Capturing the Power of a Star Inside a Bottle
Stefano Chiocchio, a genial nuclear engineer with a perpetually tired-looking face, is the man in charge of capturing the power of a star in a bottle.

An intricate global project involving 35 countries has spent decades planning and building an artificial earthbound sun that could solve the world’s energy’s problems, carbon-free.

Aside from ensuring that all the pieces of daunting technology work together, Chiocchio’s goal for the project’s human side is avoiding the kind of meltdown that would turn it into a modern-day Tower of Babel.

Years from now—maybe in a decade, maybe sooner—if all goes according to plan, the most complex machine ever built will be switched on in an Alpine forest in the South of France. The machine,

Cancer Hope From a Scorpion’s Venom
Because it's so late on a Monday afternoon, there is a listless vibe inside the University of Washington lecture hall where Jim Olson is about to speak. The audience consists of a few dozen grad students struggling with end-of-day fatigue. They scarf down free chocolate-chunk cookies as they prepare to take notes, but sugar can sharpen mental alertness only so much. The talk they've come to hear, part of a biweekly series on current topics in neuroscience, doesn't exactly seem like edge-of-your-seat material.

Olson’s first slide wakes them up. It is a pixelated photograph of an adorable 6-year-old boy named Hayden Strum, who sports a white Quiksilver T-shirt and a pirate-style eye patch. Hayden, who suffered from a pernicious brain tumor, came to Olson in 1995, back when Olson was just starting his career as a pediatric oncologist and cancer researcher. For four years, the doctor treated Hayden with successive rounds of chemotherapy and major surgery.

Radioactive Waste Raises Doubts in a Small Town
A pixie-like girl with big blue eyes and long brown hair, Hannah Samarripa began experiencing headaches and fatigue in the middle of eighth grade. By the time the spring dance rolled around, Hannah didn’t have the strength to paint her own toenails. Her mother, Becky Samarripa, did it for her, and then drove Hannah to school and waited outside, knowing she’d need a sponsor, bad,
Reactor, continued
called the International Thermonuclear Experimental Reactor, or ITER, will stand a hundred feet tall, and it will weigh twenty-three thousand tons—more than twice the weight of the Eiffel Tower. At its core, densely packed high-precision equipment will encase a cavernous vacuum chamber, in which a super-hot cloud of heavy hydrogen will rotate faster than the speed of sound, twisting like a strand of DNA as it circulates.

The cloud will be scorched by electric current (a surge so forceful that it will make lightning seem like a tiny arc of static electricity), and bombarded by concentrated waves of radiation. Beams of uncharged particles—the energy in them so great it could vaporize a car in seconds—will pour into the chamber, adding tremendous heat. In this way, the circulating hydrogen will become ionized, and achieve temperatures exceeding two hundred million degrees Celsius—more than ten times as hot as the sun at its blazing core.

No natural phenomenon on Earth will be hotter. Like the sun, the cloud will go nuclear. The zooming hydrogen atoms, in a state of extreme kinetic excitement, will slam into one another, fusing to form a new element—helium—and with each atomic coupling explosive energy will be released: intense heat, gamma rays, X rays, a torrential flux of fast-moving neutrons propelled in every direction.

There isn’t a physical substance that could contain such a thing. Metals, plastics, ceramics, concrete, even pure diamond—all would be obliterated on contact, and so the machine will hold the superheated cloud in a “magnetic bottle,” using the largest system of superconducting magnets in the world.

Just feet from the reactor’s core, the magnets will be cooled to 269 degrees below zero, nearly the temperature of deep space. Caught in the grip of their titanic forces, the artificial earthbound sun will be suspended, under tremendous pressure, in the pristine nothingness of ITER’s vacuum interior.

No one knows ITER’s true cost, which may be incalculable, but estimates have been rising steadily, and a conservative figure rests at 20 billion dollars—a sum that makes ITER the most expensive scientific instrument on Earth. But if it is truly possible to bottle up a star, and to do so economically, the technology could solve the world’s energy problems for the next thirty million years.

Read the story, more about autism and communication, and research on artificial intelligence.

Who We Are
Hollywood, Health & Society, a program of the USC Annenberg Norman Lear Center, is a free resource for entertainment writers working on storylines about health, health-care coverage and climate change. Funders have included the CDC, the Bill & Melinda Gates Foundation, the Grantham Foundation, the Barr Foundation, The California Endowment, the Energy Foundation, ClimateWorks and the Skoll Global Threats Fund.
Tumor Paint, continued

ies, but nothing could save the boy’s life.

Having been caught off guard by the emotional wallop of his opening story, Olson’s audience stays rapt as he goes on to describe a decade-long quest to solve one of the most vexing problems in oncology: the fact that a tumor’s precise boundaries are nearly impossible to define during surgery. A preoperative MRI provides only a rough guide to a tumor’s fuzzy edges; the scans often miss slivers of cancer that seamlessly blend into the surrounding tissue. Surgeons often face a brutal catch-22: Either cut out any suspicious tissue, an approach that can lead to debilitating side effects, or risk leaving behind malignant cells that will eventually kill the patient.

Olson tells the students that he finally has a solution. His laboratory at the renowned Fred Hutchinson Cancer Research Center, located just down the road by Seattle’s Lake Union, has developed a compound that appears to pinpoint all of the malignant cells in a patient’s body. It gives those cells a bright fluorescent sheen, so that surgeons can easily spot them in the operating room. Olson calls the product Tumor Paint, and it comes with a surprising twist: The compound’s main ingredient is a molecule that is found in the stinger of a potent little animal popularly known as the deathstalker scorpion.

Read the story, more on the research, and watch a video of Tumor Paint in action. ■

Drugs, continued

auburn hair and a deep drawl. “It kind of bothers me that he never gets one.”

Chiasson-Downs and the other therapists with the Chestnut Ridge Center’s opiate-addiction program had gathered to update each other on the status of their patients before launching into the day’s psychotherapy sessions. Here in West Virginia, where prescription painkillers have long “flowed like water,” as Sullivan said, the team works to keep recovering addicts sober through a combination of therapy and buprenorphine, a drug used to treat painkiller and heroin addiction.

Chiasson-Downs’ patients are in the “advanced” group—so called because they’re well into their recoveries. She relayed a few success stories—a new baby here, a relapse averted there—but even years after they’ve found sobriety, her charges’ lives are still precariously balanced.

Read the story, more on painkiller overdoses, and information on opioids and chronic pain. ■

Mississippi, continued

her job, a modest low-paying one of the sort all too common in Mississippi, America’s most down-and-out state, where a full 20 percent of the population doesn’t graduate from high school, 22 percent lives in poverty and a quarter of the state’s working-age population goes without health care coverage.

Gary didn’t have health insurance either, not that she hadn’t tried. When the Affordable Care Act mandated that Americans buy coverage, she didn’t want to be a lawbreaker: She had gone online to the federal government’s new website, signed up and paid her first monthly premium of $129. But when her new insurance card arrived in the mail, she was flabbergasted.

“It said $6,000 deductible and 40 percent co-pay,” Gary told me, her timid drawl giving way to strident dismay.

She canceled her coverage.

Never mind that the Magnolia worker was wrong—Gary’s out-of-pocket costs were legally capped at $6,300.

Read the story, and more on health disparities among rural populations. ■

Tumor Paint, and it comes with a surprising twist: The compound’s main ingredient is a molecule that is found in the stinger of a potent little animal popularly known as the deathstalker scorpion.

Dr. Jim Olson’s work tackled one of the most vexing problems in oncology: how to define a tumor’s boundaries in surgery.

Susie Fitzhugh/Fred Hutchinson Research Center

Still, it was a full six months later, when a doctor spotted her brain tumor during an eye exam—literally seeing the growth through the lens of Hannah’s eye—that the 14-year-old got the diagnosis and then the surgery that saved her life.

When Hannah got sick in 2007, her mother had no idea that, just a few blocks away in the Acreage—their lush South Florida community—other children had also suffered through the same awful symptoms. Had she known about Jessica Newfield, who was close to her daughter’s age and had been ill for many months before being diagnosed; Joey Baratta, who developed two tumors before dying at age 20; or little Jenna McCann, who got sick at age 3, perhaps she’d have gotten Hannah’s tumor diagnosed sooner.

But it would take all of the afflicted families years to connect the dots among their tragedies.

When Becky heard from a friend that another child in the neighborhood had recently been diagnosed with a brain tumor, “I was like: what is going on?” Just after Hannah underwent surgery to remove her tumor, and less than a year after the boy—a 5-year-old named Garrett Dundsford—had his brain surgery, the parents started talking.

Read the story, and more on how radiation exposure can affect health. ■

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