we are much more focused on the behavioral issues, both in terms of the diagnosis, as well as in terms of treatment. However, it’s not a black or white thing. Because we also want to educate physicians that not all insomnia is behavioral. There are underlying medical problems occurring in sleep that may also cause insomnia. And in the case of the sleep/wake schedule problems, that’s a marriage of the two.

SAH: What is your research focus right now?

MJS: What I’ve been working on mostly in the last five years is educational research on an NIH grant, what’s called a Sleep Academic Award. One of the parts of that is that we have developed a course in sleep physiology and sleep medicine within the psychological and brain sciences in which (we) are trying to educate Dartmouth undergraduates about this area.

Dr. Greeno and I work with a local corporation, and that work is focused on assessing sleepiness, trying to develop new technologies for objective assessment of sleepiness. Normally what we do is we bring in individuals to the laboratory, if they have a sleepiness problem, we look at their sleep overnight. If there is no explanation for why they are sleepy, when then ask them to stay them the next day. We put them in bed, they are wired up, we darken the room, ask them to lie down and close their eyes and relax, and we measure how long it takes them to fall asleep, that’s called the multiple sleep latency test. However, that is a cumbersome test, it takes all day to do, and also, it is subject to a lot of “noise.” For example, if they just got an upsetting phone call before their third nap, they may be in a very awed state, they are not going to go to sleep, or if it starts snowing and they are worried about their safety on the highway. This project has been devoted to trying to find another objective measure of sleepiness, and specifically what it’s involved in is measuring the central processing time for an invoked potential response. So these individuals sit at a computer, then they are given a sensory stimulant, in this case a tone or something on a screen, and every once in a while, a stimulus pops up that is different from the others, and they have to signal. What we are doing is measuring the amount of time that it takes for the response from detecting the stimulus to when they press that button. And there is a part of that that you can isolate that is the central processing time. And we think that there may be a correlation between that and sleepiness.

SAH: How close are we to fully understanding all of the physiological aspects of sleep?

MJS: Well, I don’t think it’s going to happen anytime in my lifetime or yours. We have made amazing advances in the last several decades. You have to remember, REM sleep, everyone has heard of rapid eye movement, that was just discovered in 1953, that’s not very long ago, and that’s one of the most basic things that we understand about sleep. It really has just been in the last handful of decades that we’ve learned what we’ve learned and we know a lot now, but we’ve just scratched the surface. We don’t understand, at a fundamental level, what the purpose of sleep is. It’s going to be probably decades before we really understand even that most fundamental question. There is a bright future in sleep research for undergraduate and graduate students now because there will be intriguing questions to answer for decades to come.

Faculty: have an undergraduate working in your lab? Has a student of yours produced an especially well-written class paper?

Encourage him or her to submit to the DUJS.