What causes autism, a neurodevelopmental disorder that now affects 1 in 150 children in the United States? Although studies suggest a strong genetic basis, scientists are also looking into possible biological and environmental origins, and among the most fascinating areas under investigation is the link between the immune and nervous systems. Researchers are exploring whether changes within the developing immune system could compromise nervous system development and ultimately lead to such disorders as autism.

UC Davis researchers are at the leading edge of this field of inquiry, spurred on in large part by the synergy created when the M.I.N.D. Institute began supporting scientists from varying backgrounds to work on related problems.

For instance, Kimberley McAllister, and Judy Van de Water, basic scientists at UC Davis’ Center for Neuroscience and M.I.N.D. Institute respectively, are working on complementary aspects of the immune system-autism question. Their M.I.N.D. Institute-funded studies are creating a unique set of parallel building blocks that could well lead one day to a definitive explanation of a potential contributor to autism.

“The synergy between the outstanding basic science research at the Center for Neuroscience and the translational focus of the M.I.N.D. Institute helps basic scientists like me to design their experiments in a way that maximizes the potential for understanding disease,” explains McAllister, an associate professor who began her academic studies as a medical student before getting hooked on basic science and switching tracks, ultimately earning a doctorate in neurobiology from Duke University in 1996.

A focus on MHCI

McAllister’s laboratory studies how synapses, the points at which impulses pass from one nerve cell to another, are initially formed and are subsequently altered by experience. She believes that environmentally triggered changes in certain immune system molecules within the developing brain could interact with genetic factors to cause several neurodevelopmental disorders, including autism.

She and her team have recently received grants from Autism Speaks, a nonprofit funding biomedical autism research, and the M.I.N.D. Institute to test this idea. The rationale behind this theory is:

• MHCI (short for “major histocompatibility complex I”) molecules mediate the adaptive immune response.
• MHCI molecules are present in nerve cells, or neurons.
• It’s possible that changes in MHCI in developing brain neurons contribute to autism by altering the way that synapses develop.
• Those changes in MHCI are typically triggered by environmental factors or an immune response.
• Environmental factors (such as an immune response) may alter synaptic connectivity in the developing brain.
• Rather than impact MHCI directly, environmental factors affect MHCI through cytokines, proteins that regulate intercellular communication within the immune system.

(continued page 2)
Exploring links (from page 1)

- Several cytokines have been found to be up-regulated, or overly active, in the brains of children with autism.
- Perhaps these cytokines alter synaptic connectivity in the developing brain by altering MHCI levels, and those alterations in turn contribute to autism.

“This is an exciting but as yet untested hypothesis,” she explains, “If it proves true, then understanding the role of immune molecules in normal brain development generally, much less their role in such disorders as autism. But the tools are now available to make rapid progress in this area.

“The science of brain development is remarkable. It’s amazing how environment and experience physically change the connectivity of the brain,” she says. “Ultimately, the goal of my research is to try to understand just how that happens.”

**Autism and antibodies**
Van de Water and her team are investigating biologic mechanisms of the immune system in relation to autism, focusing on both the blood factors and cells that are involved in a healthy immune response.

For example, they are currently analyzing an antibody subtype that’s responsible for the majority of the immune response to invading pathogens. Called immunoglobulin G, or IgG, its levels are much lower than normal in children with autism. This indicates problems in proper signaling of cells to produce certain proteins or factors, potentially rendering these children more susceptible to infections.

“Indeed, this tells us that there is likely something wrong in communication among cells within the developing immune systems of these children,” says Van de Water, who is also a professor in rheumatology, allergy and clinical immunology. “It may be a very basic cell-signaling pathway problem – that is, cells are not being signaled correctly to produce needed amounts of IgG.”

Her further work has led to the identification of IgG antibodies to human brain proteins as a potential marker of autism, an important development in light of the dearth of biological diagnostic tools or therapeutic targets for this disease. In this case, children with autism appear to have very specific antibodies to proteins in the brain, which may indicate damage to that region of the brain.

**Vaccines and autism**
Van de Water began her academic career pursuing a bachelor’s degree in biological sciences at UC Davis. An internship in an immunology lab there so intrigued her that she decided to specialize in the field, eventually earning a Ph.D. in immunology in 1988. Her specialty is autoimmunity, a condition in which the immune system starts reacting against an individual’s own body.

“Until the late 1990s, researchers investigated autism primarily from the viewpoint of behavior and genetics, not biology. Then came MMR,” she explains, referring to a live viral vaccine against measles, mumps and rubella (MMR) that was implicated as a cause of autism in a controversial 1998 study. The M.I.N.D. Institute issued a call for projects that might shed light on the question. Van de Water signed up and she has been with the institute ever since.

*The science of brain development is remarkable. It’s amazing how environment and experience physically change the connectivity of the brain."

— Kimberley McAllister, Ph.D.

Her studies found that antiviral responses are fairly normal in people with autism – but antibody responses to vaccines against bacteria were lower than expected. This suggests that the problem may lie in the way that invading pathogens are processed.

Today, her goal is also to study what happens during gestation that may affect neurodevelopment, including whether the mothers of children with autism have autoantibodies to fetal brain proteins.

“Through the years we’ve learned that many children with autism don’t have healthy immune systems. We are attempting to answer questions such as, ‘Why do they have such dysfunctional systems?’ and ‘To what extent is the dysfunctional immune system linked to abnormal brain development?’” she says.

Developments in the field are moving fast. As M.I.N.D. Institute Research Director David Amaral explains, “While the brain was long thought to be an immunologically ‘privileged’ part of the body, meaning devoid of an immune system, we now know that the immune and nervous systems are intimately interconnected.”

He adds, “The M.I.N.D. Institute is proud to support cross-disciplinary researchers of the caliber of Drs. McAllister and Van de Water as they further unravel such mysteries to advance an understanding of all the causes of autism.”
Animal models crucial to unraveling autism mysteries

In fascinating studies supported by the UC Davis M.I.N.D. Institute and the National Institutes of Health, two UC Davis researchers and their teams are taking different, yet parallel, paths in the urgent task of uncovering the causes of autism.

While one researcher has already learned a great deal about potential triggers of autism by exposing rhesus monkeys to autoantibodies (antibodies that attack one’s own cells), the other is now embarking on the same type of study using mice.

In new studies, one uses the rhesus monkey animal model to study potential triggers of schizophrenia and the other uses mice models to look at potential causes of two neurodegenerative, gene-linked diseases, FXTAS and Rett syndrome. They hope that by learning the causes of these diverse diseases they’ll also learn more about the causes of autism, as each disease shares subtle similarities with autism.

Animal models

It’s no accident that these studies feature animal models. As these researchers are quick to point out, almost every major medical advance of the last century is due to research with animals.

M.I.N.D. Institute Research Director David Amaral explains, “Animal research is an important component of our program, helping us make significant progress in understanding autism’s causes and potential cures. To move from hypotheses to clinical treatments, it’s essential that appropriate animal research be carried out.”

Adds neurological surgery professor Robert Berman, “We rely on animal models to test hypotheses about the causes of autism and related disorders. Mice, for instance, have life spans of about two years, enabling studies over the lifetime of the animal. We can study mice with specific genetic mutations, allowing us to model certain neurodevelopmental disorders.”

“We already know a great deal about brain development and behavior in these animals and can therefore examine how development can be altered by genetic mutations, exposure to environmental toxins or immune system dysfunction.”

Antibodies from mother to child

Amaral has just completed a study building on work by M.I.N.D. Institute researcher Judy Van de Water. She has investigated whether the mothers of children with autism have abnormally strong immune responses to proteins in the fetal brain, and, if so, what role might such antibodies play in the development of some cases of autism.

Her team has zeroed in on immunoglobulin G, or IgG, an antibody subtype that’s responsible for the majority of the immune response to invading pathogens. About 20 percent of women who have had a child with autism have abnormal IgG antibodies that interact with the fetal brain, while women of typically developing children do not have these antibodies. This has raised the possibility that some autism (continued page 4)
may be caused by the interaction of these antibodies with the developing fetal brain.

“We’ve tested the autoimmune development hypothesis by using the rhesus monkey model, injecting pregnant monkeys with human IgG and observing their offspring for one and one-half years,” explains Amaral, a professor of psychiatry and behavioral sciences whose work has just been accepted for publication in the journal *Brain, Behavior and Immunity*.

Other monkeys were injected with IgG purified from mothers of typically developing children and some monkeys were left untreated.

“This was an incredibly long-shot experiment since millions of things outside of our control could have caused failure,” says Amaral.

Rhesus monkeys were chosen because, unlike other animals, there are no areas of the human brain that cannot also be found in this species. In addition, more than any other lab animal, rhesus monkeys use facial expressions and body posture to convey social intentions, an important characteristic for autism studies.

As Amaral explains, “the social repertoire of monkeys is very broad, in many ways approaching that of humans, making it ideal for the analysis of both normal and pathological human social behavior.”

The study’s findings were striking. Working at UC Davis’ California National Primate Research Center, Amaral’s team found behaviors in the offspring that resemble autism spectrum disorder symptoms. Called profound stereotypies, they include constant pacing, repeated backflips and hyperactivity.

He notes that this is one of the first examples in autism research where a study has gone from a clinically suggested hypothesis to actual testing of a cause of a neurodevelopmental disorder.

Exciting as this work is, Amaral is insistent that it must be replicated in a larger, more comprehensive study.

“Obtaining funding for the follow-up work has been difficult since it is not yet accepted that the immune system plays a role in autism – but we are hopeful that publication of our findings will support our grant applications,” he says.

If the findings are confirmed, the logical next step will be clinical protocols derived from these studies, such as blood tests isolating IgG as a diagnostic marker and developing strategies for removing this risk factor from pregnant women.

Berman, director of the UC Davis Neurotrauma Research Laboratory, is working with M.I.N.D. Institute researchers Isaac Pessah and Van de Water to test the same hypothesis in mice models. They’re injecting human IgG from mothers of children with autism into pregnant mice to see if there is a toxic effect on brain development and consequent changes in complex cognitive function in the offspring.

**A link to schizophrenia**

Amaral recently began a study in collaboration with California Institute of Technology colleague Paul Patterson to test the theory that women who have an immune response to a virus in the second trimester of pregnancy are at increased risk of giving birth to a child with symptoms of schizophrenia or autism. Last fall, Patterson published a *Journal of Neuroscience* paper showing this to be true in mice, and now Amaral and colleague Melissa Bauman will be working with rhesus monkeys to determine if the same phenomenon is true in primates.

In the earlier mice study, Patterson’s team triggered an artificial immune response in pregnant mice, in effect giving them a faux case of the flu. The trigger they used was a snippet of double-stranded RNA called polyI:C, which fools the immune system into thinking that there has been an infection by an RNA virus. Amaral and Patterson are currently following the same tack, having received a grant from the Simons Foundation to replicate Patterson’s mouse studies in the monkey model.

“The hypothesis is that the mother’s immune response interacts with the fetal brain, leading to such behavioral abnormalities as schizophrenia or autism,” explains Amaral, Ph.D.

“The hypothesis is that the mother’s immune response interacts with the fetal brain, leading to such behavioral abnormalities as schizophrenia or autism.”

– David G. Amaral, Ph.D.

**A connection to FXTAS**

Berman is looking into the causes of two diseases that share symptoms with autism: fragile X-associated tremor/ataxia syn-
FXTAS typically affects men over age 50, causing tremors, balance problems and dementia, all of which progressively worsen over time. It’s caused by a change in the fragile X gene, called the FMR1 gene, on the X chromosome.

The section of the FMR1 gene involved in fragile X is called the promoter, and it contains a specific pattern of DNA (the molecule that makes up genes) called a CGG repeat. A normal FMR1 gene contains about 10 to 50 CGG repeats; individuals who have a fragile X premutation have about 55 to 200 CGG repeats and develop FXTAS, while those with a full mutation have over 200 CGG repeats and develop the fragile X mental retardation syndrome.

Working with Paul Hagerman at the M.I.N.D. Institute and consortium investigator Rob Willemsen at Erasmus University Medical Center in Rotterdam, Berman’s lab is funded to study mice with a very similar mutation on the FMR1 gene to that found in human patients with FXTAS.

“Our ultimate goal is to develop new treatments to halt or reverse FXTAS, including pharmacological treatments and gene-targeted therapies, for which these mice are ideal,” explains Berman. “There is now evidence that some young males with the FXTAS premutation also show autism-like behaviors, so, by understanding this disease, we hope to learn more about autism as well.”

A link to Rett syndrome

Rett syndrome is a childhood neurodevelopmental disorder characterized by normal early development followed by such autistic-like behaviors as distinctive hand movements and abnormal social behavior. Other symptoms include loss of use of the hands, slowed brain and head growth, gait abnormalities, seizures and mental retardation. It affects females almost exclusively.

“We are using a mouse model of Rett syndrome, a disorder that’s associated with mutation in another fragile X-linked gene, MeCp2,” says Berman. Mice with a mutation on this gene display many of the symptoms of Rett syndrome.

“In collaboration with Janine LaSalle from the Department of Medical Microbiology and Immunology and Isaac Pessah, we’re seeking to understand whether early exposure to such environmental toxins as PBDEs might contribute to neurodevelopmental disorders.”

PBDEs, short for polybrominated diphenyl ethers, are found in flame retardants used in a wide array of household products, including fabrics, furniture and electronics.

The hypothesis, Berman points out, is that certain gene-environment interactions may underlie or increase the risk to humans of having neurodevelopmental disorders such as autism.

“We are interested in understanding how exposure to such environmental toxins as PBDEs and mercury early in development may disrupt the brain and possibly result in neurodevelopmental disorders,” he says.

“By using genetically modified mice modeling FXTAS and Rett syndrome, we can understand the underlying cellular mechanisms that result in these disorders and test new therapies that can halt progression. Our hope is that much of what we learn can be applied to autism as well.”
As an undergraduate student at Rutgers University in the 1980s, Stephen C. Noctor had to take a course called ‘Conditioning and Learning’ to get his bachelor’s degree. Part of the charm was the enthusiasm of the professor, Charles F. Flaherty, an authority on learning and memory who died of cancer in 2004. But the subject matter, which included instruction in the nuts and bolts of brain anatomy and brain chemistry, was the real draw.

“It was where I first learned about brain cells and neurotransmitters,” recalls Noctor, a 43-year-old neuroscientist who joined the M.I.N.D. Institute in July. “It completely turned me on.”

Noctor ended up volunteering in Flaherty’s laboratory for two years while he completed his undergraduate studies, a time during which he “learned how laboratory science was done.” Then in graduate school, at the Uniformed Services University of the Health Sciences in Bethesda, he supplemented his neuroscience training with medical courses.

From a young age Noctor had shown signs of a scientific turn of mind. “I liked taking things apart to see how they worked,” relates Noctor, who grew up in New Jersey. “I started with clocks.”

So it shouldn’t be surprising that Noctor, who earned his doctorate in neuroscience in 1998 and then did a five year post-doctoral stint at Columbia University in New York, would become an expert in the inner workings of what might be thought of as the ultimate machine – the human brain.

Noctor’s area of expertise has to do with the explosion in brain cell production that takes place over a relatively short period of time during development of the cerebral cortex. In particular, he investigates the factors that control proliferation of the precursor cells that produce cortical neurons and glia, and how cortical cells migrate to reach their appropriate position.

Given their tiny size – on the order of 5 microns – the distances these cells travel within the developing brain are vast. “It’s the equivalent of climbing the Empire State Building four times,” Noctor said. And the newborn cells do climb – on the scaffolding provided by a type of neuronal precursor cell called radial glial cells that Noctor has identified through his research.

“We used to think the newborn neurons just went from point A to point B,” he says. “But we now know that there are important staging areas where the migrating cells stop and wait to receive information about what to do next.”

Complex signaling pathways regulate this extraordinary process of cell production and migration. And, not surprisingly, a number of neurological disorders result when things go wrong.

Sometimes cells go to the initial staging area and, for unclear reasons, fail to move further. Abnormal cell migration can lead to conditions like double cortex syndrome, a rare disorder which can cause mental retardation and epilepsy and is due to a misplaced layer of nerves that develop under the cortex. Lissencephaly, a disease characterized by a lack of brain folding that leaves its victims severely compromised, occurs when too few cells are produced. Noctor said autism may be caused by deficits in the proliferation process.

Noctor is hopeful that the great strides that have been made in brain research in recent years, advances that he said are due to the “molecular biology revolution” and breakthroughs in genetics, will eventually lead to treatments for such conditions.

“In the last 10 years, we’ve learned more about the brain than in the previous century,” Noctor says.

That’s not to say he and other neuroscientists don’t have a lot left to learn. “The brain is still a black box. There are so many questions that remain unanswered.”

Maybe that explains why Noctor seems just as excited about neuroscience today as he was when he took that undergraduate course at Rutgers back in the 1980s. “Science is both my job and my hobby. It sounds geeky, but I spend most of my spare time in the lab.”
Neuroscientist studies consciousness and brain function

While Clifford Saron does not set aside a period of time each day to meditate, his commute between home in Marin County and work in Davis and Sacramento – an hour-plus each way – gives him the opportunity for, if not relaxation, at least reflection.

“I’m a road yogi,” quipped the 54-year-old Saron, who specializes in using electrophysiological and behavioral methods to study sensory integration and the training of attention skills. Among other things, he is presently directing a large study examining how intensive mental training techniques such as meditation can influence cognitive flexibility, a variety of attention-related skills, emotion regulation and biomarkers of stress.

A recent addition to the M.I.N.D. Institute, Saron has been a researcher with UC Davis’ Center for Mind and Brain since 2002. He dates his fascination with the organ between our ears to his middle school years, when he first began to wonder “how mind arises from matter.”

Aside from his father, an electrical engineer with interests in consciousness, one of this New York native’s early influences was David McClelland, a prominent personality and social psychologist who died in 1998 and whose teachings Saron became exposed to while an undergraduate at Harvard. At Albert Einstein College of Medicine, where he was a graduate student, Saron found another mentor when he became a student of the neuroscientist Herbert Vaughan, a pioneer in the field of sensory and cognitive electro-physiology.

“Vaughan developed methods to approach estimating where in the brain signals were coming from,” said Saron, who recalled his years as a student as a “heady” time. “There was beginning to be a sense that tools and techniques were becoming available to investigate aspects of conscious and unconscious processing in the brain.”

Saron would go on to use some of those methods – many (up to 128) electrodes attached to the scalp to detect brain activity, response time measurements to auditory and visual stimuli – in a variety of research efforts, including studies that assessed the extent to which the left and right hemispheres of the brain were integrated and what might result from deficits in such integration.

In a 1992 paper, Saron and Richard Davidson, a professor of psychology and psychiatry at the University of Wisconsin in Madison (with whom Saron worked closely for 14 years) known for his work on the neural substrates of emotion and emotional disorders, identified a subgroup of dyslexic individuals who exhibited problems in inter-hemispheric communication. And in his 1999 doctoral thesis, Saron, on the basis of stimulus response data gathered from electrodes attached to the scalps of research subjects, concluded that the two halves of the brain were highly interdependent for a task that most researchers thought involved only one side of the brain.

“I was able to show that both sides of the brain were active before research subjects responded to a visual stimulus that initially only projected to one side of the brain,” Saron said. Noting that there are some 250 million connections in the corpus callosum, the structure between the two hemispheres, Saron said “there’s lots of evidence that mental function is not so neatly lateralized” as had once been thought.

At the M.I.N.D. Institute, Saron is taking part in the Autism Phenome Project, the largest and most comprehensive assessment of children with autism ever attempted. It aims to distinguish among recognized subgroups, or phenotypes, of autism. It will link these different forms of autism with distinct patterns of behavior and biological changes.

(continued page 8)
Saron, along with another institute faculty member, Susan Rivera, post-doctoral scholar Yukari Takarae and junior specialist Rita Beransky, is investigating how individuals with autism combine information from different senses such as sight, sound and touch.

What they have found so far is that the brains of children with autism respond to visual, auditory, and touch stimuli – such as flashing lights or tones or taps to the finger – in a fundamentally different way than typical children. For example, in an electrophysiological study that is part of the Autism Phenome Project, children with autism showed little differences in their response to different volumes of noise, which was not the case for typical children.

Saron emphasized that some of the data is highly preliminary – only a small group of children have been studied so far. But he said “the process of multi-sensory integration appears impaired for some children with autism spectrum disorder.”

In addition, Saron’s lab is also studying, in collaboration with human development graduate student Costanza Colombi and M.I.N.D. Institute faculty Sally Rogers and Susan Rivera, how the brains of individuals with autism respond to the perception of goal and non-goal directed movements, an important component of social interaction. Also, in collaboration with Takarae and M.I.N.D. Institute faculty member Tony Simon, Saron is continuing to examine communication between the hemispheres, only this time in children with a deletion of part of their 22nd chromosome, using methods derived from his doctoral work.

As for that meditation study, dubbed The Shamatha Project after a Tibetan term for stable attention, Saron said that early results of the project, which is based on everything from behavioral and brain wave data to blood samples, will be presented at a conference in the spring.

Until then, he uncharacteristically, isn’t saying much, except that “we’ve got a Ft. Knox’s worth of data.”

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**Distinguished Lecturer Series**

Join us for another season of inspiration and ideas from prominent researchers and physicians who provide the latest information on the science and treatment of autism and other leading neurodevelopmental disorders.

**February 13, 2008**  
Russell A. Barkley, Ph.D., Medical University of South Carolina  
4 p.m. – Life Course Impact and Mental Health Outcomes of Children with Attention-Deficit/Hyperactivity Disorder  
6 p.m. – Attention-Deficit/Hyperactivity Disorder: Advances in Diagnosis, Understanding, Causes, and Management

**March 12, 2008**  
Carolyn B. Mervis, Ph.D., University of Louisville  
4 p.m. – Language and Cognitive Development of Children with Williams Syndrome or Duplication of the Williams Syndrome Region  
6 p.m. – Early Development of Children who have Williams Syndrome or Down Syndrome

**April 9, 2008**  
Laura Schreibman, Ph.D., University of California, San Diego  
4 p.m. – Developing Individualized Treatment Protocols for Children with Autism  
6 p.m. – The Science and Fiction of Autism

**May 21, 2008**  
Christopher J. McDougle, M.D., Indiana University  
4 p.m. – The Pharmacotherapy of Autism and Other Pervasive Developmental Disorders  
6 p.m. – Practical Aspects of Medication Treatment in Autism for Parents and Other Providers

**June 11, 2008**  
Deborah Fein, Ph.D., University of Connecticut  
4 p.m. – Can Children with Autism ‘Recover’?  
6 p.m. – Early Detection of Autism Spectrum Disorders: State of the Science

For more information about the lecture series offered at the M.I.N.D. Institute and to view recordings of past lectures, visit our Web site: www.mindinstitute.org.

The M.I.N.D. lecture series is supported with a generous gift from Mort and Marcy Friedman.
Clinical study to assess children with autism

Although all who are affected by autism have some difficulties with social interactions, communication skills and behavior patterns, specific symptoms and severity differ widely among individuals. This diversity is a major roadblock to scientific progress and to clinicians’ abilities to effectively treat the disorder.

The Autism Phenome Project, a longitudinal study that will collect biomedical and behavioral data from 1,800 children and their families over the course of five to eight years, will address these issues.

Parents with children who are 2 to 3 1/2 years of age with either autism or typical development are invited to enroll their children in this longitudinal study. For a detailed description of the study, please visit our Web site at http://app.mindinstitute.org, or contact project manager Lou Ann Barnett, Ph.D., at (916) 734-0441 or louann.barnett@ucdmc.ucdavis.edu.

Current research

One of the ways that all parents can help find causes, treatments and, eventually, cures for neurodevelopmental disorders is to enroll their children in clinical research studies.

At the M.I.N.D. Institute, dozens of studies are under way on autism, fragile X syndrome, developmental delay, Tourette syndrome, attention deficit hyperactivity disorder, 22q11.2 deletion syndrome and other neurodevelopmental disorders. These studies focus on:

- interventions
- genomics
- brain structure
- immunology
- learning patterns and more

Children who have developmental concerns, as well as those who do not, are eligible to enroll.

For more information about the studies that are enrolling participants, visit the M.I.N.D. Institute Web site at www.mindinstitute.org, or call clinical research coordinator, Meridith Brandt, at (916) 703-0320.
Disc jockeys team up to raise autism awareness

Pat Still and Tom Mailey have done as much as anyone to elevate public awareness of the M.I.N.D. Institute during the past several years. And they’re not even on the payroll.

The DJs, known to their radio listeners for the past 15 years simply as “Pat and Tom,” host the 5 a.m. to 10 a.m. slot weekdays on Sacramento country music station KNCI, 105.1 FM. Between hits by Brad Paisley, Martina McBride and Keith Urban, they engage their audience with updates about popular performers, comments about current events and zany antics.

Yes, they conducted an on-air interview with a guy named Uncle Booger, who invented an emergency porta-potty that attaches to a trailer hitch. And they demonstrated the parental difficulties of assembling tiny toys given away with fast-food kids’ meals. Mailey credibly impersonates Carol Channing’s voice, and Still can imitate Shaggy, the cartoon dog.

But Pat and Tom also are staunch advocates of worthy causes. They publicize and participate in fundraising events that have increased public awareness and support of the M.I.N.D. Institute. Both speak passionately about it because they have more than a passing interest.

Mailey’s 10-year-old son, Joey, has attention-deficit/hyperactivity disorder (ADHD) and a mild hint of Tourette syndrome. Still’s 8-year-old son Dimitri has autism. Both boys have been treated at the M.I.N.D. Institute. Still in particular has been involved with the M.I.N.D. Institute since its formative days, encouraged by newscaster Sarah Gardner. Still’s wife D’Anne worked with Gardner as a producer and camera operator for television stations KCRA channel 3 and KQCA channel 58. Gardner and her husband Chuck, whose son Chas has autism, were among the founding parents who helped create the M.I.N.D. Institute.

Back in 2000, Pat and D’Anne participated in a walk, along with Dimitri in a stroller, to raise funds for the M.I.N.D. Institute. The following year, Still took part in the ground-breaking ceremony for the facility. When construction of the M.I.N.D. Institute was completed in April 2003, Still, Sarah Gardner and actor David Gallagher – whose brother has autism – together hosted the public ribbon-cutting ceremony.

The Stills were intrigued by the M.I.N.D. Institute because they had become suspicious about Dimitri’s withdrawn behavior. Their other son, Lucas, was 3 years old when Dimitri was born.

“By the time Dimitri reached the age of 3 months, he still wouldn’t look directly at us, and never made eye contact with us,” Still said. “He didn’t react when we called his name, so we suspected deafness, but tests when he was 11 months old confirmed that he could hear just fine.” Only through evaluation at the M.I.N.D. Institute was the diagnosis of autism confirmed when Dimitri was 19 months old.

“Dimitri is a smart little guy, but he doesn’t communicate the way that you and I do. We credit the team of tutors at his school and the therapists at the M.I.N.D. Institute for the progress that he has made.”

– Pat Still

(continued next page)
“The Wiffle tournament doesn’t raise a lot of money, but it has raised public awareness and given us an opportunity to talk about the M.I.N.D. Institute,” Mailey said. “We have plenty of breaks [between songs] when we can goof around and scratch the itch to be 12 years old again, but we also have lots of other breaks in which we can do something for the community,” Mailey said.

The Tourette syndrome manifestations that Mailey’s son Joey exhibits are subtle facial muscle movements. Although they’re irritating to Joey, Mailey said the movements are barely perceptible to others. He and his wife, Vicki, also have two other children: another son, Sam, and a daughter, Emma. Mailey describes his family’s involvement in M.I.N.D. Institute activities as much more ancillary than that of Pat and D’Anne Still.

Even as Dimitri has begun learning to cope with the world around him, his parents have undergone changes as well. “Early on, our greatest hope was that Dimitri eventually could live a normal life. That hope is still there, but we now know we have to adjust our sights and re-evaluate continuously. If he could just somehow survive even through assisted living to enable him to do something productive, I would turn somersaults for that,” Pat Still confided. “One of our greatest fears is that responsibility for Dimitri will come down around the neck of his brother when we’re gone. When I see a homeless person, I think, dear God, I hope that is not what lies in store for my son.”

The Stills take solace in a slogan that Sacramento advertising executive Dave Mering created for a series of M.I.N.D. Institute public service announcements: “It takes a heart to cure a mind.” Speaking for his friend, Mailey adds, “Pat believes if a cure for autism is ever found, that discovery will be made at the M.I.N.D. Institute.”

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**M.I.N.D. INSTITUTE 10TH ANNIVERSARY CELEBRATION**

**THE JOURNEY OF THE M.I.N.D.**

A PROMISE FOR THE FUTURE.

Third annual gala benefiting the UC DAVIS M.I.N.D. INSTITUTE.

Saturday, March 29

As we celebrate 10 years of progress and growth, join us in honoring the vision of the founding families and the State of California. The evening includes a gourmet dinner, fine wines, select auction, dancing to Hip Service, and inspiration from a special guest.

Contact Terri Contenti at 916.703.0289 for tickets and more information.
Executive director’s message

This year, the UC Davis M.I.N.D. Institute celebrates its 10th anniversary. We have accomplished much for such a relatively young institution, assembling a broad, multidisciplinary team of clinicians, scientists and dedicated staff who are conducting and publishing leading-edge research and increasingly becoming the “go-to” experts for federal research agencies, state and federal policy-makers, and journalists covering health, science and the environment for prominent media outlets.

We are fortunate to have a dedicated community of children, families and donors who partner with us to find better treatment strategies and, ultimately cures, for a host of neurodevelopmental disorders, from autism and attention deficit/hyperactivity disorder to fragile X and Tourette syndromes. They are also helping us to generate the funds and support needed to build a second state-of-the-art research facility to evaluate innovative treatments for these disorders.

In this issue of M.I.N.D. Matters, we highlight some of our innovative research, rich faculty collaborations, and dedicated families and staff who make up the unique and successful enterprise that is the M.I.N.D. Institute. These research articles bring you up-to-date on the complementary aspects of work conducted by Center for Neuroscience associate professor Kimberley McAllister and M.I.N.D. Institute professor Judy Van de Water, who are further exploring the links among autism, the immune system and the brain. Kim is investigating whether environmental factors can trigger changes in key immune system molecules that might contribute to autism. Judy is studying what happens during pregnancy that may affect neurodevelopment, including whether the mothers of children with autism have autoantibodies that affect fetal brain proteins.

We also highlight the important animal studies conducted by neurological surgery professor Robert Berman and M.I.N.D. Institute Research Director David Amaral, who are taking different, yet parallel, paths in the urgent task of uncovering the causes of autism.

We also introduce you to two new M.I.N.D. Institute faculty, Stephen C. Noctor and Clifford Saron. Steve is an assistant professor of psychiatry and behavioral sciences who studies cell growth and migration in the developing brain. Cliff is an assistant research scientist who is investigating responses to sensory issues in children with autism spectrum disorders.

In our philanthropy section, we give you a peek inside the professional and personal lives of two prominent Sacramento DJs, Pat Still and Tom Mailey, both of whom have sons with neurodevelopmental disorders and play important roles in raising awareness about autism and the M.I.N.D. Institute.

We cordially invite you to participate in our 10th annual gala, scheduled for March 29, 2008. Join us as we celebrate the progress and growth of the M.I.N.D. Institute and honor the vision of our founding families.

Robert L. Hendren, D.O.
Executive Director
UC Davis M.I.N.D. Institute