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In the not-to-distant future, asteroid mining will likely use autonomous or semi-autonomous robots to extract resources. Conflicts are likely to emerge between competitors. One company's robot might dig in an area earmarked or claimed by another company. The aggrieved company would seek legal redress in the form of ejecting the intruder and recovering a fair calculation of monetary damages for its occasioned losses. This commentary will explore the inability of existing legal rubrics to fashion a remedy to this kind of dispute.

Robotic autonomy is measured in degrees. I picture programmed machinery which can be deployed across a single asteroid or through an asteroid cluster; which can identify possible mineral lodes with little or no Earth-based human intervention. This machinery, or perhaps different models, would also be designed with the ability to tap and extract resources for testing and exploration. It seems probable that as greater numbers of automatic machines are sent to asteroids, they will crowd one another. Conflicts will be unavoidable.

Trespass rests on real property rights. The Outer Space Treaty seems to reject the recognition of any real property rights in space.

The legal cause of action that comes most readily to mind to remedy a physical intrusion into another person's spatial areas is trespass. Trespass remedies intrusions into one's possessory rights to real property, as an owner or a tenant. The shortcoming of the Outer Space Treaty (1967)¹ to recognize, or at least fully recognize, traditional real property rights has been exhaustively considered by scholars.² Those shortcomings were partially—and inadequately—addressed by the Commercial Space Launch Competitiveness Act of 2015.³ Unfortunately, the Act lacks mechanisms for dealing with a dispute between two rival mining ventures in space.

An earlier draft of that Act did contain a legal framework section that would have allowed a company involved in commercial asteroid mineral extraction to seek legal relief when another company interfered with its activities. The final version, though, deleted that framework (see [“Staking a claim to space resources”](#), *The Space Review*, December 14, 2015). Thus, there is no legal rubric that has been intentionally created to

address jostling robots in the asteroid belt. Instead, existing legal doctrines would have to suffice.

Disputes between companies of different nations are especially uncharted. In a dispute between, for example, a Canadian company and a United States company as to whether one company's robots trespassed on the other company's asteroid areas, the Outer Space Treaty's rejection of real property rights in space is implicated. If there can be no legal realty on asteroids, it follows that trespass is an inappropriate theory for the aggrieved firm. Trespass rests on real property rights. The Outer Space Treaty seems to reject the recognition of any real property rights in space.

Once rocks have been extracted from an asteroid, they become personal property (or "movables"). A claim of conversion will lie against the firm that snatches rocks from another firm's possession. But while the rocks are still attached to the asteroid, they are real property, as much as a dinosaur fossil is real property until it is unearthed.⁴ Only upon severance can minerals become personal property. Real property rights in space are uncertain, and quite possibly unachievable under the terms of the Outer Space Treaty, to which the United States is a signatory.

Do the deep recesses of the common law offer any possible solution to this problem?

The problem, then, is that because no property rights to the asteroid vest prior to severance, the aggrieved firm is left arguing an injury to an interest that is unrecognized, and quite possibly unrecognizable, pursuant to international treaty. Trespass appears a non-starter, because it depends on the legal existence of real property in outer space. Do the deep recesses of the common law offer any possible solution to this problem?

A similar problem confronted a Mr. Samuel Keeble in 1707.⁵ Keeble owned a spot of real property known as Minott's Meadow. There, he constructed an elaborate duck catching contraption known as a duck net as a means to ensnare large numbers of wildfowl. He was a wholesaler of ducks just as an asteroid miner would be a wholesaler of ices or ores. Keeble's problem arose when Edmund Hickerlingill, on three occasions, discharged firearms to scare away the ducks from Keeble's nets. Hickerlingill did so with both feet firmly planted on his own ground and so had not physically entered (trespassed) upon Hickerlingill's property. Keeble had possessory rights in realty, but those rights hadn't been intruded upon.

Keeble's problem was twofold: First, Hickeringill has not trespassed on Keeble's real property. Second, wild ducks (like asteroid minerals) are incapable of private ownership except upon capture. Prior to Keeble capturing any wild ducks (we might say "severing" them from the wilderness), they were owned by no one. Hickeringill had intentionally frightened great quantities of ducks away from the nets, but Keeble couldn't assert any property rights in the ducks.

Still, the trial court awarded Keeble twenty pounds sterling in damages. Hickeringill appealed, but Chief Justice Holt surveyed the law and concluded, "I am of opinion that this action doth lie." Keeble won.

The court explained that "if Mr. Hickeringill had set up another decoy on his own ground near the plaintiff's, and that had spoiled the custom of the plaintiff, no action would lie, because he had as much liberty to make and use a decoy as the plaintiff." The court continued: "But, in short, that which is the true reason is that this action is not brought to recover damage for the loss of the fowl, but for the disturbance." The court could not fashion a remedy for invasion of Keeble's property, but it could for the malicious damage to his privilege of operating a commercial enterprise.

The unhappy asteroid mining firm might rely on the holding in *Keeble v. Hickeringill* in suing the rival company with the wandering robot. It could argue an invasion of commercial privilege if not property. It seems to fit, and although *Keeble* is an awfully old case, it's still studied in the first week or two of any law school student's study of property law, and thus will be recalled by even 21st century attorneys.

The problem is that the *Keeble* holding rests squarely on the maliciousness of Mr. Hickeringill's shots. Hickeringill had contrived to "wrongfully and unjustly" aggrieve Keeble (a longstanding neighbor-to-neighbor feud can be presumed). Hickeringill acted out of spite rather than earnest economic competitiveness. Autonomous robots do not act out of spite in any traditional sense of the word.

Now conceivably, a robot's software could be written in such a way so as to impute spite to the company which uploaded the software. Malice can, I think, be coded. Malice-tuned software would be a "smoking gun" for applying the *Keeble* rule. A human agent with malicious intent, acting on behalf a company, which designs an autonomous robot-actor to act in a spiteful

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manner towards a competitor would fit nicely within *Keeble*. The malicious mind upon which *Keeble* depends is, in this scenario, that of the programmer. Thus, in this scenario, the aggrieved company could recover for invasion of its mining privileges. But without spite originating in a human, a straying robot would be more akin to Hickeringill simply setting up his own commercial duck capturing enterprise of his own, luring some ducks to his own nets, which, as a consequence, spoils some of Keeble's profits; an act with damage without a remedy.

The maliciousness dilemma with robots is a serious one. Robots are unlikely to be vested with personhood, legally speaking, until their AI approaches or surpasses human levels. In other words, you cannot sue a robot, and you won't be able to for the foreseeable future. You can only sue a person (whether individual or corporate actor) who directs the robot towards wrongful acts. You cannot sue a robot any more than you can sue an algorithm—or a mousetrap, despite its primitive autonomy and ability to harm. An autonomous robot that chances into another person's sphere of interests might therefore cause a wrong without an available legal remedy. This is dangerous stuff.

It's a problem recently explored by philosopher John Danaher.⁶ He concludes that there is a serious gap when it comes to robot misdeeds. Danaher agrees that "when a robot misbehaves people will look to the human manufacturers and programmers as potential targets for retributive blame." The attenuation between programming and autonomy will typically hold the programmer (or her company) blameless, leading to a "retribution gap." A strong human desire for retribution will be unmet when there is no appropriate target for blame. These responsibility gaps are troubling, and problematic.⁷ A wrong lacking a legal remedy encourages private acts of retribution, which can lack proportionality and predictability; an eye for an eye that ends up blinding both companies' revenues.

The scenario presented in the opening paragraphs—that of a mining robot which wanders into a competitor firm's area upon an asteroid—is unmapped territory, legally speaking. Ambiguity in legal rights is never a good thing, especially in the commercial context. Ambiguity represents a business risk that is difficult to quantify. A capital investment with incalculable risks is best avoided entirely. Certainty is preferable to uncertainty.

The law should anticipate asteroid mining conflicts before they arise. One possible solution is strict liability for the acts of autonomous robots. Strict liability would impose legal responsibility without a showing of any wrongful act or spite, or even negligence. It's a convenient solution because strict liability is already a recognized legal doctrine; it imposes liability without fault in the context, for example, of extremely dangerous activities like storing dynamite. When the shack of dynamite goes off, causing injury to a neighbor, liability can be imposed without having to prove fault. But robots are not inherently dangerous, and imposing strict liability for any act of a robot that causes harm is overbroad, and just as likely to stifle investment in extraterrestrial commercial ventures as uncertainty.

Endnotes

1. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, art. I, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 (commonly called the OST or Outer Space Treaty).
2. E.g., Daniel H. Deudney, "High Impacts: Asteroidal Utilization, Collision Avoidance, and the Outer Space Regime", in *Space Policy in the Twenty-First Century* 147, 161 (W. Henry Lambright, ed., 2003) (noting: "Overall, outer space is governed communally" and with communal arrangements, "property is frequently subject to depletion, crowding, and collision.").
3. US Commercial Space Launch Competitiveness Act (also known as the SPACE Act), Pub L. 114-90. 129 Stat. 704 § 101 (2015). Chapter 513 of the Act purports to grant private property rights to extracted outer space resources for those who comply with the Act. 51 U.S.C. § 51303.
4. See *Black Hills Institute of Geological Research v. South Dakota School of Mines and Technology*, 12 F.3d 737 (8th Cir. 1993) (holding that the *Tyrannosaurus rex* fossil known as "Sue" was real estate when it was discovered partially exposed on the ground).
5. *Keeble v. Hickeringill* (1707) 11 East 574; 103 ER 1127.
6. John Danaher, "Robots, Law and the Retribution Gap," 18 *Ethics and Information Technology* 299 (2016).
7. See Robert Sparrow, "Killer Robots," 24 *Journal of Applied Philosophy* 62 (2007) (considering blameworthiness when an autonomous weapon system commits a war atrocity).



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