Dispatches from The Brandy Desk

Live from the 2012 Society of Neuroscience Conference

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1 Welcome to New Orleans

If ever in an intimate moment of self-reflection you have considered just what is going on in your head when you wonder why you think, feel and act the way you do, then you should be here in New Orleans. At the annual conference for the Society for Neuroscience (SfN), 24,000 scientists from around the world are unveiling 16,000 posters of new research for five days. It is a spectacular affair appropriately held in a city famous for jazz and not for the faint of heart or weak of liver. On day one you will need coffee. By day two you will need bourbon. Both on day three. And if by day four you still have your feet under you, by the end of day five you will be toasting out of a trumpet atop a balcony on Frenchman Street. Ladies and gentlemen, this is your brain on a neuroscience conference.

Let us consider the coffee first.

A conference is where a community convenes to show each other their research, and possibly spark new collaborations, bury hatchets, or escalate existing feuds. Though in general a conference like SfN, the world's largest in any science, has terrific atmosphere since the attendees – tenured academics, hopeful professors, postdoctoral researchers, graduate students, research assistants; the weight classes of academia in descending order – really want to be here and accomplish something, be it one grand inspiration for a paper or a few good conversations for some ideas. The only complaint you could lodge against SfN is that it is too big. Indeed the field is disparate. The SfN media hot-topics handout lists no less than 131 abstracts across twenty-six themes which is still a very sample of the whole which you can't get your head around, much less your brain. Neuroscience is, loosely, the study of the brain, but if one were to compare it to a live band the like heard at many boozy conference after- hours socials, the drummer is playing blues, the pianist is playing Mozart, the guitarist doesn't seem to grasp volume control, the bassist is experimenting with bowing his string with a clarinet, and the clarinet player is chatting up the girl who does communications for the start-up throwing the social. Their only connection, vague at best, is music.

Not that a neuroscientist would say this outright. Because there is a sentiment which suggests that how neuroscience is conveyed outside academia is getting out of hand. Recently the field has grown in public popularity and influence. Clearly this is good; all humans have brains, and would like them to function properly, for the most part. But with popularity and influence come dilution. There has now arrived a swelling literature of bestselling, water-in-the-wine pop-science books that increasingly come under scrutiny for their dramatic conclusions and self-help interpretations of the wine. John Maunsell, editor of the Journal of Neuroscience, the field's premier publication, confided to your correspondent at the media cocktail party his worry that much true neuroscience is lost on its way to the general public.

"What distresses me is that the media only picks up the flashy stuff when there is a lot of cool science being done that is not necessarily curing a disease or wrapping up the brain, because mostly we don't know," said Maunsell. Though complication is inevitable, he believes in remembering that complexity begins with simplicity.

"I recently read this great little book called *Ignorance* that said science is truly about the question you start with, not the methodology, and certainly not the result. That felt very natural to me. When I teach my students I wish I start every semester with, this is everything we don't know about the brain; now, this is what we do know. So how can we know more?"

Diluted wine is all well and good for church. But the truth is slow and methodical.

If you really care about the wine you will inevitably care about how it is made and one day go to the vineyard to learn from the sommelier who himself is learning from the grapes. You will see there is no magic, only very hard work without guarantee of success. Broadly speaking, it is not excessively romantic to note that a scientist is one who cares about what something, say the brain, really is and really does and not simply what is convenient or intuitive. Like any person endowed with irrepressible adventure, dominating independence and a touch of flamboyance, a scientist will be driven by conviction and purpose, alongside the darker motivators like publications, respect, boredom, competition and egotism. Your correspondent, an economist, enjoys their company, especially with beer in us.

As for the science on hand at SfN 2012, there is so very much. Your thirsty correspondent could not hope to taste them all. While he was filling his first cup of coffee day one in the press room removed from the brilliant madness of the ongoing scientific gumbo downstairs, he was counseled on the matter of coverage by the science correspondent to England's The Guardian who was refilling his not for the first time. It is hell to choose and worse to make decisions. (Choice and decision making are popular research topics in neuroscience.) But at this kind of party, where there is so much afoot and you must decide to have not so that you may have, the analogy to the vastness of the life that mortals live is adequately delivered. Muffin in hand he parted with advice: "All you can do is go about, look around, and and stay where you are interested."

Research at the conference is presented in marquee lectures, topical symposia, and posters. The lectures are entertaining and the symposia are razor sharp but the poster presentations are the most flavorful. You can't beat live communication. At a poster presentation, a researcher stands besides his work to field inquiries. Collaborative scientific research may be published yearlong, worldwide, and instantly accessed online, but a conference is where researchers can disagree with each other in person. So your correspondent navigated the massive crowd in the corridors without spilling too much of his coffee and entered the convention center main galley. It was the emotional equivalent to the sudden rush of cool air one feels when walking through a narrow entrance into a high-ceiling cave with art on the walls.

In the main galley posters are on display in long aisles is large and vast and there are no rickshaws, though one attendee was spotted riding bicycle through the corridors and down the aisles of posters. Everywhere are posters. Posters, posters, posters. Posters about facial communication. Posters about unlearning fear. Posters about impulsivity. Somewhere there are posters about memory which will inform you why you cannot remember half of what you have seen. Each poster demanding your attention with aggressive titles, colorful imagery, and provocative mathematics. Each poster a point in a pointillism painting. Each poster a grape in the vineyard. And yet you do not relieve your thirst.

Down one of the periphery aisles in the galley was a poster presenting a paper titled "Neural Random Utility", a neuroeconomics study from New York University exploring for evidence in the brain of a random utility model, one from economic theory which accounts for people switching their preferences, one co-author dueled with a review editor. The paper had been submitted for publication to the American Economic Review and swiftly rejected by referees demanding changes. Let me play the devil's advocate, said the review editor. Why are the errors so high? Why is utility not constant? Does this make any sense? Meanwhile a gathered crowd paid ferocious attention. These tend to be a friendly lot but at the same time entirely impatient with hesitation and unforgiving for

statistical insignificance. It was a tense scene that reminded a bystander of a bullfight he once saw in Mexico where the lead bullfighter was gored and his replacement won the ear with a perfect display on his substitution. You could forgive the co-author for suspecting this advocate was not the devil himself.

But then a disembodied voice sounded in the galley declaring poster viewing for the day to be over. Ultimately, many useful points had been addressed to aid its resubmission. The lighting inside dimmed as presenters removed their posters from their stands, rolled them under their arms, and shook hands during while they laughed about their advisors, lamented their funding, and filed out into the southern Louisiana dusk. The science never stops. You keep a pen in your pocket because you never know if during dinner something about watching your friends determine what to order suddenly inspires an experiment.

Meanwhile in the press room, the journalists made no visible panic over deadlines; getting things right seemed more important. When working time was over the British press discussed where they would eat. One suggested that it was probably time they tackled the challenge of twenty dozen oysters. When your correspondent inquired whether this was possible and whether there was a poster at the conference that could inform us, he shook his head no, but noted that the mark of a good stomach smith is he finishes his plate, has nightmares, and eats the press room danish morning next nonetheless. His colleagues hummed in agreement.

This is the basic layout of a science conference, and more roughly, how science happens. A particular breed of people have an idea, find money to pursue it, try to get data, analyze the data, then write it all up. Then they meet their colleagues at a giant conference to knock heads and let loose. It is not so complicated in the end. If it sounds like a very simple process in theory then you are correct. If it sounds very tedious then you are also correct. If you don't mind tedium for the sake of discovery because bourbon will take care of that then you are already a scientist.

2 Neuroethics and the abuse of cognitive enhancement drugs

Gonzo journalist Hunter S. Thompson once said: "I hate to advocate drugs, alcohol, violence, or insanity to anyone, but they've always worked for me." If only he were alive today so a neuroscientist could have a look at his brain. But in this correspondent's experience there are college students who make good proxies. Certainly with alcohol and violence; and who is not insane, to some degree; and what seems to always work for them as well are drugs, study enhancements like Adderall in particular. Somewhere tonight there will be a undergrad holed up in the library who will try to synthesize half a semester's worth of material the night before a midterm by grinding a pill of prescription speed given by a friend with Attention Deficit Disorder, perhaps, into a fine dust for intranasal administration. Should he be successful then eventually it will be difficult to separate his desire for an education from his appetite for drugs.

So much in fact that the abuse of these drugs by students was one of the main topics of a marquee lecture on neuroethics called "The Impact of Neuroscience on Society: The Neuroethics of 'Smart Drugs"'. If it were not so well delivered in the enormous, dim, and mostly empty convention ballroom, your correspondent would have inquired as to whether part of determining such drug ethics involved donating samples to the press whose ostensible business it is to know what is going on. Indeed it was a heavy- eyed morning. The night before at historic jazz house Preservation Hall, brain-games and brain-training company Luminosity threw one hell of a box social with a live band whose drummer used to play with Ray Charles and a chef who must have been read creole cook books before bedtime in his childhood. Scientists reveled at the open bar in the back garden–once a saloon for Spanish soldiers until the War of 1812 and later a photography studio for whores–and carried on after the house curator had enough and exported them to Bourbon Street. They have had a long, hard year. Some did make it to the neuroethics lecture but you sensed and smelled they would rather be at Preservation Hall discussing the ethics of certain hangover cures than the ethics of cognitive enhancer consumption by healthy people.

But there we were, listening to excellent stuff by Barbara Sahakian, faculty at Department of Psychiatry at the University of Cambridge. Your correspondent has long suspected that plenty neuroscientists, unlike say economists, harbor deep fascinations with drugs since they go straight to your brain and pull the levers all which ways. This neuroscientist was one indeed. Her domain nowadays, besides ecstasy – ravers who came to her lab were found to be prone to depression due to extreme weekend highs and subsequent weekday lows – are prescription drugs for diseases and conditions like Alzheimer's, attention deficit hyperactivity disorder, and depression, with the fundamental goal of understanding the neural basis of dysfunction to develop better drugs. Specifically she wants to create drugs with no risk for substance abuse which means drugs that have no effect on dopamine. But that morning she had grander things to address.

"I want to take you on a journey," she began, lifting not a few surprised eyebrows in the crowd. Others were unsurprised. Probably they have been a few journeys themselves. "A journey," she continued, "that I've had about how my research as a neuroscientists has impacted on society and led me to think about how drugs may change the future of society." Her motivation for her research came, as is common, when a colleague offered her drugs.

"I was offered a cognitive enhancer by a colleague at a meeting in Florida some years

ago, and that stimulated me to write this lecture. I had complained to my colleague that I was jet lagged, and he said do you want some of this?" she said.

"I started chatting with some people at the break. One person was on adder all, one person was on Ritalin, they were taking all sorts of things. I thought, well this is interesting. Many academics were using these drugs and were receiving a global effect. They said it improved their mental energy and sustains hard thinking."

This sort of use is rampant. Sahakian rattled off proof. The global share of Modafinal, a narcoleptic treatment abused by people who want to stay awake, is $700 with 90% of use off-label. Nature did a poll that from about 1000 respondents from sixty countries found 1 in 5 to be using cognitive enhancements. New Scientist in conduction with BBC found similar results. The newspaper at the University of Cambridge informally surveyed campus to find one in ten students using stimulants.

"I thought it would be the neuroscientists who were using these drugs because they were learning about them and might be tempted to use them. But it turns out it was the philosophers and English students, because they had to write these very long essays."

Musicians, she says, have also told her that they use non-prescribed cognitive enhancers so they can perform a piece of music live with precision, or to enhance their emotional performance. Other people talk to her about seeking a competitive edge. This includes test-takers and athletes. The key connection among these users is a desire to focus attention at a critical time, sometimes believing they cannot do so under their own powers. Her studies have shown that healthy people feel more comfortable engaging in tasks with a cognitive enhancer than without. Working memory is that which is important to academic achievement. It is linked to fluid intelligence which is learning to learn, creative intelligence. It is also linked to crystallized intelligence, which is one's IQ. Both have been found to be improved by cognitive enhancers in youth and adult subjects of low and high education. You get increased efficiency in the neural network employed by the task at hand - likely those in the prefrontal cortex.

"Your brain does not work as hard, yet you are getting a better performance," says Sahakian. That is indeed efficiency and it sounds great. Users are encouraged by another set of results from her laboratory that show the effects of cognitive enhancers on people with disorders and healthy people are no different. So why not hand out capsuled motivation to everyone? Indeed, why not, grumbled your correspondent when he realized he was out of coffee and only half-way through lecture.

Sahakian started her lecture with a summary of findings from her lab on the effects of cognitive enhancers on patients with psychiatric disorders, her project for the U.K. government stood out. Last year one its biggest hits in terms of cost were days lost from work due to depression, a cost called absenteeism. It is important because it stems from a bigger problem which is society fails to screen people for mental health as rigorously as it does for physical health. Biomarkers that signal the presence or potential of more severe conditions like Alzehimer's and schizophrenia – many cases of schizophrenia, interestingly, are either developed or diagnosed among patients in their college years, according to Sahakian – are extant for depression too, which means they can be detected relatively early to ensure that they do not get in the way of themselves or society. Governments are investing into treatment and prevention research not solely because neurophysicatric disorders distress patients but because they drain society. Both are reasons she believes in cognitive enhancers.

"Cognitive enhancers exist to improve cognitive abilities in people with cognitive impairments," she said. "And it's been said that would reduce severe cognitive impairment

by just one percent a year would cancel out estimated increases in long-term care costs due to our aging population." Perhaps this all sounds cold. But cold is good. To solve a problem you must first isolate it and this requires precise emotional processing which Sahakian calls cold cognition so you do not become like the doomed Lady Brett Ashley and Jake Barnes in Hemingway's The Sun Also Rises who as they drive away from Madrid think about how nice it would be if they could only be together. It is nice to think about how great you could be if only your cognition was enhanced. It is nice to think about how you can overcome your depression through self-treatment. It is nice to think about yourself in the nicest way and imagine that others do too. Fantasy is so very nice indeed. But fantasy is not as good as science when it comes to problem solving or treating debilitations. That one's depression is bad for society should be if anything flattery; that each cog matters in this way to the wheel should make us all feel good if we have to think about it. At any rate, Sahakian made it clear that treating disorders with cognitive enhancements is done for specific purpose and not so that a healthy person can attempt to manifest an unhealthy fantasy of themself.

"While we can fairly well treat the psychotic symptoms of schizophrenia, the hallucinations and delusions with the anti-psychotic medications we have, people with schizophrenia are left with profound cognitive impairment, and those impairments stop them from rehabilitating," she said. "Some can't go back to work or to school."

ADD and ADHD, for which seventy percent of cases are treated adequately by drugs, the remainder – which include patients for whom drugs are ineffective because they improve only say self-control but not working memory, or whose side-effects are too intense – face similar consequences without new treatments. About five percent of children of worldwide have ADHD. Fifty-percent of children with ADHD keep it through adulthood.

"If we don't treat severe ADHD, what happens is that unfortunately you have poor outcomes, including increased educational dropouts, joblessness, and criminal activity," she said.

The true goal then of her research, fundamentally and briefly, is to repair the impaired. But doing so brings us to the discussion of how much repair is ethical when the repair can be disseminated to people who don't actually need it.

There is one set of ethical problems dealing with patient diagnosis and treatment. Chief among them is whether administering neural protective agents to at-risk patients at different ages corrupts their development. It is one thing to take antidepressants in your twenties and many people do and it is a good thing if properly managed and taken. Sahakian agrees. But if a child has high potential for adolescent or adult depression should he be administered anti-depressants beforehand? Drugs for neuropsychiatric disorders are designed to treat what exists but not to prevent what might. It may never. You can't measure what people colloquially call spark but you can measure spikes, sensitized neuronal stimulation, so in the very least you can scientifically say that if you feed a kid drugs it turns out he didn't need you may get a kid with no spikes in his eyes and if you get enough of them you'll have a society of fifty shades of grey. Hypothesize too if a government or another institution, like religion, prefers programmable human development over the organic variety. But let us save the discussion for robots, zombies, and suits for another day. We are already off track, and there are no cognitive enhancers here in this cafe on Decatur Street to put us back on artificially.

The other set of ethical problems is abuse. Abuse is using a drug you do not need. Though they have always had a taste for them and mountebanks have been there to provide them, humans have survived all right for most of their history on earth without

drugs. So most people today who are using some drug they were not prescribed might actually be abusing it. Take your correspondent, who has taken to chewing the coffee beans raw to reach his deadlines. Importantly, he hypothesizes recklessly, is to consider whether human nature tends towards extremes or regresses to a behavioral mean. There are drugs that take you to both places. Key then is determining whether there is an inherent human preference for extremism that demands normalizing drugs to diminish risk or one for normalization that demands drugs to break away from the mean. But there is no certainty of either. People who want to be unique but also fit-in would be the best population to sample for study but you would corrupt the study by forcing them one way or the other. You would end up with a bunch of useless data and worse a group of messed-up people and inevitably a host of ethical dilemmas being codified into lawsuits. There are limits to science and there is even less money to clean up its aftermath.

Sahakian nonetheless does know a great deal about healthy people abusing cognitive enhancers because they think it makes them better. There is substantial evidence that this is false. Take another Sahakian study. A group of medical students on hospital rotation, staying awake for past twenty-four hours, were administered a cognitive enhancer. Smart drugs are popular with doctors because there are no tremor affects like in caffeine. But the study found that the students did not perform their duties to patients any better or worse. A cognitive enhancer will not somehow make you a better doctor any more than it will make you a doctor. It will keep you awake and sharp for awhile but that itself is poor logic for consumption since not even cognitive enhancements cannot reverse the diminishing cognitive abilities brought upon by sleep deprivation. Sahakian also mentioned that many people who come into her lab report taking cognitive enhancers out of peer pressure or coercion. She says you can measure addiction by looking at neural physiology but it is redundant when they come in and say they can't stop, they don't want any more but they can't stop. These are the serious cases. Addiction to perfection is as real as that pill going down your throat.

Divisions abound on what is to be done. Some experts say that if people can boost their abilities to make up for what mother nature didn't give them, what's wrong with that. Others say that people shouldn't be using these drugs because they're designed for people with serious problems who really need help. So another question for the ethicists is whether cognitive enhancers will ultimately level the playing field or juice the opposing team.

Then there is the problem of illegal procurement. Partly to blame are over- diagnoses: patients may receive more than they need, giving them the opportunity to distribute their prescription. Similar happens when obesity is fought with Adderall prescriptions – one side effect is appetite reduction. Worse is online vending. Surveys find that many cognitive enhancers are bought online but their quality is not guaranteed, and they may be contaminated.

Sahakian wrote a handbook on neuroethics for her colleagues. At the University of Cambridge there is a clinic where young people came come in when they have unusual thoughts, or perhaps are hearing voices, so schizophrenia can be picked up early in order to protect their cognitive abilities. Likewise for other neuropshyicatric disorders. But there is much work to do and the problems will not cease. Treatment for those who need it desperately ought not to be held so it can be perfected to make sure those who don't need it can use it without recourse. Life should be fair. But don't take away my advantages. Who is to say how we should develop? You can get all sorts of hot-blooded opinions on this sort of thing. But most of all your correspondent wondered about human

will and what smart drug abuse may do to it. Then he remembered a note made earlier by Sahakian.

"There are other ways to enhance yourself," she sad. "Learning generates new brain cells. Physical exercise is good for mood and cognition since it affects the hippocampus."

So after the lecture your correspondent left the convention center which by lunchtime mid-conference resembled a music festival in terms of sheer crowd density and went with his colleagues for a glass of New Orleans.

Walking it off back to the press room where Nora D. Volkow, psychiatrist and director of the National Institute of Drug Abuse and great- granddaughter of Leon Trotsky, would be chatting with the press, he detoured through the main galley where the posters hang. This time around he noticed all the research on the brain on drugs. Like: "Dissecting Learning Processes Involved In Acquisition of Heroin Self-Administration." Or: "Potent Effects of Hallucinogenic Drug Ibogaine On Adult Zebrafish." As it so happens it was Hunter Thompson who first brought fame to Ibogaine by accusing 1972 presidential candidate Edward Musky of crippling addiction to it while on the campaign trail. Zebrafish are popular in neural science drug research, and this study folded into what co-author and Tulane neuroscientist referred to as the Zebrafish Neurophenome project. Three independent presentations over three days were ultimately made at the conference, which is something of a coup. One presentation included a poster embedded with live-video of the impressive image techniques the authors developed to track swimming of intoxicated zebrafish to precisely identify drug effects. Staying at the top of the tank, nicotine makes them go in figure eights, LSD makes them go casually erratic, but Ibogaine makes them go straight to the bottom. The imaging analysis technique is the most important finding because it propels further research on drug effects. The rest The rest was left to your correspondent's imagination. He imagined attendees on hallucinogenics at a neuroscience conference gathering to discuss drug ethics. It writes itself.

Doctor Volkow was in inspired form when she spoke to the press. Prescription drug abuse is getting the most of their attention these days because people are dying more from it. Still much of the hour talk was dominated by a radio man who apparently had come to the conference with a lengthy agenda concerning what he regarded to be the failures of scientists and later that day prompted your correspondent into a full-throated defense of economics – let us pretend it is a science – when he was interviewed by the radio man on his research, which if nothing else may appease his advisor who is not as interested in brains. Eventually in a private moment Doctor Volkow turned her thoughts to cognitive enhancement abuse by asserting that drugs should be made available to those who need them even if abuse is possible.

"We don't know depression at the molecular level, we don't really know the neurobiology, and while we have many theories, in the meantime we develop medications," she said. Essentially it is that psychiatric and psychological theory are slower than medication development. "You don't want to wait until perfect knowledge, but you want to do something about devastating conditions now."

She had words for the effect of cognitive enhancement abuse on emotional intelligence. She is in agreement with Dr. Sahakian that we simply do not know. But Dr. Trotsky remembered then a study she made in her clinic to see if people can respond negatively to overstimulation by dopamine – by being made to feel too good artificially. She gave normal people a high dose of an amphetamine and found that those whose neural scans indicated the highest dopamine levels found the feeling they got aversive and overwhelming. Only those with lower levels found it beneficial. But there is much left to know.

That was all we could leave with.

Meanwhile, they are out there, the brains and the drugs and both of them together in sun and in shadows. That night, back on Bourbon Street, while standing outside with a beer to hear atmosphere from the bar, a local approached your correspondent and began telling jokes. Those shoes on your feet, I know exactly where you got them. Oh you know that one? Ok, I'll tell you how many children your father had. You ready? This is how many he had. None: your mother had all his children. Welcome to New Orleans folks. I got some coke if y'all want.

3 Mind control, someday

Perhaps it is the onset of delirium caused by trying to properly report a 30,000 attendee conference while also and no less properly reporting the colorful after-hours, but after a few days at SfN 2012 your correspondent has acquired the impression that this huge mass of brain scientists, when focused and sober, is capable of all sorts of wonder on which an apprentice science fiction author would feast. None of the press so far seem to harbor ambitions for literature, but if you had to bet a grant on who secretly does, bet on the absent freelancer – we will leave him unnamed – who carries around the convention center with him a fresh mint julep and feeds the mint leaves to the mouse saved from a laboratory that rides sentry on his shoulder.

There are plenty of hot topics to cue from, but his first book would probably be about neural optogenetics, a combination of optical and genetic research methods that involves shooting lasers into particular brain tissue to inhibit or disinhibit its operative cells. Basically, generously and hopefully, mind control. Since its breakthrough about two years ago the method has advanced to the point where researchers now talk about perfecting it and applying it. Imagination however is faster than both. Conveniently for our author there was a poster at this year's conference devoted to optogenetic research on mice and how it has explored neural circuitry forming the mammalian brain. Needless to say then that he could use it to make a nice story about a mouse who escapes a neuroscience laboratory researching mind control and with his new and powerful brain, which he got somehow–our author is a fast writer and can gloss over this–he turns the tables on the scientists, with many lessons learned along the way. Does this not sound ridiculous? Indeed it does. But the fastest way you will have mind control in your life is by reading fiction.

The point here is that the results of science trickle slowly from the laboratory into the world. Even when optogenetics is perfected and its best applications defined there will still be hell to pay to organizations like the FDA and whichever other bureaucracies until it can go straight to, for example, helping people with brain disorders. Partly because without proper vetting there will be even more hell to pay when something goes wrong. The rest? Figuring out how to vet, how to sell, and how to manage. This is especially true for devices made to treat medical conditions. And don't forget we are talking about putting things into your brain to change how it and by extension you operate.

Let us consider a specific example.

Daniel McDonnall, PhD and director of research at neurotechnology firm Ripple stood for a few hours one afternoon at his poster presenting a bit of biomedical engineering he has been working on for seven years: an implantable blinking prosthesis.

"There are two blinking muscles in your eye," explained McDonnall to your correspondent. "The ambicularis oculi keeps it open, and the lemtor pelpebrae keeps it closed. There are about three thousand patients every year whose closing muscle does not function."

The main cause of such unilateral facial paralysis is damage to the 7th cranial nerve which controls the closing muscle. Facial trauma, tumor resection, and about one percent of Bell's Palsy cases are behind the nerve damage. The consequences of being unable to blink in one eye are significant. The unprotected eye desiccates, increasing risk of infection. In some cases patients become depressed, often solely from the unaesthetic of the condition. Milder cases still cause great discomfort.

"Think back to any staring contest you've had," McDonnall said. Your correspondent

remembered many great yet painful victories. “That’s the rest of your life.”

For awhile the most common treatment, according to McDonnall, was a small gold bar placed in the eyelid to weigh it down. McDonnall’s prosthesis by contrast dynamically restores blinking in the unhealthy eye by recording blinks in the healthy eye and sending signals to the implanted stimulator which blinks the unhealthy eye. As a result, the two eyes blink simultaneously.

That is how it is supposed to work, anyway. Only canines, which have similar eyelid size and blinking pattern of humans, have tested the prototype. There is a huge approval bottleneck before it reaches humans. “For one, we are using electronics, and two, we are implanting something in the body long-term,” said McDonnall. “The FDA has no evaluation for something like this. We have to invent the tests.”

Such unilateral facial paralysis has been known for about thirty-five years, he adds, but because the patient population is small it has not received priority. This is another contributor to the bottleneck. McDonnall’s research however is funded by the National Eye Institute, which suggests growing concern with the condition. But he does not expect swift approval of his blinking prosthesis.

“Many years from now,” he said. “Many years.”

Sadly we have not seen our author since the conference started. Maybe he has started writing, maybe for many years as well. He certainly has competition. If there is an award from the Society of Neuroscience for best satire then your correspondent will go ahead and give it to neuroscientists Timothy Verstynen and Bradley Voytek, representatives of the Guerrilla Science Project, for their poster “Advances in Neuroprosthetics for Detroit Law Enforcement: Building a better RoboCop today”. Brain computer interfacing (BCI) was science fiction in 1987 when the first robocop was invented. Now it is a promising field which the authors sampled to develop the second and improved robocop. Its kills are up, it runs on Mac OSX, and it only cost $30, the cost of printing the poster.

4 Interview with Dr. Joseph LeDoux

Famous, dead academics are known for looking over your shoulder. Famous, living academics on the other hand are known in their circles as rockstars. You are a rockstar if you publish frequently and well, if you lecture near and far, or if you are just plain brilliant and everyone knows it. You are a rockstar if colleagues compete for your attention at socials. You are a rockstar if assistants manage your email. Rockstars do and behave as they like without great consequence. For example rockstars could dominate the tradition of breaking finished pint glasses outside the bar, but they are busy being important so they entrust proceedings to younger scientists. Rockstars are many things but most of all they are myths that flourish because no one believes in rockstars more than rockstars. So when your correspondent heard about NYU's Joe LeDoux — the most cited neuroscientist on the subject of fear, lead guitarist and singer of The Amygdaloids, and all around friendly dude — he asked how much absinthe was in his sazarac to the talking palm tree that resembled a barman, who assured him it was nothing that would get in the way of an interview.

(Your correspondent): How does it feel to be back in New Orleans? Visiting old haunts?

(Joe LeDoux): Well, I always know I'm home when I step off the plane and into air that's thick as soup. Even though the weather was kind of nice this trip I kept waiting for it to thicken up. Regardless of the weather, though, Louisiana is home, and I love to come back. But NOLA is only part of the way home. I'm from Eunice, deep in Cajun country, about 3 hrs west. It's a different world there. Very conservative thought processes. Still, I love visiting, and especially enjoy the food and music. No surprises there.

What came first to you: science or music?

I wasn't very interested in science as a kid. I loved sports when I was really young, and then became obsessed music as a teen. I was in a couple of bands in high school. First came the Deadbeats (which we were) and then the Countdowns (the space program was just blasting off). And I was a DJ at KEUN in high school. We hosted Percy Sledge at the National Guard Armory. Defining moment — doing shots of whiskey with Percy. I marched off to college and studied business. While doing a masters degree in marketing I took a course in psychology with a prof who was studying the brain. I fell in love with what he was doing and never looked back.

Can you compare doing research to writing songs? Is there an everyday-life-inspiration component to both?

Absolutely. In both you start with a vague idea, work hard to develop it into a concept, and then struggle to through ups and downs while you make it work.

Paul McCartney once said: "I'm not into 'Hey, what's your sign?' or any of that. But, I mean, magic as in 'Where did you come from? How did you become the successful sperm out of 300,000,000?' — that's magic I believe in." From your experience, do you believe in songwriting magic? Or could it

somehow be figured out?

I'm reluctant to go there since Paul McCartney is in a different league. So I'll leave his thought in his head and just say what my experience tells me. Anything is magical until you figure it out. I tried writing songs when I was a teenager but nothing came out.Now I do it all the time. Did I just figure it out or did the decades in between give me something extra. Maybe a little of both. Lately I've been writing with Amanda Thorpe, who sings and plays bass in The Amygdaloids. That has been a wonderful experience. I write a draft song and then we get together. Something special (magical?) then happens when she sees my lyrics and music from another angle. I have to be willing to let go of some of my attachment to a song (which can be a very strong attachment) but when I do the result is always a fantastic transformation. But even then the song is just an infant. I has to be crafted, otherwise it falls short. So what am I saying? Some inspiration, some craft, and a lot of detail work. A lot like science.

"Map of Your Mind" has been stuck in my for a week. Any science behind that?

Most of my songs are songs about love and life, with a touch of mind/brain stuff running underneath. Map of Your Mind is about trying to get inside the head of someone you care about and want to connect with in a profound way: "Made a map of your mind, I've charted my course. I'm sailing deep inside, I've got the winds of force. Got the heat of your heart, to keep me from the cold. Got the currents of will to take me to your soul." People tend to really be drawn to this song. I think the the nautical metaphor works well. But the song also has a musical twist that seems to grab the listener — a 3/4 riff interspersed in a traditional 4/4 song. Just really works.

It's a great tune. How did you write it?

I was up in the Catskills a couple of summers ago and that's what came out. I usually start with some phrase about mind and brain and then try to build something from that. I got the idea "map of your mind" while thinking about cognitive mapping in the hippocampus. There's a geeky under current to most of my songs but I try to keep that part pretty implicit. Not always though. Our song Brainstorm is all about a psychotic breakdown, and All in a Nut is about the amygdala (which is from the Greek word for almond).

So you research fear. What is fear? What do we know, what don't we know?

We know a lot about the circuits that detect and control responses to threats. That's what most researchers who study fear study: detection of and responding to threats. Especially researchers who study animals. We know very little about how the feeling of fear, or any other emotion, or any other kind of conscious experience comes about. While the detection of threats is an ingredient that contributes to the feeling of fear, the former essentially occurs unconsciously and the feeling occurs when these and other unconscious processes invade consciousness.

What is your biggest fear?

I hate snakes. Grew up around them down in bayou country. I got to be an expert water skier as a result. Would start standing on the shore of the lake with my skis on and then jump in just as the rope tightened. At the end I'd ski right back onto land. But somehow this dissipated quite a bit over time. I still don't like slithery slimy things but they no longer freak me out.

I can't speak for the human race but music has always helped me conquer some fears.

Music is a great way to help cope with problems.

We're wrapping up SfN 2012, the world's biggest science conference. What do you think will become of it in the future?

Everyone loves to trash SFN. It's an out of control monster. I can't say I disagree. I don't go that often anymore. Mainly if it's in DC (because it's close) or NOLA (because its home). I don't see how it can be broken up into pieces since everyone in the field does cross-disciplinary stuff. It is great for students and young scientists to get a whirlwind tour and meet people, and to hear some of the giants of the field speak. So it has a role. It's just not the role it used to have when it was much smaller.

They should have a huge concert one night in the huge galley where they hang posters.

That would get me to the meeting, even in San Diego.

Would you ever quit your post at NYU to take The Amygdaloids on a world tour?

Ha!

New York City is a pretty good place to be in the meantime. Do you have a favorite venue you like playing?

I used to love places like Banjo Jim's and the Lakeside Lounge in the East Village. Kenny's Castaway's had so much tradition and was close to NYU so it was fun and easy to get an audience. But these bastions of the beat are all kaput. We did our last record release at Bowery Electric, which is a great place. And I also like the Sidewalk Cafe in the East Village. I live in Williamsburg and would love to do some shows there but the club scene in that area currently catering to a younger crowd. But I see it changing a little and we are hoping to make our way into some of the joints there.

If you could be in a band with any of your favorite scientists in history, who would they be and what would they play? Keep in mind Archimedes just went solo, so you can't have him.

I wanted to do some 60s soul for a while, and always though The Platonics would have been a good name for a Motown boy band. We did a song called Reminds Me of You on

our last record that has a Motown vibe. But I don't know about Plato. But you were asking about scientists anyway. I'm going to go out on a limb and pick someone who has been in disgrace for a long time. I think Franz Josef Gall had a good idea: phrenology. In fact the localization of function that he argued for is commonplace today. But he clearly went too far when he said you could make a map of one's mind by feeling the bumps on their head. But this propensity to flirt with fantasy might have made him a killer song-writer. So in the hope the he would bring that magic that Sir Paul was talking about to The Amygdaloids, I'm resurrecting him for that world tour you asked about.

5 Interview with Michael Caruso (aka Dr. Flux)

A rumor circulated the conference for a few days about a scientist going around in a cape. This rumor died like bad research when your correspondent met NYU neuroscientist Michael Caruso. Resplendent in sequin fashion and mutton chops, the gentleman chatted a pair of belles smoking shag in the Louisiana heat and then made a sparkling entrance to the poster galley where he presented his latest work on brain disorders. Your correspondent had not seen that much personality in one man since Buenos Aires. Naturally an interview was in order, with of course only one way to begin.

(Your correspondent): Let's start with those pants. Are they actually pants?

(Michael Caruso): Haha, no, they are not in fact "pants". They're sequined tights I purchased from from Joyce Leslie.

Well I imagine they must have opened a few eyes here at the conference.

I definitely got more than a few double-takes. A few people even recognized me from last year's conference when I had shaved half of my head.

Everything about you seems to be about the merging of multiple worlds. It makes me think of the importance of true expression.

I think expression in general is all about building a character, making ourselves larger than life. When it comes to what I wear, I have a split second to give someone an impression of who I am. In that split second I like to do something unexpected, something that makes people take a second look. Being someone with my foot in several different worlds, I like to play off of that when it comes to the way I express myself visually.

Here we are in New Orleans. What do you think?

I'm in love with this city. The music, the culture, the people: it's all so vibrant and yet relaxed. I've met people from all over the world, musicians, artists, activists, scientists, and all of them come together here. America in general is known as a melting pot, but it's here in New Orleans that I really feel some truth to that. Everyone just exists together. It's really special.

I feel like you were made for the French Quarter. Or maybe made from the French Quarter. Anyways there is definitely a flourish of Mardi Gras to your look.

I definitely tried to use the flourish and decadence of Mardi Gras as inspiration for some of my outfits. It got to the point that more than a few people mistook me for a native.

And what about the conference? Jesus Christ is it big.

SfN is HUGE! It's always huge and will always be huge. It's astounding to recognize how large the field of neuroscience is. There were over 10,000 posters alone by my estimate.

Everyday has overlapping symposiums featuring hundreds of speakers from across the world. It's literally overwhelming, which is why I come with a strategy. I approach the conference from both a scientific and a social angle. Scientifically, I find the research that isrelevant to my work and select a few key presentations to focus on. Socially, I use an approach I like to call scientific peacocking. I plan all of my SfN outfits carefully to be both quasi-professional and ostentatious. I meet a hell of a lot of people this way, many of whom I wouldn't meet if I stayed within my corner of neuroscience.

You presented some of your research. Tell us about it.

My research attempts to answer the question of how the brain changes in developmental disorders. I work with the visual disorder amblyopia, commonly known as "lazy eye." The brain of of a person with amblyopia actually works differently when it comes to visual processing. I take a look at the nature of some of those changes, specifically when it comes to visual motion perception.

Did you dress for the occasion?

When it came to presenting my science, my outfit was much more about understatement. I didn't want it to detract from what I was presenting. However, that didn't stop me from color coordinating with my poster.

What did the coordination look like?

I used a purple and green color scheme in the poster, which I mirrored in my outfit. I was wearing a fitted purple dress shirt with a black vest and light green tie, along with a pair of black riding pants and Frye boots.

If I gave you a million dollars, what science would you do? My goal is to eventually take my research in the direction of more cognitive developmental disorders like autism or psychiatric disorders like schizophrenia. I decided to study neuroscience because of an intense interest in how normal cognition can become disrupted. My current research examines these questions in the visual system, where our answers aren't muddled so much by a limited understanding of cognition. If I had a million dollars I would probably use it to move my research in a more cognitive direction.

Sorry, I don't have a million dollars.

Financial promises were made Mr. De Geest. I expect compensation.

How about these sequin cuffs I found in a voodoo shop? I suspect they are haunted since they were robbed off the skeleton of Isaac Newton.

I knew Sir Isaac originated scientific peacocking! Finally I have proof.

And alongside a scientist, you're also a burlesque dancer.

That I am. I don't get to perform as much as I did in my first year in grad school, but I

do still get on stage from time to time under the performance name Dr. Flux. Burlesque first appealed to me because it is literally a limitless theatrical art form. The only rule is that you need to take something off. I've been able to explore a lot off different ideas and concepts creatively on stage in ways that have pushed me to look at the world differently. I think staying creatively active helps me to stay mentally active in ways that inevitably inform my science.

SfN ought to apply the law of burlesque to poster presentations next year to make grant money fly.

I don't know about grant money, but these conferences would be decidedly more entertaining if clothing removal was required by each poster presenter.

New York City attracts all sorts of suspect characters. How does the graduate student fit into the scene?

The thing I love about New York City is that any one of your identities doesn't need to define you. When I go out at night I can become whoever or whatever I want. The lines blur in this city; the only limits are the ones we impose on ourselves.

The perfect day and night in NYC is:

The perfect day starts with a bike ride along the Hudson and finishes with a late lunch/early dinner in the West Village complete with people watching. The perfect night begins at 11 in a seedy East Village dive bar and ends at 6 AM in a loft in Brooklyn with torn fishnets, rhinestones in unexpected places, and makeup encrusted contact lenses.

If you could only dress one way for the rest of your life, what would you wear?

A red waistcoat, white pants, white shirt, accented by a red, orange, and fuschia paisley vest with matching red paisley cravat. It would be cut in the style of a a Mad Men power suit.

I imagine you having a side-kick dressed the same.

He goes by "The Footman." We pull heists all over the city.

6 The Economist and The Microscope

Eighty-two years ago when a young and struggling painter named Henri Cartier-Bresson first saw Martin Munkacsi's photograph "Three Boys at Lake Tanganyika", he said, "Damn it" and immediately went to the street with his Leica 50 mm camera. He went on to become the father of modern photojournalism before returning to art. Those years of photography, he felt, made him a better painter. Perhaps this was on the mind of the young and struggling economist, inspired by a neuroscience poster she saw, marching through the main galley to the Leica stand in the exposition center to inquire about a microscope.

The exposition center which lays in the middle of the main galley resembles a bazaar specializing in high tech gadgetry. Some company representatives are scientists themselves but others are plain salesmen with an eye for a researcher with grant money to spend. You sir, that's a handsome fountain I see in your pocket, allow me to demonstrate the precision of our lasers with an engraving of your name. Can't quite edit genomes in your monkey's brain just right? Look no further than GeneArt! Best of all is the representative for Life Technologies who brings his pitch home with a ten minute magic show to an applauding crowd. Meanwhile graduate students float from stand to stand, collecting free mugs, t-shirts, and tote bags which one filled with a year supply of pens. You can walk your imagination in this fantastic place. But our determined economist passed it on her way to the Leica stand.

Representatives dressed in khakis and black polos were leaning against their equipment when the economist approached them and said, "Gentlemen, your microscopes please". After the director from Mannheim quizzed her research purposes–she was unsure, saying only that she had inspiration, which was true, and had just come into a grant, which was not–he called over the resident expert on confocal microscopy. This economist likely needs to examine brain slices, the director said to the expert, who was confused. So your correspondent, who was there to support his dear colleague, offered: I believe what she wants is to get down to the bottom of things like never before. That was enough to convince the expert to tour us through the latest in microscopy, a spectacular machine called the Confocal Laser Scanning Microscope Leica TCS SP8, which looks like something Apple designed and which we called Lucy for short. But before presenting Lucy, the expert, who had the presence of Paul Simon telling songwriting stories, first wanted to talk about Leica's history.

"Before cameras, we made microscopes," he said. "It wasn't until 35mm film was introduced that we started with cameras. There were these Germans who wanted to film the effects of a flood, but because 35mm film was too expensive to risk unusable footage, they took single frame shots as tests. That spurred the development of 35 mm camera film. The rest is history." Your correspondent asked the expert if he was familiar with Cartier- Bresson. Do I not have his pictures of New Orleans pasted onto my office wall in Illinois, he said.

Having declared his love for what can be seen with a good eye, our expert presented Lucy, who he said was well-endowed with Leica's new imaging technique, Stimulation Emission Depletion (STED), a method of super- resolution. Looking into the eyepiece while the expert flicked a switch that activated the laser and turned a knob that focused the objective, your correspondent observed what appeared to be a neon-green orange slice against a black backdrop. It was a dyed cell nucleus, filled to its borders by minuscule dots. These were extremely fine intra-cellular particulate matter, each approximately ten

microns in diameter, and they unsighted the eye from seeing details of interest. This occurrence is what the expert, after a lengthy explanation involving optics, physics, and perhaps voodoo for good measure, eventually called noise.

"When you look at something extremely close up the tiny things will may dominate your view," said the expert. "That's noise, and you want to remove it so you can see what you are after."

Image noise removal will be familiar to readers. Photoshop is an example of noise removal software where the noise is removed after an event. What makes Lucy incredible besides her lovely body is that she removes noise in real time. The photography corollary would be a camera with a noise- removal setting that photoshops the scene in the viewfinder as the image is being made. With this in our minds the expert activated the STED laser to commence the noise-removal demonstration that is Lucy's prize quality. Your correspondent was asked to stop investigating his press badge with the microscope. The economist listened carefully.

"How much an instrument like the human or a microscope can produce an image of an object is limited, and what can't be accurately detailed is the noise," said the expert. "But what we can do by super-resolution is average many images of the same object, which smooths out the effect of the noise on the aggregate image."

STED then is the process that reduces the objective into many small images and averages them into the aggregate image which achieves higher detail by minimizing noise. The science behind STED goes way back to Einstein discovering stimulated emission, a process in which an electron interacting with an electromagnetic wave transfers energy in the form of a photon to the ambient electromagnetic field. When the transfer of energy exceeds absorption, optical enhancement of the field occurs. This is most basically how lasers work, and STED is a like a photoshop laser. Did our dear Einstein have this in mind all along? Fiddling equations alone in a humble home office in Vienna, wondering how to see the details of the universe like Galileo before him? Who knows, said the expert. "You can invent the future, but you can't predict where it will go."

We watched the cell nucleus come into focus on the computer monitor as STED went into action. On the left hemisphere of the monitor were controls that controlled the STED laser loading images into the monitor's right hemisphere. Once one image was loaded, another would be loaded on top of it, and as this happened there was a line running down the image space from from top to bottom like the line that ran down old television screens when you adjusted the antenna to get better resolution. The super-resolution process happened very fast. Within thirty seconds all the noise from the orange slice was removed and all that remained was clean, clear image of the vast emptiness of a cell nucleus that for some reason was very moving to see. The expert said it was a neural cell from the hippocampus, the memory region of the brain.

"See anything that interests you in there?" the expert asked the economist. Neuroeconomics has made efforts to identify possible neural correlates to economic theory institutions such as utility and pinpoint mechanisms behind decision making. The machine of choice for this work employs functional magnetic resonance imaging (fMRI). Perhaps there indeed are parts in the brain that drive economic behavior. Or perhaps it is closely connected to other behavior and the job is to understand such connections. But what cannot be seen, at least not yet, is intra-cellular communication, or information sharing between cells in the brain that could reveal how the many regions of the brain work in cooperation or conflict with each other. This is a long way from paper and pencil, so what an economist would ever need a microscope for was beyond our expert. The

economist did not know either. What she knew was that what happened in the brain would happen whether or not academics categorized them by terminology that changed from field to field and in doing so corrupted the truth. What should it be that one field has the answer and the rest are unnecessary. Academia ought to be more like a brain and less like an appendix. All this silently poured from her face as she look intensely into the empty cell on the computer monitor.

"How much does it cost?" the economist asked. The expert said, $120,000. That is ten-thousand times what I paid for lunch, the economist replied. There is no free lunch, not even at the Society of Neuroscience, unless you are a member of the press. So the expert and the economist exchanged information – maybe her advisor would suddenly decide to build an economics laboratory – and wished each other a good conference. Walking down the aisles of posters in the main galley as she hummed "Piece of My Heart" by Janice Joplin she resembled Cartier-Bresson walking in the farm in Vosges after he escaped a Nazi prisoner camp to find his beloved Leica that he buried before the war. Everyone has a purpose to find or if things went bad to rediscover. Our economist walked out the conference center. Her colleagues were waiting for her at the Howling Wolf.

Economists believe that preference is revealed by choice and for this they are labeled shortsighted by neuroscientists who believe that preference is revealed by deep-rooted neural processes not always expressed by actions. Let them all have microscopes. Let them all love Lucy. Then they will have something to laugh about together at the bar.

7 Until next year

Oxford mathematician and avid cricket fan G.H. Hardy was known around campus for marking men he met with a mental scoresheet he kept with his colleagues at dinner. The scoresheet contained descriptors for which a man was marked. One of Hardy's favorite descriptors was "old brandy", which meant: "taste that was eccentric, esoteric, but just within the bounds of reason."

The six neuroscientists with whom your correspondent drove straight to New Orleans from New York City were surprised to hear that old Hardy, who on his deathbed in 1947 maintained that there was not a morning of the most creative mathematics that could surpass an afternoon of watching cricket with a handful of walnuts and a companion for banter, was using their word which had dominated their vocabulary since the conference began. There have been calls, in particular from neuroeconomics, to break up the conference – this mad, exhilarating, exhausting conference – because it has become too disorganized, too disparate, just too damn much.

Your correspondent hopes not. Brandy is the best way to describe the annual Society for Neuroscience conference and the scientists of all levels who love it. And when the games come to New Orleans, as they have on five occasions out of forty, why, brandy practically flows out the trumpets, down the narrow streets of the French Quarter, through Jackson Square, and into your mind as you lay under the live oak tree, planning your next report. Because at this conference in this city there is much reporting to do. At the Spotted Cat on Frenchman St they serve reports in pint glasses that hands in the dancing crowd will pass on to the swing band, showering the pianist. At the Candlelight Lounge in Treme, where jazz was born, reports come in plastic cups while the famous brass band plays dixieland. Or you might find yourself walking the French Quarter with a very large report in your hand because it is local custom. This was all in the name of journalism and when the occasion was suitably brandy, science, and stating so became accepted currency among the many thinkers in town that week. My esteemed colleague from WYNU radio and NYU neuroscience, when questioned by skeptics on what authority he made predictions such as the imminent supremacy in funk music by Brooklyn outfit Space Clamps, had only to settle his audience by informing them: "I'm a reporter, and I'm drunker than you are."

Then you might go somewhere to think seriously about all this reporting. So you go past Exchange Way where men once dueled with pistols and past the Latin American styled building called The Cabildo where the Louisiana Purchase was signed to Napoleon House. The general lost the war his sale funded and he was thereafter exiled to Elba, but New Orleans loved him so much that she crowdsourced funds to send pirates on a rescue mission to Elba and bring Napoleon home to live in the house where you are now drinking Pimm's and eating gumbo. Go there and imagine what you would do with fresh funding after being inspired by your new ability to accept the cynics of science without becoming one. That is the best lesson your correspondent can share with you from his thorough coverage.

After five days of action – posters to study, future collaborators to inspect, socials to attend, press conferences to sleep through – there is no telling exactly what the conference accomplished. It is hard to even figure out what happened as a whole. Veteran science journalists cover the conference by choosing a few topics that come with press releases containing quotes by authors of the research ready for print, and then go to the press conferences to fill in any gaps. They might schedule a supplemental interviews. But few

of them were in the guts of the conference, the poster galley, where your correspondent attempted to get a grip on any undercurrent that may have been driving the entire conference. Science develops slowly. Research centers on creating hypotheses to test theories and then amending those theories when results demand so. Yet there is something about a conference of this sheer magnitude that makes you think there somewhere in the convention center is a hidden laboratory where the world's top brain scientists are discovering mysteries after breakfast, unraveling them after lunch, and toasting the next batch of mysteries after dinner. Because the most confident scientist would say there are no mysteries, only puzzles that will eventually be solved, over generations if not more. Your correspondent is the impatient type and could not wait that long. If you are not careful like a scientist then this sort of conference will intoxicate you into an endless hunt from poster to poster for not just insight on how the brain really works but for the meaning of life itself. Send a reporter with a camera and a voice recorder, yes; but do not send a hopeless graduate student with a notebook to the world's biggest neuroscience conference.

At best you can take a sample to represent the conference as a whole to understand it better and therefore understand how and maybe even why things happen. Fortunately your correspondent managed alongside his more scattered reporting to gather two. We mentioned before that science happens slowly so patience is tantamount. The thrill of the conference happens when you are wandering about the poster galley on the hunt. Sitting down in a chair in a dark side-room watching a three hour symposium made up of fifteen minute powerpoint presentations is not a thrill. But if you can stay awake it is more worthwhile than thrill.

The first symposium was simply titled Sleep Matters. For starters sleep matters because no animal life cycle exists without it. Still, little is directly known about what happens in our brains when we sleep. So many curious attendees came to find out what we've learned since the last conference. Besides the usual invested researchers hoping to glean inspiration or maybe steal methodology, naturally it attracted a fair share of walking zombies, victims of too much conference.

The sort of research presented there – most of it embargoed from public release until after the end of the press conference on the same material some days later – was the kind of stuff you could immediately put in a self-help-by-science book about why you need a full night's sleep every night. One in five Americans are sleep deprived, and the researchers who consider this a public health problem one after the other presented their latest findings, many yet unpublished, on what sleep deprivation does to you. It weakens memory and disrupts the natural remodeling of memories that helps us remember relevance and forget irrelevance. It cripples learning. It is beginning to be linked to Alzheimer's: too little sleep creates similar effects to the disease, but small changes in sleep cycles can actually improve memory. Fearful memories can be reactivated and possibly diminished by sleep, which may influence future PTSD treatments. To try to sum it all up, sleep deprivation affects the hippocampus and the brain's "default mode network," which in turn affect memory and event ordering and recollection but exactly how remains unclear. Man is circadian–how much he needs is debated, though Da Vinci found he could manage with many twenty minute naps rather than a single block of sleep but he did not make it regular practice–and if he does not get enough sleep he will impair his ability to interpret and understand reality. Rather like when is in an unhealthy romance. These are exciting results but pending confirmation by further, rigorous experiments. (All were found using mice, not humans.) To contribute

to the literature your correspondent considered approaching the author of the study "Researchers Study the Impact of One Sleepless Night" so as to offer his personal and well-documented anecdotal data. But he had not slept the night before the symposia and could not remember who the author was. After a few days, most conference neuroscientists look the same: shirts tucked into slacks, pens tucked into shirts, brains tucked into heads.

The second symposium was called The Social Brain, which brought to mind New York Times columnist David Brook's book "The Social Animal", only the material presented was not inflated with significance by fictional characters. Most of the material presented was about decision making in social settings. Some results are disturbing, really. Subjects in experiments manipulate each other in social norm compliance. Subjects only make social decisions if their attention is held. Subjects promote misinformation to confound one another. Monkey subjects, that is, though some experiments used humans who were oftentimes more disagreeable than monkeys high on dopamine. What was most cool about this symposia were the methodologies. Experiments were creative and new. The best was Penalty Kick, in which two monkeys play a computer game similar to Pong but with only one paddle; one monkey controls the ball and tries to put it past the monkey controlling the paddle. The presenter showed us a video of the monkeys in action. There they were in their cockpits, sipping on juice they got as reward for a goal or a save in between rounds of play. After each presentation the presenting authors fields questions from eager attendees or fends off aggressors like the sociologist who accused every neuroscientist of misunderstanding society. And after each symposia people find each other to talk about a future together. The sort of thing you could only do at a conference.

The neural processes of choice, value, and decision making are common topics in the budding field of neuroeconomics, for which a few of the presentations at The Social Brain were involved. Much has been said of the validity and future of neuroeconomics before by skeptical economists and optimistic neuroscientists. Let your correspondent simply say then he believes its validity strong and its future bright. Neuroeconomics is a neat example of the crossover potentials between neuroscience and other academic disciplines. Sometimes they go overboard. (Your correspondent recalls reading "neuro" prefixes to just about anything on plenty of occasions.) But for the most part the field has gone from strength to strength. Neuroeconomists certainly think so. At their social, which was relatively small since the disciples are smaller in number than all other subfields, they drank heartily and debated vigorously about the promise of their academic union. There are those who say we are exercising futility, but if we cannot demonstrate to them otherwise the illumination of our interdisciplinary work, we need only be patient. Science advances one funeral at a time. In such vibrant atmosphere it is very easy to adopt a energetic viewpoint of science as an unstoppable movement devoid of cynicism and replete with hope.

That at least is the romance of too much brandy. Day to day, science is a tough business. Competition for places–in grad school, in postdocs, in faculty, in publications–is brutal. Plenty of scientists become plenty cynical even if they make it. Plenty of scientists quit and become brewers or musicians or what have you. Most scientists you will never hear about. They will drift between institutions on short contracts, chiseling away their life's work in marble with a pencil. Or others will eschew academia – the desk-flying, the laboratory incarcerations, the unyielding, uncompromising, and unseeable frustrations – and do completely different stuff. As your correspondent noted in his first dispatch, science is not for the faint of heart or weak of liver. In fact having all of your organs functioning optimally is recommended.

Nonetheless science, unlike most other things you can do with your life, does well at attracting people who are interesting and do not care about status, an illness that influences too many people, from televised politicians to unknown tweeters. If your correspondent had to choose one, his favorite discussion with a scientist for journalism purposes was with NYU post-doc Pascal Wallisch. A book about spontaneity of thought could be written about him, while he himself writes plenty on what goes on in his head for the public [link to blog]. The discussion took place during an interview between Wallisch and your correspondent's esteemed colleague from WYNU radio, on assignment at the conference as well, on the convention center balcony, sometime during happy hour which in New Orleans starts at eleven in the morning. Wallisch said not a few fascinating things about how the brain is constantly collecting information to build a model of reality for the mind. For example, depression involves a starker, sadder model of reality. But if there is a singular and universally true reality, your mind is not a part of it. None are. Why? "Because the mind," said Wallisch, pointing his finger to his head, "inhabits the brain." The mind inhabits the brain. The mind inhabits the brain. The mind inhabits the brain. After considering that declaration for awhile your correspondent's went on holiday for a few minutes to a very brandy place and came back changed, possibly forever.

Take it from an economist: what is known about the brain does not compare to what is not known. You don't need to go to a conference to learn this. You can learn it just fine trying to explain yourself. You ask, what the hell is wrong with my brain? Probably a lot, but that has not been the point of this coverage. All of this you can learn from academic journals by building your understanding one article at a time like every scientist must. The point of this coverage has been to show you what it is like at an enormous neuroscience conference in New Orleans because next year the conference unfortunately is in San Diego and with luck we will already be too committed in our uncompromising lifelong work inspired by this week. We will reconsider though for New Orleans. The media organizers for the Society of Neuroscience have not given any suggestion that the conference will return to New Orleans in the near future. May she come home soon.