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Jurassic Generation

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Jurassic Park is the greatest science story ever told. This is a truth into which I was initiated on my very first viewing, terrified and rapt, a few days after I concluded first grade—after which *Jurassic Park* held for some time the status not just of Best Science Movie but Best Movie Ever. I have seen it, let us say, more than a few times. This spring, it is enjoying a brief re-release in commemoration of its twentieth anniversary and acknowledgment of the cinematic and commercial marvel of IMAX 3D, into which it has been converted. I could not, of course, pass up the opportunity to see it once again like never before on the big screen, and my youthful assessment of the movie's greatness has been vindicated.

Some scientists, unsurprisingly, balk at *Jurassic Park*. After all, the science is so inaccurate! *Velociraptor* was smaller and had feathers. *Dilophosaurus* wasn't venomous. *Tyrannosaurus rex* could not run so fast. That opening scene where the paleontologists just wipe sand off of an intact and perfectly preserved dino skeleton is hogwash. In any case, near-complete DNA molecules cannot survive in fossils for tens of thousands of years, much less tens of millions. Also: did you know that most of the dinosaurs depicted in *Jurassic Park* actually lived in the Cretaceous period?

This is the pedant's approach to science fiction, and it does have its uses. Among other things, how would scientists be able to maintain bonding rituals within their tribe if they could not rally around movies that get their specialties wrong? Astronomers have *Armageddon* and *Contact*; volcanologists have *Volcano* and *Dante's Peak*; physicists have the *Stars Trek* and *Wars*; and paleontologists have *Jurassic Park*. (Artificial intelligence researchers are another story—most of them would be out of a job if not for the movies.)

More importantly, *Jurassic Park* isn't after simply the facts. Nor, as many reviewers complained at the time of its initial release, does the movie seek to tell stories about fully three-dimensional human characters. Rather, it offers us a fable about the natural world and man, and the relation between the two: about science, technology, imagination, aspiration, folly, power, corruption, hubris, wild nature in its many forms, and, most importantly, dinosaurs.

Jurassic Park is not exactly a film that demands deep reading: its themes are big and brash and on

the surface. Many of these subjects (except dinosaurs) have been covered more thoughtfully in other books and movies, essays and poetry. But part of the movie's oomph comes from the way it manages to wrap up so many different ideas about science, technology, and our relation to the natural world. It is not an especially new or sophisticated take so much as a memorable agglomeration of themes, attitudes, tropes, stereotypes, and archetypes surrounding the scientific project—yet it manages to give new life to these ideas rather than exhaust them in service of the story. This, along with the eminent quotability of just about every line of dialogue, has much to do with the film's peculiar resilience in the popular conscience as a cinematic depiction of science.

First, there is perhaps no movie that better captures the range and depth of our awe before the power of nature and our own power over it. Throughout the movie, we are brought to feel the field biologist's primal thrill of terror before mighty creatures; the conservationist's ancestral thrill of entering the wild; the dual existential thrill of paleontologists, geologists, and astronomers at peering over a span of time in which the self becomes nothing, and yet by knowing transcends; and the bioengineer's Promethean thrill of releasing the deepest powers of life.

The depictions of each of these stances toward science and nature are aided and abetted by the sensory experience of the movie. Despite *Jurassic Park*'s relatively primitive graphics technology, two decades later it somehow looks better than nearly all of the wave of computer-generated movie imagery it inspired—most notably *Avatar* and the *Star Wars* prequels, which despite the expense lavished on them were the respective cinematic equivalents of eating a box of Splenda and Styrofoam. Because *Jurassic Park*'s special effects were put in service of directing and story, they helped it to rack up several of the most breathtaking moments in cinema. Even more effective is the score, one of John Williams's best, which moves adroitly through each of the flavors of thrill and awe, delivering emotionally what the rest of the film imparts through visual splendor and visceral terror.

Naturally, the awesomeness of *Jurassic Park* also explains why the movie appealed so much to the imaginations of children like myself, not yet fully civilized out of the wild realm of gnarling and gnashing of teeth. The majority of those children, also like myself, did not eventually become paleontologists as first planned. But the tacit consensus among my generation that Science Is Cool probably owes more to *Jurassic Park* than to any other single source, including Bill Nye the Science Guy and the tales of our grandparents once dipping their toes into the lunar seas.

That this Science-Is-Cool attitude has a rather large influence on today's ostensibly rational debates over science, and that few of the self-proclaimed defenders of science are eager to admit this even as they speak openly of cultivating it, speaks to the troubled relationship between science and our non-scientific motivations for doing science. The influence of these other motivations—such non-rational ends as profit, glory, and wonder—is as unavoidable for scientists and policymakers as for the inventors and entrepreneurs we see driven by them in the movie. (Two of the biggest of those motivations, innate curiosity and financial self-interest, are of course central drivers for the creation of dinosaurs by both the fictional engineers and the real-life moviemakers. Who knows what kind of money Jurassic Park would have made, but *Jurassic Park* the movie cleared nearly a billion dollars at the box office.)

For all these reasons, *Jurassic Park* is not a depiction of science as cool reason, but of science as passion, discovery, and wonder, even fear and trembling—less Richard Dawkins and more Carl Sagan, if Sagan were marveling at the grandeur of existence right as existence was about to eat him for lunch.

The notion that *Jurassic Park* would enkindle a generation's enthusiasm for science might have surprised and frustrated Michael Crichton, the author of the 1990 book on which the film was based (Steven Spielberg purchased the movie rights before it was even published). For Crichton, the story was meant not as an ode to Science but as a warning about today's scientific enterprise: the terror of *T. rex* on the loose was a parable less about the majesty of nature and the miracle of human creation than about the foolishness of our aspirations for technocratic control.

This theme, of course, is still present in the movie, albeit largely as a way to get the dinos out of their pens so they can dispense munchy poetic justice to their creators. Indeed, one of the remarkable things about the film is how well the Science-Is-Cool factor coexists with the themes of peril. We see human beings devoured by ill-conceived monsters and yet still somehow find ourselves sympathizing, at least up to a point, with the monsters' makers. The film is somehow simultaneously a cultural touchstone for both the awesomeness of science and nature and for our anxieties about the hubris of the scientific enterprise.

Jurassic Park presaged any number of ethical issues in science from the last twenty years. The most obvious and explicit of these is the "de-extinction" movement, which just over the last few months has become an increasingly heated debate, with proponents suggesting we should recreate species made extinct by human activity and critics echoing exactly the arguments that the movie's biolo-

gists make about reintroducing species whose habitats and ecosystems are lost to history (or prehistory, as it were). The movie also touches on the issues of cloning and other forms of reproductive technology; the ethical treatment of animals; habitat loss and wildlife degradation; the role of corporations in driving technological innovation, and the corruption of pure research that sometimes results; the role of private donors in influencing research priorities; the fear of unintended consequences in genetically modified agriculture and wildlife; the role of regulation in driving certain research abroad and underground; and on and on.

More than concerns with any particular kind of technology or practical aspect of the scientific enterprise, however, the film is best known for articulating a wariness at the idea of exerting excessive control over the forces of nature. This is the central lesson that each of the characters is forced to learn over the course of the movie in one way or another. The form in which this lesson will be delivered for many is foretold in one of the opening scenes, when a snot-nosed kid, hearing paleontologist Alan Grant (Sam Neill) lecture about the *Velociraptor* he is digging up in the Montana desert, scoffs at the idea that this "six-foot turkey" could be scary. Grant, who expresses distaste for and even irritation at the presence of children, proceeds with relish to describe the means by which these creatures would have made a snack of the boy back in the day:

> You stare at him and he just stares right back. And that's when the attack comes, not from the front, but from the side—*whshht!*—and the other two raptors you didn't even know were there.... The point is: you are alive when they start to eat you. So, you know: try to show a little respect.

One of the few characters in the film who truly respects the power of the beasts—the game warden who oversees the "living biological attractions" in the island amusement park—is nonetheless offed in precisely the manner Grant describes, even recognizing and admiring the intelligence of the beast that bests him; his famous last words are "Clever girl." Most of the other major characters who have been involved in the island's design and management eventually meet similar fates.

Even Grant, whose knowledge of the dinosaurs helps him navigate through the island unfazed (and whose sound skepticism of the Jurassic Park project exempts him from the dispensation of poetic justice anyway), is subject to other natural forces of which he is initially in denial but has by the end of the movie grudgingly come to accept. A man whose chosen field of study is creatures long dead, he is brought over the course of the film to appreciate creatures of his own kind not long alive, forced by

the circumstances of the story to harness the same protective parental instinct that allowed species like ours to make it in the first place.

The major character who unexpectedly escapes his toothy comeuppance is the master creator himself: John Hammond (Richard Attenborough), a showman, impresario, and entrepreneur. Hammond's project of rational control fails on just about every conceivable level. In his first scene in the movie, he informs Grant, along with Grant's professional and romantic partner, Ellie Sattler (Laura Dern), "I can tell instantly about people. It's a gift." But Hammond, who is also fond of repeating almost as a mantra that he "spared no expense" in creating the park, appears to have spared at least one expense, and misjudged one person: Dennis Nedry (Wayne Knight), the master engineer who has been hired to design the entire software architecture of the island. Unable to secure the salary he feels he deserves, Nedry conspires to steal dinosaur embryos for a rival biotech firm, a plan which soon goes awry and unleashes prehistoric chaos. (Nedry winds up in the belly of at least one *Dilophosaurus*, while the container full of embryos is lost in a muddy stream.) All of this, of course, happens while Grant, Sattler, and several other visitors are touring the facility, during which a tropical storm also comes crashing down on the island—"Why didn't I build in Orlando?," moans Hammond.

Next is the failure of all of the technical controls on the island itself. Aside from the foolish reliance on a single human programmer, none of the safety measures seems to have been well thought out. The dinosaurs are contained by electrified fences dependent not only on functioning software but a constant power source, both of which fail, as might have been predicted but wasn't. (Haven't these characters ever seen a movie?) Indeed, every element on the island seems conceived with the notion of carefully controlling the actions of its animal residents and human visitors alike—including restraints and prescribed feeding times for both—all of which prove fruitless. "*T. rex* doesn't want to be fed, he wants to hunt," warns Grant. The systems that the designers believed to be multiply redundant in fact set the stage for cascading chains of failure.

The book adds richer detail about the folly of the technocratic mindset. Even among well-intentioned characters, we are constantly shown the troubles that result from miscommunication, assumption, and deference to authority. In one case early in the novel, a mysterious, partially eaten specimen of an animal thought to be a mutated lizard is sent by a researcher to a lab for analysis and species identification. The lab carries out the analysis but, lacking the personnel to identify the species, simply repeats back the presumed species of the lizard it had been told; the researcher takes this to mean that the lab has

confirmed his own guess about the species, which delays the eventual realization that this is no lizard at all.

The illusion of control is a prominent theme in the movie, but another detail from the book illustrates it better than almost any of the rest: During the process of creating the dinosaurs, one of Hammond's chief scientists, Henry Wu (B. D. Wong in the movie), attempts to explain to Hammond that, since the scientists are extensively filling in the missing holes in the dinosaurs' genetic code with fragments from modern animals, they are not in fact recreating long-extinct species so much as reconstructing some approximation of them. Thus, Wu argues, there is no reason not to start engineering them purposefully, "domesticating" them to be more docile, slow, and easier to manage. (Indeed, the rival company intent on stealing Wu's work aims to miniaturize the dinos to sell them as household pets: imagine playing fetch in the park with Rex, the tiny *T. rex*.) Hammond scoffs at the idea of intentionally creating anything other than "real" dinosaurs; but Wu, for all the crassness of his proposal, has still reckoned better than Hammond with the truth of what they are doing.

Many of these themes are explicitly addressed in a scene in which the principal characters, sitting peaceably around the lunch table while the real fun has yet to be unleashed, argue about the wisdom of the Jurassic Park project. These few minutes offer one of the best brief cinematic depictions of the reflexively ebullient and wary attitudes toward science, represented respectively by John Hammond and Ian Malcolm (Jeff Goldblum), the rock-star mathematician who specializes in chaos theory. Grant and Sattler, meanwhile, rather meekly remind them of the need for caution, while the lawyer in the room imagines only the fantastic profits to be had. Malcolm chastises Hammond:

> Genetic power is the most awesome force the planet's ever seen, but you wield it like a kid that's found his dad's gun.... I'll tell you the problem with the scientific power that you're using here: it didn't require any discipline to attain it.... You didn't earn the knowledge for yourselves, so you don't take any responsibility for it. You stood on the shoulders of geniuses to accomplish something as fast as you could, and before you even knew what you had, you patented it, and packaged it, and slapped it on a plastic lunchbox, and now you're selling it, you wanna sell it.

When Hammond emphasizes the remarkability and wonder of his accomplishment, Malcolm retorts, "Yeah, but your scientists were so preoccupied with whether or not they *could* that they didn't stop to think if they *should*." Hammond, aghast, responds, "I simply don't understand this Luddite attitude, especially from

a scientist. I mean, how can we stand in the light of discovery and not act?" (By the way, those plastic lunchboxes were available in real life, and I proudly employed one throughout second grade.)

Only so much philosophical depth can be packed into a single movie scene, of course, but this one alone manages to surpass in wisdom just about everything that is being churned out by Oxford's techno-ethics mills these days, with their "just-asking-questions" pose of suggesting that we genetically and pharmacologically enhance human populations for managerial purposes eerily similar to the ones Wu suggested for dinosaurs in the novel. This scene speaks to an era in which our sense that we control world events seems to be ebbing—from anxiety over climate change, to energy stability, to housing bubbles, dirty bombs, and asymmetric warfare.

Or take the current debate over "geoengineering": that is, whether we should try to control the climate and ecosystem of the entire planet, first to combat climate change and then—why not?—to effect whatever other changes might please us. Although this idea was barely conceivable when *Jurassic Park* was made, its soundness is already taken as a given by many futurists and even some policy wonks, and one can hardly think of a more apt argument against it than Ian Malcolm's talk of the unpredictability of tinkering with unfathomably complex natural systems.

This is part of the genius of *Jurassic Park*—it seems to cover nearly all of the major attitudes toward science, for and against. But it is also the trouble with the film's having become, intentionally or not, one of the most iconic pop-culture representations of the scientific enterprise. For one thing, the fear of unintended consequences risks being overstated in real life. Malcolm's warnings about unpredictable systems, rather dumbed down for the purposes of the movie, are the kind of idea many people have in mind when they invoke the "precautionary principle," even against technologies like nuclear energy that are not unpredictable in the way that concerned Crichton, and more or less can be and have been demonstrated safe.

Relatedly, *Jurassic Park* misrepresents critics of science and technology. Those of us with concerns about certain of the impulses that motivate the modern scientific project must constantly take pains to avoid the charge of being Luddites, of simply being afraid of the change wrought by scientific and technological innovation, or of being motivated by—heaven help us—the fear of "playing God." Like *Frankenstein* before it, *Jurassic Park*, though astute in its critique, risks becoming through its very success and fame a kind of disinformation, an easy means for dismissing any warnings about certain avenues of innovation as unserious or clichéd.

Part of the blame can after all be placed on the story itself. Although Crichton viewed his tale as a general warning that "science is too important to leave to scientists," as he put it in a 1993 interview, he was particularly worried about the explosive and largely unchecked growth in the biotechnology industry that was already evident by the 1980s. Crichton, like so many since, saw the primary danger of man's attempted power over nature as one of unintended consequences: the power is always to some extent an illusion. This is the real fear about "playing God" that several of Crichton's characters articulate, and that the movie powerfully depicts from several angles: there is nature's intrinsic power; man's original vulnerability before it; his ability to overcome and harness it; and his ultimate vulnerability again before it. In one scene, when the visitors are first introduced to the dinosaurs, Grant collapses to the ground in shock, and then slowly gazes back up, with an expression, all but perfectly portrayed by Sam Neill, that manages to evoke each of these ideas at once. He is filled with awe and terror at the power he is witnessing—just whose power neither he nor we are quite sure.

But what is all but absent from a movie and a novel that purport to warn us about the excesses of the biotech industry is any sense of the true ultimate aim of that enterprise. The real biotech future will not be defined by genetic engineering of hardier crops and exotic pets, or even animal cloning and de-extinction. It will be, and in many ways already is, defined by bringing these powers to bear not on external nature but our own natures: by genetic enhancement of ourselves, selection of our children to fit our preferences, babies made not just in petri dishes but artificial wombs, children drugged out of normal behaviors in order to be easier to manage in schools, the medicalization and subsequent "treatment" of anything about ourselves and others we see as disadvantageous or simply dislikable.

Critics of these aims too often find themselves having to argue on the grounds of folly and unintended consequence—a vague apparition of peril with an immediate purchase on the public conscience that owes in no small part to stories like *Jurassic Park*. It remains to be seen what these technological projects will really bring, but it is unfortunate that we do not yet have a cinematic touchstone that as vividly portrays the possibility that we might destroy ourselves after all, but quietly, without the spectacle. For as troubled as we should be about biotechnology giving us something quite worse than we were expecting, we ought to wonder even more about the possibility that we will get exactly what we asked for.

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