

## MINING LAW FOR OUTER SPACE

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### Abstract

Existing international law allows public and private entities to appropriate minerals in outer space. At present, however, neither national or international laws specifically protect mining interests. The first section of this article describes the regime of international law which governs resource appropriation, including recent developments in the law of the sea and the law governing Antarctica. The second and third sections discuss the United States' General Mining Law of 1872 (30 U.S.C. § 22 *et seq.*) and the *S.S. Central America* case (1989 A.M.C. 1955 (E.D. Va. 1989)), which allowed deep sea treasure hunters to perfect a claim by means of telepresence. In the final section of the paper, the aforementioned statute and case holding are analyzed as precedents for outer space. The author recommends mining laws which would clarify the legal status of miners prior to and during mining operations, as a means of encouraging mining investment.

### Introduction

In 1983 one author estimated that the precious and strategic metals in a single asteroid could have a market value of five billion dollars.<sup>1</sup> Unfortunately that estimate focused on the metals' intrinsic value, and was based upon assumptions regarding other factors which are difficult to predict, including the costs of exploration, surveying, excavation and transportation. But the estimate was nonetheless worthwhile, because it illustrated the potential value of extraterrestrial resources.

While investors could become rich by mining asteroids for precious and strategic metals and then selling the materials in terrestrial markets, the more likely use for asteroidal resources is in extraterrestrial construction and manufacturing operations. Scientists believe that some earth-approaching asteroids contain abundant amounts of hydrogen, nitrogen, and free metals, all of which may be scarce on the Moon.<sup>2</sup> On the other hand, the Moon contains significant amounts of oxygen, silicon, iron, aluminum and titanium.<sup>3</sup> All of these materials will be valuable for extraterrestrial activities because launching raw materials from earth is too expensive.

Most aerospace scientists are familiar with the preceding discussion and techniques for processing and using extraterrestrial materials continue to be developed and discussed in the technical literature. Lawyers, however, have paid little attention to the issue of extraterrestrial mining.<sup>4</sup> Legal issues warrant further discussion, because entities will never begin mining projects if their investments are not protected.

This article examines the existing treaty law which governs resource appropriation, and other treaty, statutory and case laws which provide precedents for extraterrestrial mining. The article concludes by describing the broad outlines of a mining law which would both protect and encourage investment.

### International Law

There are two international agreements that indirectly control mining operations in outer space: The 1967 Outer Space Treaty<sup>5</sup> and the 1979 Moon Treaty.<sup>6</sup> Other agreements relating to the law of the sea and Antarctica provide precedents which are directly relevant to space mining.

The Outer Space Treaty The 1967 Outer Space Treaty is widely accepted in the international community. Many of its provisions are considered to be customary international law and would therefore apply to all nations, and not merely those party to the agreement. The treaty sets forth the following regime for development activities in outer space: (1) space objects occupy locations on a first-come, first-served basis<sup>7</sup> (2) nations have jurisdiction over space facilities and all personnel in or near the facility, irrespective of nationality<sup>8</sup> (3) personnel have the right to conduct their activities without the harmful interference of other states (4) although entities may not claim ownership of mineral resources "in place," once they have been removed (i.e. mined) then they are subject to ownership<sup>9</sup> and (5) jurisdiction and any rights with respect to a given area cease when a facility is returned to Earth, destroyed or abandoned or when activity is halted outside a facility.<sup>10</sup>

The Outer Space Treaty does not specify what rights operators have with respect to areas around facilities or in areas of ongoing activities, such as mining activities. Many authors, both American and Soviet, say that facility operators have a right to a "safety zone" or a "keep-out zone" in the vicinity of facilities.<sup>11</sup> Certainly states have a right to prevent damage or destruction of a facility by exerting a measure of control over activities within a reasonable distance around the facility.<sup>12</sup> The Outer Space Treaty and principles of general international law prohibit interference with activities, so exercises of jurisdiction in mining areas would also be justified to the extent necessary to prevent interference. The physical extent of these safety or keep-out zones is unclear, but if the analogous regime for drilling platforms on the continental shelf is any indication (safety zones of 500 meters)<sup>13</sup>, then one could predict that the extent of these zones will be strictly limited.

The Moon Treaty The 1979 Moon Treaty declares that space resources are "the Common Heritage of Mankind" and specifically prohibits any form of property rights with respect to those resources. Other provisions would establish a significant bureaucracy to control development. Vague terms in the treaty also require "equitable sharing of benefits" with non-space-faring nations, which is interpreted to include both profit sharing and technology transfer.

Most nations, including the United States, have not accepted the Moon Treaty, although it has been signed and ratified by seven nations and has entered into force with respect to those nations. Pro-space activists and mining interests opposed this treaty and effectively lobbied to prevent its signature in the United States. Of the key space-faring nations, only France signed the agreement;

other members of the European Space Agency, the USSR, China, Japan and India did not sign the agreement. None of these countries, including France, has ratified the Treaty.

The Law of the Sea The 1982 Law of the Sea Treaty<sup>14</sup> was negotiated contemporaneously with the Moon Treaty and it contains similar provisions regarding property rights, technology transfer, benefit sharing and bureaucratic institutions. The Sea Treaty has also encountered opposition, although it has gained wider acceptance than the Moon Treaty, probably because the bulk of the treaty does not concern mining and codifies existing law which most nations have already accepted.

Before the Sea Treaty was completed, the United States enacted the Deep Seabed Hard Mineral Resources Act<sup>15</sup> to reassure private investors and to inform the United Nations of its displeasure with the treaty's mining provisions.<sup>16</sup> The Act establishes an exploration licensing and mining permit system. The law says that other nations must have enacted similar legislation before they can ask the United States to recognize their mining claims. During the period of 1980 - 85 the following countries enacted national legislation similar to the U.S. act: the Federal Republic of Germany, United Kingdom, France, Japan, the Soviet Union, and Italy.<sup>17</sup>

Unfortunately, delegates to the sea convention did not heed the dissenting nations' wishes and the final form of the treaty incorporated the objectionable mining provisions. This posed a problem for the four state-owned companies and four private multinational consortia which had begun exploration of the deep seabed. With the exception of India's state-owned company, all of these entities were (and are) interested in a specific region - the Clarion-Clipperton Zone of the Northeast Pacific - where manganese nodules are known to exist in economically-recoverable quantities.

As one might expect, overlapping claims resulted when all of these entities focused on the same geographic area. The state-owned companies of France and Japan and three of the multinational consortia (comprised of investors from Italy, Belgium, Canada, the Netherlands, the Federal Republic of Germany, the United Kingdom and the United States) claimed mining sites which overlapped with the area claimed by the Soviet Union.

Of that group, France, Japan, Italy, Belgium, Canada, the Netherlands and the U.S.S.R. were all signatories to the Sea Treaty. Although none of those countries have ratified the agreement, they apparently desired to comply with the terms of the treaty, which required them to resolve conflicting claims before registering with the treaty's Preparatory Commission as "Pioneer Investors." A series of negotiations ensued, outside the framework of the Sea Treaty, concluding on April 19, 1987 with a statement of understanding between France, Japan and the Soviet Union<sup>18</sup> and on August 14, 1987 with an "Agreement on the Resolution of Practical Problems with Respect to Deep Seabed Mining Areas" between the Soviet Union and signatory nations with consortia interests.<sup>19</sup>

This second agreement provides that parties will recognize each others' claims, respect the boundaries of those claims, and comply with international law and existing legislation to ensure that there is no physical interference with other parties' exploration and mining activities. The United States subsequently exchanged bilateral Notes with the Soviet Union<sup>20</sup> and the other parties<sup>21</sup>

agreeing (respectively) to be bound by the agreement's provisions, and to not terminate its adherence with the agreement without other parties' concurrence.

This agreement and exchange of Notes are significant because they indicate that the Soviet Union will accommodate the ideological position of the non-signatory states and that the Preparatory Commission (which did not object to the agreements) will accept a mining regime conducted outside the framework of the Sea Treaty, on the basis of mutual cooperation and without international control.<sup>22</sup> These developments are also relevant in a broader context because they illustrate nations' changing political attitudes toward resource development at the international level.

Antarctica Both the Moon Treaty and the Sea Treaty pitted western developed nations against the Soviet Union and the undeveloped nations. In contrast, the subsequent Antarctic Resources Regime<sup>23</sup> represented a confrontation between environmental and development interests. In June of 1988 representatives of thirty three nations initialed the agreement, which would supplement the 1959 Antarctic Treaty. The agreement would have allowed mineral and oil exploitation while still honoring the original treaty's ban on territorial claims.<sup>24</sup> The Resources Regime placed strict controls on appropriation, however; it required unanimous, case-by-case approval from the twenty six consultative nations that hold voting rights under the original Antarctic Treaty.<sup>25</sup>

Although the Resources Regime contained significant and extensive provisions intended to protect the environment, it was nonetheless opposed by environmental groups throughout the negotiation and drafting process (a period of approximately six years). Environmentalists felt that any development of Antarctica presented too great a risk, and they argued that the continent should become a "world park." Their principal fear was damage to plankton, which could cause world-wide ecological effects.<sup>26</sup>

Unfortunately, in January of 1989 an Argentine supply ship went aground near Antarctica and leaked approximately 150,000 gallons of diesel fuel<sup>27</sup> (by comparison the tanker Valdez spilled 13,200,000 gallons of oil off the coast of Alaska later in 1989). This spill adversely affected local wildlife and disrupted scientific studies at nearby Palmer Station (U.S.).<sup>28</sup> After the incident, French naturalist Jacques Cousteau and the Greenpeace organization intensified lobbying efforts.

In August of 1989 Greenpeace was rewarded: the Australian and French governments announced that they would not sign the agreement.<sup>29</sup> This announcement left the future of the treaty in doubt because the Resources Regime could not enter into force unless it was ratified by a group of nations which includes Australia and France.

With the Resources Regime in limbo, many nations were concerned that without a governing agreement, development would proceed by default.<sup>30</sup> These concerns led the treaty nations to attempt to limit appropriation a second time.

In April of 1991, the Antarctic Treaty nations drafted a Protocol to the 1959 agreement which would prohibit mineral exploitation for at least fifty years. When the Treaty nations reconvened on June 22, 1991, the United States was the only delegation which returned without government approval

to sign the Protocol. The Chief U.S. delegate would not rule out signature by the United States, saying merely that the government needed more time to consider the issue.<sup>31</sup> The deadlock was broken on July 3, 1991 after a compromise was reached which allowed the mining ban to be lifted by a vote of three fourths of the voting (consultative) members rather than the unanimous approval previously specified by the Protocol.<sup>32</sup>

The United States' decision to join in the mining ban is troublesome because some may view the action as a precedent for outer space. The relevant circumstances in outer space should be distinguished from those in Antarctica, however.

Treaty nations banned development in Antarctica to protect the Earth's environment. The mining industry did not oppose the ban because mining companies are not presently interested in Antarctica. In contrast, most areas of outer space have no ecological system to protect and there is considerable interest in extraterrestrial mining. In fact, moving mining and manufacturing activities into outer space will benefit the Earth's environment because it will eliminate detrimental effects on our air, water and wildlife. In this respect, the law of the sea is a more appropriate analogy for outer space because there *are* companies interested in mining the seabed and that activity is not viewed as a threat to the environment.

### The General Mining Law of 1872

The United States' policy of promoting and protecting resource appropriation in international areas is consistent with its approach to mining at the national level. The principal law which governs national mining activity is the General Mining Law of 1872.<sup>33</sup> That law promotes resource appropriation by allowing prospecting and mining virtually free of charge on America's public lands.<sup>34</sup> Miners' prospecting activities are protected by the case-law doctrine of "pedis possessio" (discussed below), and after a valuable mineral deposit has been discovered, by the General Mining Law which grants a "patent" or fee title to the land encompassing the deposit.

Miners do not need a federal license or other grant of permission to prospect and mine under this system.<sup>35</sup> To obtain a patent to the land in which minerals are located, the miner must *discover*<sup>36</sup> a *valuable mineral deposit*,<sup>37</sup> *locate* the claim,<sup>38</sup> record the claim,<sup>39</sup> do at least \$100 of annual assessment work or other improvements,<sup>40</sup> file annual affidavits of assessment work with the Bureau of Land Management,<sup>41</sup> and apply for the patent.<sup>42</sup>

The italicized phrases are terms of art which have been further defined by the courts. For example, the courts have subjected the requirement of "discovery" to a "prudent man standard"<sup>43</sup> and a "marketability test"<sup>44</sup>; i.e. the discovery must be such that only a prudent person would expend further effort, and the minerals discovered must offer some possibility of generating a profit. The term "valuable mineral" has been scrutinized to determine what substances qualify; in the context of this article, it is important to note that water is not considered a "valuable mineral."<sup>45</sup> Finally, the term "location" is the process of marking and describing the boundaries of the claim.<sup>46</sup> The General Mining Law specifically limits the size of claims which may be located.<sup>47</sup>

Pedis Possessio While prospecting, and before discovery, miners are protected in their occupation of the land by the doctrine of pedis possessio. "Pedis possessio" literally means "actual possession."

The doctrine says that a prospector occupying an area and diligently searching for minerals is treated as a licensee or a tenant at will; no one else can acquire rights in the area through a forcible, fraudulent or clandestine intrusion. If, however, the prospector does not act to exclude others or does not search diligently for minerals, and another prospector enters the area peaceably, without fraud or subterfuge, and discovers minerals and locates a claim, the location is valid and the original miner must respect it.<sup>48</sup>

This doctrine only provides miners with limited protection. Some minerals cannot be discovered without substantial amounts of capital, specialized equipment, and engineering, technical and organizational expertise. In those instances, miners face the risk of losing their entire investment if another party makes a peaceable discovery without their knowledge.

Courts have addressed this issue with respect to uranium, which is difficult to discover because deposits are often deep beneath the earth. To more adequately protect their investments, uranium prospectors have adopted the practice of locating and recording their claims before actual discoveries are made. Although federal and state statutes require miners to discover a valuable mineral before locating a claim, courts and regulatory agencies have allowed miners to validate claims with subsequent discoveries, so long as other miners have not established intervening rights.

In several cases, state supreme courts have expanded the pedis possessio doctrine in connection with uranium prospecting. In 1958 the Utah Supreme Court held that miners could base a valid discovery on radiometric detection and geological analysis, particularly when miners had physically discovered deposits nearby.<sup>49</sup> In a similar case, Colorado validated a discovery based on radiometric detection, assaying and the type of rock present at the site.<sup>50</sup> Finally, in a third case, the U.S. Geological Survey made an initial discovery while preparing anomaly maps from airborne surveys. The Nevada Supreme Court validated the claim of the first on-the-ground locator using a geiger counter (radiometric detection).<sup>51</sup>

These cases may find application in the law of outer space because extraterrestrial miners face circumstances which mirror those faced by uranium prospectors: they cannot discover minerals without substantial amounts of capital, specialized equipment and engineering, technical and organizational expertise. One author has gone a step further and suggested that courts need to provide protection to miners who do no more than locate claims and demonstrate a feasible plan for their exploration.<sup>52</sup> In light of the risks faced by extraterrestrial miners, that would seem to be a valid recommendation for the field of space law.

Mineral Leasing The Mining and Minerals Policy Act says that it is United States policy to "foster and encourage private enterprise in [mining activities]."<sup>53</sup> However, in recent years public land law has been partly superseded by overriding public considerations as the government has sought to prevent or diminish mining's adverse effects on other resources and amenities.<sup>54</sup> The General Mining Law provides that valuable mineral deposits "shall be free and open to exploration and

purchase . . . *under regulations prescribed by law* . . . so far as the same are applicable and not inconsistent with the laws of the United States.<sup>55</sup> This statutory language has resulted in regulations of mining activities which encompass a broad range of public policy issues including pollution control and environmental impact, zoning, land use planning, reclamation, administration of the public trust, competing recreational and preservational values and wildlife protection.<sup>56</sup>

The impact of these regulations has been minimal however, when compared to the effect of laws which have withdrawn various lands and minerals from the coverage of the General Mining Law. There are three principal reasons why the United States has enacted such laws: (1) some minerals, such as coal, are so abundant that there is no need to encourage development; (2) the government has an ongoing need for fuel for government vessels and vehicles and it makes no sense to give fuel away and then buy it back; and (3) if valuable minerals are not given away, they can become a source of revenue.

To implement these policies, the United States has enacted a leasing system for certain minerals and in certain areas of the public domain, as an alternative to the General Mining Law's location system. Minerals subject to leasing include the fossil fuel minerals (oil, gas, oil shale, coal, asphalt, bituminous rock, and solid and semi-solid bitumen); fertilizer and chemical minerals (phosphate, potash, sodium) and geothermal resources.<sup>57</sup> All minerals on acquired lands, which amount to about eight percent of all federal lands,<sup>58</sup> are subject to leasing rather than location,<sup>59</sup> as are minerals on the outer continental shelf (principally oil and gas).<sup>60</sup> The Federal Land Policy and Management Act of 1976 establishes further procedures for the withdrawal of land administered by the Bureau of Land Management.<sup>61</sup>

Leasing differs from the General Mining Law's location system in the following respects: (1) miners must obtain permission from the federal government before prospecting or mining; (2) miners must pay royalties, rents, and bonus payments; (3) miners may only obtain leases through competitive bidding in areas where minerals are known to exist; (4) miners do not obtain fee title; leases have specified time limits which may be extended if minerals are being produced in commercial quantities; (5) the United States may require "due diligence" and (6) the United States may require protection of competing resources and the environment.<sup>62</sup>

As one can see, the mineral leasing system imposes greater regulatory burdens and expense upon miners than the General Mining Law's location system.

#### The S.S. *Central America* Case

In June of 1986 the Columbus America Discovery Group located the wreck of the *SS Central America*, which sank in 1857. The ship carried gold which is now worth approximately one billion dollars.<sup>63</sup> Using computer analysis, advanced sonar and a remote-controlled robotic probe, the group found the wreck approximately 160 miles off the South Carolina coast, nearly 1 1/2 miles beneath the surface.<sup>64</sup>

Unfortunately, Columbus America had to go to court to quiet conflicting claims to the treasure.

Shortly after the group made its discovery, a second expedition began searching for the *Central America* in the immediate vicinity of Columbus America's activities. When the second ship refused to leave the area, Columbus America sought relief in federal district court.

To prove their discovery and to permit the court to assert jurisdiction, Columbus America used a telerobotic vehicle to retrieve a piece of coal from the wreck. The coal was delivered to the court, which acknowledged the discovery, asserted its jurisdiction, and issued a Temporary Restraining Order prohibiting other ships from entering the area.<sup>65</sup> In subsequent actions the court issued Preliminary and Permanent Injunctions, ultimately enjoining other ships from entering a twenty-square-mile area surrounding the treasure site.<sup>66</sup>

When news of the discovery became public, thirty nine insurance companies which had paid claims against the ship's cargo asserted ownership of the treasure. In a second opinion, the court dismissed twenty one of the claims,<sup>67</sup> and found that the remaining insurers had abandoned any right to the treasure because they had not listed the ship's cargo as an asset in their accounting records or retained any other records of ownership. The opinion concluded by granting Columbus America title to the treasure.<sup>68</sup>

The court established two important precedents in this case: (1) it protected the rights of individuals to exclude others from a specified area in international waters, and (2) it recognized telepresence as a valid method of discovery. Admiralty law previously protected only the rights of nations;<sup>69</sup> this is the first time that a court has granted rights to private individuals.<sup>70</sup> And telepresence now offers an alternative to the human presence which admiralty law has traditionally required to establish possession.<sup>71</sup> Legal experts have already recognized that these precedents may be applied directly to extraterrestrial mining and salvage operations.<sup>72</sup>

### Recommendations

Extraterrestrial miners will face a situation similar to that faced by both uranium miners and the Columbus America Group: first, they will have to invest a substantial amount of money and effort before they begin their projects; second, they will have to use remote sensing and robotic probes to locate minerals; and finally, they face substantial risk should others dispute their claims. In light of these circumstances, a mining law should be drafted which protects miners' rights and encourages investment to the maximum extent possible.

There are no overriding public considerations which would justify regulations and other limitations on space development. Miners will operate in an inherently risky environment: a lifeless vacuum, without "normal" gravity, far from civilization. It follows that systems of regulation and ongoing payments such as one finds in the Moon Treaty, the Law of the Sea Treaty, the Antarctic Resources Regime and the United States mineral leasing law are simply not justified. Similarly, the Antarctic Protocol is not a valid precedent because it was designed to protect the environment.

Mining laws for outer space should follow the precedents of the General Mining Law and the Deep Seabed Hard Minerals Resources Act. Nations should enact national mining laws that provide for

reciprocal recognition of other nations claims as does the Deep Seabed Act. These laws should establish a mineral location system similar to that set forth in the General Mining Law. The law should however, be modified to reflect the need for greater protection of miners' rights prior to discovery, and to recognize the role of remote sensing and telerobotics in the process of discovery. Legislators should also change the definition of "valuable mineral" to reflect the fact that some minerals (like water) that are not particularly valuable on Earth, may be of much greater value in outer space.

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  61. 43 U.S.C.A. §§1701, 1714.
  62. G.C. COGGINS & C.F. WILKINSON, *supra* note 34, at 397-400.
  63. Seanor, *\$1 billion Ruling*, ABA J., October 1990, at 22.
  64. Seanor, *The Case with the Midas Touch*, ABA J., May 1990, at 51.
  65. Columbus-America Discovery Group, Inc., v. The Unidentified, Wrecked and Abandoned Sailing Vessel, S.S. Central America, In Rem, 1989 AMC 1955, 1956 (1989); *I.d.* at 53-54.
  66. Columbus-America Discovery Group, Inc. v. The Unidentified, Wrecked and Abandoned Sailing Vessel, In Rem, 742 F. Supp. 1327, 1332 (E.D.Va. 1990); Frantz, *Salvage of Steamer's Gold Hits Rough Seas*, L.A. Times, April 3, 1990, at A1, Col. 1.
  67. Columbus-America Discovery Group, Inc. v. The Unidentified, Wrecked and Abandoned Sailing Vessel, S.S. Central America, In Rem, 742 F. Supp. 1327, 1333 (E.D.Va. 1990).
  68. *I.d.* at 1343-48.
  69. Seanor, *supra* note 63, at 23.
  70. Frantz, *supra* note 66, at A1, col. 1.

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71. Frantz, *supra* note 66, at A16, col. 1.

72. Frantz, *supra* note 66, at A16, col. 1 - A17, col. 1; Seanor, *supra* note 63, at 23.