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THE ENJOYMENT AND ACQUISITION OF RESOURCES IN OUTER SPACE *

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In their interactions in the larger arena, states and their surrogates may be observed to employ many different types of resources as bases of power and to make claims of many varying degrees in comprehensiveness of authority and in scope and duration of control over such resources. The more important resources so employed and subjected to claim include, apart from manpower, not only the land masses, in all their protean forms, but also the oceans, air space, outer space, polar areas, rivers and so on. Some of these resources, such as the oceans, air space over the oceans, and international rivers, which experience has demonstrated to admit of a high degree of shared use

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by reasonable mutual accommodation, have been generally regarded as not being subject to exclusive appropriation by particular states, and the only claims which states have reciprocally honored in traditional international law have been those asserting shared access and requiring reasonable accommodation among users. Other resources, such as the land masses and closely proximate waters and air space, have commonly been regarded as admitting only in modest degree of shared use and competence, and states have reciprocally honored each other's claims to a most comprehensive and continuing, exclusive competence over such resources; indeed the very conception of the contemporary state embodies, as is well known, this high degree of exclusivity in the competence of a territorially organized group. The policies followed by the general community in this allocation of resources between inclusive and exclusive authoritative control have, building upon the experience that inclusive use and competence most often achieve the greatest production and widest distribution of goods and services for the benefit of all, established a very strong presumption in favor of the inclusive control of sharable resources, with exclusive control being protected only when it can be shown to contribute most to common interest.

The kinds of claims which will be made to the newly accessible resources of space, and the responses which the general community will make in honoring or rejecting and accommodating such claims, must obviously depend upon many different variables in the whole earth-space community process by which such resources are sought to be exploited. It is, accordingly, again necessary that we review the more prominent features of the probable process of interaction for their potential significance to claim, policy, and decision. From the vantage point of such review, we may then formulate probable types of claims, suggest a more detailed clarification of general community policies, assess the relevance of comparable past experience, and project probable developments and recommendations with respect to allocation of space resources.

I. Significant Features of the Process of Interaction

A. The Probable Resources

The first important question is of course what resources are, or may become, available in space. The most comprehensive inquiry would extend even beyond our solar system, since there appear to be good grounds for believing that interstellar space harbors planets not unlike our Earth, which could sustain advanced forms of life and

resources similar to our own.[1] Unfortunately, despite the rapid accumulation of new information about outer space, our knowledge is still very largely limited to our own solar system, and little can safely be said about other systems of stars, even within our own galaxy. Our present interest must, hence, be focused primarily upon the physical resources presently known to exist, or reasonably expected to be found, in our own solar system and which either are now exploitable or may become exploitable at some time in the future.

In earlier sections of this book we have already made some indication of the rich potential of space resources and have emphasized the extraordinary importance of the void of space as an immense medium, like the oceans and air space, for the movement of various types of man-made instrumentalities. The great range of physical resources, other than the void, which present knowledge suggests as potentially available to man may be indicated, in language which makes no pretense to scientific homogeneity, by the following itemization: *radiations* (cosmic rays, electro-magnetic waves), *forces* (magnetic, gravitational), *particulate matter* (solids, dust, gases), *asteroids*, and, of course, larger *celestial bodies* (Moon, planets). One might add, in addition, *the spectrum of radio frequencies* which, because of the new interferences with earth activities made possible by access to space, has become a resource common to the whole Earth-space community.

For a brief indication of some of the more important characteristics of these resources, we begin with those less tangible in form, and perhaps presently least controversial in terms of claims and policy, and conclude with those more tangible in form, which can be expected to pose at least some difficulties in terms of claims and policy.

1. Radiations

Among the most important resources of the void would appear to be the many different kinds of radiations. It has been said that outer space is "a veritable sea of radiations" [2] which traverse the void and come from various parts of the universe. These radiations are believed to consist mainly of cosmic rays and electro-magnetic waves.[3] Though a great deal remains to be discovered about their properties, the electro-magnetic radiations, including X rays and gamma rays, are already regarded as a potential source of energy for man's activities in space.

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[1] SHAPLEY, OF STARS AND MEN 53-75 (1959); POSIN, LIFE BEYOND OUR PLANET: A SCIENTIFIC LOOK AT OTHER WORLDS IN SPACE (1962); OPARIN & FESENKOV, LIFE IN THE UNIVERSE (2d ed. 1961).

[2] DUBRIDGE, INTRODUCTION TO SPACE 46 (1960).

[3] *Id.* at 46-47. See also WILSON, IGY: THE YEARS OF THE NEW MOONS 103-16 (1961); BURGESS, FRONTIER TO SPACE 103-36 (1956).

Our knowledge of the universe and of the earth itself has been seriously hampered by our inability to study the whole spectrum of radiations undistorted by the terrestrial atmosphere. Despite recent developments in observational techniques, fuller appraisal of these phenomena will become possible only by observation conducted above the atmosphere. Spacecraft both unmanned and manned, as well as observational stations in space, will enable scientists to study the complete range of the radiation spectrum, from which a vast amount of knowledge concerning our immediate environment and the most distant reaches of the universe may be obtained.[4] The study of solar radiations, which cause occasional disruptions in communications and probably affect the weather, is expected to yield especially useful information.[5]

Solar radiation will probably, in addition to being a primary medium of enlightenment, have many other valuable uses in the exploration of space. One such use is the production of electricity for spacecraft and space platforms.[6] Presently available solar cells are capable of producing 90 watts of power per square yard of absorbing area, and this yield could probably be increased to 200 watts with more efficient equipment.[7] Such units can work almost indefinitely because they need no fuel, generator, or destructible moving parts, and have already been successfully used in several artificial satellites. Solar radiation is, further, expected to provide an important source of energy for activities carried out upon celestial bodies. Considering the enormous cost and effort required for the transportation of essential materials to bases and settlements in space, and the undoubted necessity of an adequate supply of energy (power), solar radiation will probably be harnessed for purposes of lighting and heating, processing of local raw materials, growing of plants (not only as a source of food but also for changing carbon dioxide to oxygen) and, possibly, for supplying power to spacecraft.[8] Future technological developments

[4] See, *e.g.*, Goldberg, *Studying the Universe from a Space Platform*, in PEACETIME USES OF OUTER SPACE 111-38 (Ramo ed. 1961).

[5] Kaplan, *The Sun and the Earth*, in *id.* at 139-52; Neiburger, *Utilization of Space Vehicles for Weather Prediction and Control*, in *id.* at 153-73. Data provided by the Explorer VIII satellite and rocket probes have, for example, disclosed the existence of a "shrinking helium belt" at an altitude of 600 miles to 1,550 miles above the Earth. "The importance of knowing how this belt varies with time is vital to future space communications. The types of ions—whether they be from oxygen, hydrogen, nitrogen or helium—determine the number of electrons which will be present. These electrons, in turn, determine what radio wave lengths should be used for more effective communications." NASA News Release, October 15, 1962, p. 3.

[6] *Cf.* Sailor, *Solar Photovoltaic Power Sources for Space Vehicles*, in 5 ADVANCES IN THE ASTRONAUTICAL SCIENCES 149-56 (1960).

[7] GODWIN, THE EXPLORATION OF THE SOLAR SYSTEM 124 (1960).

[8] *Id.* at 39-40, 124, 138, 140. See also VASSILIEV, SPUTNIK INTO SPACE 131 (1958).

will almost certainly put this tremendous source of energy to new uses, now impossible to anticipate.

Another type of space radiation includes cosmic rays, "composed of charged particles such as protons and heavier atomic nuclei which are moving with energies ranging from a few billion volts to a hundred-million-trillion volts." [9] They are found throughout our galaxy, moving in all directions at speeds up to practically the velocity of light.[10] Though most cosmic rays shatter upon hitting the earth's atmosphere, a certain number reach the surface of our planet. According to Professor Wilson:

> These strong cosmic rays are by far the most energetic things we know. Weight for weight, they completely dwarf atomic explosions. Even more powerful cosmic rays may exist, and a search is being conducted to try to discover whether there is an upper limit to their energy.[11]

It is not too fantastic to suggest that at some time in the future this enormous energy contained in cosmic rays may be harnessed for use. At this time, however, from perspectives of space exploration, man's main interest in cosmic rays is in finding protection against their penetrating power, since they can pierce the shield of spacecraft with possibly fatal consequences for astronauts.[12] The nature of cosmic rays has been the object of most intensive study during the International Geophysical Year when a great deal of new knowledge was acquired. Such studies continue, immensely aided by steadily improving space technology, and with especial emphasis upon the investigation of the full range of effects which they may have upon humans exposed to them for prolonged periods of time.[13]

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[9] MOTZ, THIS IS OUTER SPACE 190 (1960). See also WILSON, *op. cit. supra* note 3.

[10] MOTZ, *op. cit. supra* note 9, at 190-91; SULLIVAN, ASSAULT ON THE UNKNOWN 201-02 (1961).

[11] WILSON, *op. cit. supra* note 3, at 107. See also LEONARD, FLIGHT INTO SPACE 135-38 (1957). It should of course be remembered that the total energy flux from cosmic rays is small compared to that from ordinary sunlight.

[12] One of the objectives of Mariner II Venus probe was to measure the intensity of the cosmic rays at great distances from the Earth and away from the perturbing effects of celestial bodies. The Mariner measurements indicate a cosmic ray flux of approximately 3.0 particles per square centimeter per second throughout the flight and this constancy of the radiation intensity is considered "a new and significant piece of information" for future manned exploration of space. The recorded radiation dose during the journey of Mariner to Venus has been approximately 3 roentgens, and "much of this radiation was extremely penetrating." NASA News Release, December 28, 1962, p. 5. For a comprehensive account of the nature of cosmic radiation hazard to space travelers, see HANRAHAN & BUSHNELL, SPACE BIOLOGY 155-76 (1960).

[13] *Id.* at 176-80. See also CLARKE, THE EXPLORATION OF SPACE 93 (rev. ed. 1959); HOLMES, AMERICA ON THE MOON: THE ENTERPRISE OF THE SIXTIES 225 (1962).

One of the most interesting results in connection with the IGY was the discovery of the Van Allen radiation belts of charged particles in the immediate vicinity of the Earth. These belts are a source of a powerful concentrated energy and as such pose a serious hazard to astronauts.[14] Our knowledge about the Van Allen phenomena, as more recent discoveries indicate, is still far from complete[15] and current studies of interest to astronautics are concerned with devising techniques for protection against this radiation, rather than for its use.

Another potential source of power in the immediate proximity of the Earth, above the 100 kilometer altitude, can be found in the layer of nascent (monatomic) oxygen. It is suggested that a catalyst such as nitrous oxide can reconvert the oxygen into its normal state thereby creating an "inexhaustible propellant supply" for spacecraft operating at this level.[16] Geodesy, meteorology, spacecraft ascent and re-entry testing, and reconnaissance are activities which could be particularly aided by the exploitation of this source of energy.[17] Powerful electric currents in the upper atmosphere are also mentioned as a potentially limitless reservoir of power "which mankind may someday tap." [18]

2. Forces

Space also contains two immensely powerful forces, magnetic and gravitational,[19] whose usefulness in the wealth and power processes is at present questionable. However, the acquisition of knowledge about the existence or non-existence of magnetic and gravitational fields around various celestial bodies, and of the properties of these phenomena, is of great importance to all aspects of space travel.[20] Dis-

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[14] HANRAHAN & BUSHNELL, *op. cit. supra* note 12, at 180-87. They report that in prevailing opinion, "it would be best for space travelers to by-pass the hard Van Allen radiation entirely." *Id.* at 186. See also DUBRIDGE, *op. cit. supra* note 2, at 41-42; GODWIN, *op. cit. supra* note 7, at 29-30. STAFF OF SENATE COMM. ON AERONAUTICAL AND SPACE SCIENCES, 87TH CONG., 2D SESS., REPORT ON MANNED SPACE FLIGHT PROGRAM OF NASA: PROJECTS MERCURY, GEMINI, AND APOLLO 21-23 (Comm. Print 1962).

[15] More recent discoveries are briefly outlined in *Hearings on H.R. 11737, NASA Authorization for Fiscal Year 1963, Before Senate Comm. on Aeronautical and Space Sciences*, 87th Cong., 2d Sess. 213-16 (1962).

[16] GODWIN, *op. cit. supra* note 7, at 168-69.

[17] *Id.* at 169.

[18] CLARKE, THE MAKING OF A MOON 117 (rev. ed. 1958).

[19] See *id.* at 116-17; MOTZ, *op. cit. supra* note 9, at 38-46; WILSON, *op. cit. supra* note 3, at 187-98.

[20] The United States satellites Pioneer V, Explorer X, and Explorer XII have, for example, helped to discover the area in space where the Earth's magnetic field ends and the interplanetary magnetic field takes over. Measurements taken by Explorer XII, in addition, indicated that "there may be a turbulent transition region" separating the two fields. NASA News Release, September 30, 1962, p. 3. CLARKE, *op. cit. supra* note 18, at 184-85; HANRAHAN & BUSHNELL, *op. cit. supra* note 12, at 95-110.

coveries with respect to these forces will of course indirectly affect the acquisition of values more tangible than enlightenment.

3. Matter

In addition to being filled with radiations, space contains vast quantities of matter in various forms and different sizes, such as individual molecules, gases, particles of dust, micrometeorites, meteors, and comets. Apart from the planets, their satellites and asteroids, the largest pieces of solid matter known to exist in the void of space are the meteors, ranging in size from tiny specks of dust to large bodies weighing hundreds of tons.[21] Prior to the extensive research done by artificial satellites, it was widely feared that micrometeorites would pose a serious threat to the safety of manned spacecraft.[22] As far as is known, however, not one among more than a hundred satellites launched, has been crippled by micrometeorites.[23] Even though the large meteors which have fallen upon the Earth have been found to contain mainly nickel-iron alloy, they appear in space so rarely that they are highly unlikely to be of any practical value. Man's principal interest in meteors, at least in the present, is, therefore, in the acquisition of new knowledge about the extraterrestrial matter, which may unlock the secret of the origin of our solar system.[24]

More amenable to different uses could be the vast expanses of an incredibly low-density "gas," spreading in interplanetary and interstellar regions. Providing a vacuum nearly a billion times better than any vacuum obtainable on Earth, these regions could conceivably become giant laboratories for experiments requiring a more perfect vacuum.[25] Another form of matter in space whose potential economic usefulness is, however, very much in doubt is represented by the comets, believed to be a combination of solid dust particles and gases.

4. Celestial Bodies

Man's search for new lands and resources has historically been motivated not merely by his immediate economic needs, but also by his inherent spirit of adventure as well as by expectations of the acquisi-

21 CLARKE, THE CHALLENGE OF THE SPACESHIP 66-76 (1959).

22 See, *e.g.*, LEY, ROCKETS, MISSILES, AND SPACE TRAVEL 358-61 (rev. ed. 1958).

23 *Cf.* HANRAHAN & BUSHNELL, *op. cit. supra* note 12, at 3-132 (1960); WILSON, *op. cit. supra* note 3, at 85.

24 CLARKE, THE MAKING OF A MOON 49 (rev. ed. 1958); CLARKE, THE CHALLENGE OF THE SPACESHIP 74-75 (1959) reports that there is "considerable evidence" linking meteors to radio-communications, and some indication that they may effect meteorology.

25 DUBRIDGE, *op. cit. supra* note 2, at 72; CLARKE, THE EXPLORATION OF SPACE 94-95 (rev. ed. 1959).

tion of other values. All these traditional factors, and many new ones, have contributed to the fact that more interest has been shown in the celestial bodies than in any other space resource. We have already indicated, in the chapter on minimum order, the importance of certain celestial bodies in terms of the military strategy of the space age. Here our concern is with the celestial bodies as a new dimension for the acquisition of wealth and other base values. The dominant body of our solar system, its star, is of course the Sun. However, because of its prohibitively high temperature,[26] it appears that for a long time to come the only conceivable use of the Sun may be provided by the radiation it emits.[27] We pass, therefore, to the consideration of the Moon, the planets and asteroids.

a. The Moon

Because of its proximity to the Earth—the mean distance being only 238,857 miles—the Moon has been chosen as the first target of manned landing upon a celestial body.[28] Already in 1959, one artificial satellite had impacted on the lunar surface, and in the same year the first pictures of the Moon's hidden side were obtained.[29] As a result of the increased interest in this natural

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[26] The surface temperature of the Sun is approximately 10,300 degrees F. and temperature of its interior is estimated at about 50 million degrees F. NASA, SPACE: THE NEW FRONTIER 12 (1962) [hereinafter cited as SPACE: THE NEW FRONTIER].

[27] In the words of Professor Wilson, "[T]he sun is, in fact, an enormous nuclear reactor, not fissioning uranium as man-made reactors do, but fusing hydrogen as men hope the reactors of the future will." WILSON, *op. cit. supra* note 3, at 40.

[28] Achieving manned lunar landing by 1970 has been declared a national goal of the United States. Project Apollo, estimated to cost about $20 billion over the next eight years, envisages construction of a spacecraft capable of carrying a crew of three men and a special lunar excursion vehicle in which two men will explore the Moon. NASA has recently described this pioneering expedition as follows:

> As presently envisioned, lunar orbit rendezvous would require a single launch of a Saturn C-5 boosting a 13-foot diameter, three-module spacecraft. The spacecraft would include a five-ton, 12-foot tall command module housing the crew; a 23-ton, 23-foot tall service module providing mid-course correction and return-to-Earth propulsion and a 15-ton, 20-foot tall lunar excursion module. The three modules would proceed to the vicinity of the moon, and would be placed in lunar orbit as a unit. Two astronauts would then transfer to the lunar excursion vehicle and descend to the moon while the Apollo mother craft (command-service modules) remain in lunar orbit.
>
> After a period of exploration extending up to four days, the two men would use the lunar excursion vehicle to ascend from the moon to a rendezvous with the Apollo mothercraft in lunar orbit. After crew transfer, the lunar excursion vehicle would be jettisoned and the command module carrying the three-man team would be boosted back toward Earth by the service module with an engine generating 20,000 pounds thrust. Just before entering the Earth's atmosphere, the service module would be jettisoned and the command module oriented for reentry.

NASA News Release, July 11, 1962, p. 3. Additional data on the United States manned space exploration can be found in SENATE REPORT, *op. cit. supra* note 14.

[29] For an account of the photographing of the Moon's far side by the Soviet automatic interplanetary station, Lunik III, see RICHARDSON & BONESTELL, MAN AND THE MOON 84-92 (1961).

satellite of the Earth and the aid provided by space technology, our knowledge about the Moon has appreciably increased in recent years, particularly in regard to its topography.[30]

It may be recalled that the Moon revolves about the Earth approximately every 28 days, facing us always with the same side. Its distance from the Earth varies from 221,463 miles to 252,710 miles. The surface of the Moon is about one-sixteenth the surface of the Earth and its circumference approximately 6,800 miles. The temperature during a lunar day is about 270 degrees F. falling to about minus 250 F. at night. The most prominent features of the lunar surface are vast dark areas ("Maria"), visible to the naked eye, which were thought by early astronomers to be seas and oceans.[31] Modern astronomy is, however, quite certain that there is no free water on the Moon; in fact, the prevailing view holds that the Moon is covered by a layer of dust.[32]

A large part of the Moon's surface is extremely rugged, consisting of vast walled plains up to 180 miles in diameter, mountain peaks rising to nearly 30,000 feet, hills, valleys and clefts.[33] The origin of some 30,000 large craters, visible from the Earth, is still a matter of debate, though most astronomers believe they were caused by meteors. For all practical purposes, the Moon has no atmosphere. The existence of lunar life appears highly improbable because of the extremes in temperatures, intense solar radiation, lack of oxygen and water. However, the claimed detection by several visual observers of certain spots which are supposed to have changed character slightly with time has led some astronomers to suggest the possibility that some type of vegetation or primitive plant life might conceivably have adapted itself to lunar conditions.[34]

The technological problems which must be overcome before a manned base can be established on the Moon are many and varied, though not insurmountable.[35] One of the most demanding tasks will be the ferrying of supplies indispensable to sustain the life of astro-

30 "Probably the most valuable information obtained from Lunik III is that, contrary to expectations, the far side of the moon does not resemble the near side. The large dark areas called maria, which make up the familiar face of the man in the moon, are almost entirely absent. . . . This shows how far wrong we may be when guessing at the nature of the nearest of the heavenly bodies, even when half revealed to us." *Id.* at 85-86.

31 See *id.* at 39-66; WILKINS & MOORE, THE MOON 24 (1958).

32 RICHARDSON & BONESTELL, *op. cit. supra* note 29, at 52-66; SPACE: THE NEW FRONTIER 13.

33 *Cf. id.* at 13; WILKINS & MOORE, *op. cit. supra* note 31, at 23.

34 CLARKE, *op. cit. supra* note 25, at 109; WILKINS & MOORE, *op. cit. supra* note 31, at 45.

35 For an account in the light of technological developments as of 1961, see HOLMES, *op. cit. supra* note 13, at 213-40. RICHARDSON & BONESTELL, *op. cit. supra*

nauts, such as oxygen (1 to 1.5 pounds daily per person), water (1 to 2 pounds) and, of course, food.[36] Owing to these difficulties in supply, it is commonly expected that from the very beginnings of manned lunar exploration, much effort will be channeled into finding ways to use locally available resources as much as possible. Hence, observes one author, the lunar pioneers "will prospect for ores—not precious metals or even uranium at first," but rather for "common materials from which oxygen, water and rocket fuel can be extracted." [37] For the same reasons, they will probably carry to the Moon "seeds of many kinds for experiments to learn what sort of plant life can grow indoors in the lunar soil." [38] Since rocket fuel is by far the heaviest load which must be shipped from the Earth to lunar explorers, early geological experimentations will probably be concerned with analysis of the Moon's composition in order to find minerals which permit extraction of propellants.

The actual living quarters of lunar explorers may take varying forms: they could be built from materials carried from Earth, or by burrowing into the walls of mountains or cliffs, digging caverns underground, or using natural caves.[39] Underground structures are suggested as especially advantageous because they would furnish plenty of room without creating the problem involved in the transportation of building materials from the Earth. In addition, this solution could protect astronauts from the extremes in temperature. Power and heat might be produced, until local resources allow exploitation, by a small nuclear reactor, or by the use of solar rays, or a combination of both methods.[40] Travel about the lunar surface will be done by specially designed vehicles which are already in various stages of experimentation, if not production.[41]

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note 29, at 112-59, offer a comprehensive and detailed projection into the future, prepared by distinguished scientists and engineers. A slightly out-of-date Soviet speculation appears in VASSILIEV, SPUTNIK INTO SPACE 124-48 (1958). The more recent Soviet predictions are offered in VASILYEV & GUSHCHEV, REPORTS FROM THE TWENTY-FIRST CENTURY 204-07 (1962).

[36] DUBRIDGE, *op. cit. supra* note 2, at 54. "A loaf of bread brought to the moon from the earth will cost as much as a brick of gold of the same size costs on the earth." VASILYEV & GUSHCHEV, *op. cit. supra* note 35, at 205.

[37] HOLMES, *op. cit. supra* note 13, at 239. By the beginning of the 21st century the Moon settlement might become self-sufficient. VASILYEV & GUSHCHEV, *op. cit. supra* note 35, at 205.

[38] HOLMES, *op. cit. supra* note 13, at 239. More on lunar farming in RICHARDSON & BONESTELL, *op. cit. supra* note 29, at 142-52.

[39] Various possibilities in the building of a permanent base on the Moon are explored in *id.* at 154-59; CLARKE, THE EXPLORATION OF SPACE 111-18 (rev. ed. 1959); DEL REY, ROCKETS THROUGH SPACE 113-14 (rev. ed. 1960); COX & STOIKO, SPACEPOWER: WHAT IT MEANS TO YOU 114 (1958); Kumagai, *A Proposal for a Village on the Moon*, 1 SPACE J. 41-43 (1958).

[40] *Cf.* RICHARDSON & BONESTELL, *op. cit. supra* note 29, at 135-40.

[41] For illustrations see Ley, *Getting Around—When We Get There*, 1 SPACE WORLD 26 (1960).

Even though no one can today predict the whole range of possible uses to which the Moon can be put, some such uses are already evident or, at least, fairly foreseeable. One of its greatest immediate values will be in providing an unparalleled opportunity for scientific observations. In the words of Professor DuBridge:

> The moon is a body of exceptionally great interest to those scientists interested in the origin and evolution of the solar system—and of the universe in general. The moon is, in a true sense, an unspoiled relic of the days when the solar system was being formed. No processes of erosion by wind or water, of decomposition or decay, no alterations due to the growth or death of plant or animal life have taken place. Only a steady bombardment by meteors, and possibly some volcanic activity, have changed the moon's surface from what it was 4.5 billion years ago.[42]

A vast amount of otherwise unobtainable knowledge about the universe could be secured not only by studying the Moon itself but also by observations conducted from the Moon of other terrestial bodies and their surroundings. Lunar telescopic observatories would have tremendous advantages over those used on the Earth because of the absence of the distorting effects of the terrestrial atmosphere. As one commentator rather picturesquely stated, "Astronomers transported to a space observatory would feel like men who have been groping in a dark basement and have suddenly opened a door on the sunlit world." [43] Discoveries expected to be made from Moon-based telescopes are many. Dying stars which have nearly spent their energy, and infant stars in their formative stages could be accurately analyzed; indeed, entirely new types of celestial bodies and processes still unknown to man might be detected.[44] Of direct significance to future interplanetary voyages would be the acquisition of knowledge about certain vital characteristics of our solar system. Furthermore, this new knowledge about our solar system would permit the making of accurate cosmographic maps which are of utmost importance to safety of space travel.

In addition to providing ground for scientific observatories, the lunar surface will no doubt be used for the establishment of spaceports. Such spaceports will initially be used for navigation between the Earth and the Moon and the intermediate space platforms. At a later date, they will also serve as a base for interplanetary travels.[45] If

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[42] DuBridge, Introduction to Space 56 (1960).

[43] Leonard, Flight Into Space 189 (1957).

[44] *Id.* at 192-93. See also Richardson & Bonestell, *op. cit. supra* note 29, at 160-65; Holmes, America on the Moon 236-37 (1962).

[45] Vasilyev & Gushchev, *op. cit. supra* note 35, at 207.

technology succeeds in making it possible to produce rocket fuel from lunar materials, this would have tremendous effect upon the economics of space flight, improving it, according to one estimate, "by a factor of ten or more." [46]

Among the possible uses of the Moon in the more distant future one may mention the establishment of permanent settlements ("colonies"). Such settlements might in the beginning house people with a grave heart condition, who could prolong their life by many years living under conditions of low gravity.[47] Development of chemical processing plants for conversion of various minerals, should they be found, would undoubtedly accelerate creation of larger settlements.[48]

b. Mars

High on the priority list of both unmanned and manned exploration of celestial bodies is the planet Mars. The special interest in Mars is due not only to its relative nearness to the Earth but also because we know more about it than about any other planet. At its closest approach to the Earth, Mars is only about 34.5 million miles away and at its most distant point some 210 million miles. The difference, of great importance for timing of Martian missions and for radio communications, is due to the fact that Mars and the Earth rotate about the Sun in the same direction but not at the same distance and speed. Thus, it takes Mars 687 of our days to complete one revolution of the Sun, while the Earth, of course, makes this revolution in 365 days. Mars has, further, only one-tenth of the mass of the Earth and its diameter of 4,140 miles is slightly more than half that of the Earth. The temperatures on the surface of Mars are believed to range from a high between 50 to 100 degrees F. to much lower than minus 100 F. Mars has approximately one-quarter the surface area of the Earth, but because it has no oceans, the land area of the two planets is nearly equal. While Mars almost certainly has an atmosphere, little is known

[46] CLARKE, THE EXPLORATION OF SPACE 116 (rev. ed. 1959). See also DEL REY, *op. cit. supra* note 39, at 114; HOLMES, *op. cit. supra* note 44, at 239. Soviet commentators expect the lunar city by the beginning of the 21st century to produce synthetic fuel for rockets and commence the manufacturing of spacecraft. VASILYEV & GUSHCHEV, *op. cit. supra* note 35, at 207.

[47] CLARKE, THE CHALLENGE OF THE SPACESHIP 36 (1959), adding that "there's an air of suppressed excitement among the doctors studying the matter."

[48] In his more recent speculation about the possibilities of larger colonization of the Moon, Clarke observes:

> It seems unlikely, in view of the cost and the technical difficulties involved, that the human population of the moon will ever be more than a few thousand people. Yet it is extremely dangerous to make negative predictions, and the moon may turn out to be such a valuable and interesting place that it may one day be colonized on a really large scale.

Clarke, *Down-to-Earth Survey of Space*, N.Y. Times, Nov. 5, 1961, § 6 (Magazine), p. 32. See also DEL REY, *op. cit. supra* note 39, at 142-49.

about its composition. Some believe, however, that the Martian atmosphere corresponds to that encountered at an altitude of 56,000 feet above the Earth.[49] White polar caps observable on Mars, generally thought to be composed of ice crystals, exhibit seasonal changes. The color of the planet also changes with the seasons, from green to yellow and to brown. The surface of Mars appears to be relatively flat, although plateaus of several thousand feet elevation apparently exist.[50]

One of the most stimulating reasons for exploring Mars is to find out whether, and what kind of, life exists there. If anywhere in our solar system some form of life exists, it is commonly held that it will be found on Mars.[51] The probability of finding at least primitive forms of vegetation is very good. The temperature extremes are not too great, sufficient carbon dioxide exists in the atmosphere, and the polar caps could conceivably provide the necessary minimum of moisture to sustain certain kinds of primitive plant life. The main evidence which supports this speculation is the aforementioned seasonal changes in the color of the planet. Further evidence is furnished by recent spectroscopic observations which have detected hydrogen-carbon compounds in these colored areas.[52] The existence of some form of animal life on Mars is, on the other hand, highly improbable, though not impossible.[53]

What has been said so far would suggest that first missions in the vicinity of and upon Mars will be mainly concerned with the gathering of knowledge about this planet.[54] Until such knowledge is available, we may of course merely speculate about the more specific uses to which Mars can be put. Nevertheless, even the meager information now available allows certain anticipations.

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[49] SPACE: THE NEW FRONTIER 13.

[50] DUBRIDGE, *op. cit. supra* note 42, at 66.

[51] *Id.* at 64; SHAPLEY, OF STARS AND MEN 55 (1959); SPACE: THE NEW FRONTIER 13; CLARKE, THE EXPLORATION OF SPACE 126 (rev. ed. 1959); VASSILIEV, SPUTNIK INTO SPACE 154-58 (1958).

[52] CLARKE, *op. cit. supra* note 51, at 126; GODWIN, THE EXPLORATION OF THE SOLAR SYSTEM 98 (1960).

[53] Most scientists share these views. However, Vassiliev, a popular Soviet author, presumably drawing upon Soviet scientific authorities, holds that the existence of vegetable forms of life strongly indicates that "certain animal organisms" must also be found on Mars. VASSILIEV, *op. cit. supra* note 51, at 156; see GODWIN, *op. cit. supra* note 52, at 99.

[54] A recent congressional document states that "of the planets, Mars and Venus are first objectives because they are the first that technology makes available to our space probes; because they are most 'earthlike,' and, most important, because of the possibility of adding information on the possible existence of life on these bodies."

The first exploratory missions to Mars are planned for 1964 and by 1968 a heavy instrumented capsule may be landed on the surface. *Hearings on H.R. 11737, supra* note 15, at 260, 584. In the autumn of 1962 the Soviet Union launched a heavily instrumented spacecraft towards Mars which is expected to radio back a wealth of information about this planet.

It is quite likely that early expeditions to Mars will attempt to establish scientific observatories as well as select and prepare more permanent landing strips. Around such strips first settlements may be expected to grow. When compared to conditions existing on other celestial bodies of our solar system, the Martian environment appears to be quite favorable to the establishment of more permanent settlements.[55] It is believed that many of the necessary materials needed for the construction and maintenance of such settlements could be extracted from local resources.[56] According to one author, these resources alone could secure the production of required rocket propellants.[57] Polar caps should satisfy the need for water and the presence of water with the aid of appropriate agricultural techniques might solve the problem of food.

In the more distant future, depending of course upon the experience of early explorers, population or even political pressures on Earth may lead to the establishment on Mars of permanent, self-sustaining communities. Suggestions have already been made as to the possibility of technology advancing to the point where local atmosphere and temperature could be altered to such a degree that human beings could adapt themselves to living outside of protective structures or suits.[58] Mars could, further, eventually become a new source of mineral supply when the resources of the Earth are depleted. When manned travels to the more distant planets of our solar system are undertaken, Mars will no doubt be an invaluable intermediate station.[59] This role of Mars will be of special importance if its chemical plants can provide refueling of spacecraft from local resources.

c. Venus

In addition to the Moon and Mars, the planet Venus has been chosen as one of the first objectives of space exploration.[60] Even though Venus comes in its orbit closer to the Earth than any of the other planets—about 26 million miles—extremely little is known about it. The reason for this is Venus' atmosphere which is so dense—its depth being estimated at some 20 to 30 miles (below the top of the

55 DuBRIDGE, *op. cit. supra* note 42, at 64; CLARKE, THE EXPLORATION OF SPACE 140-42 (rev. ed. 1959); Clarke, *supra* note 48, at 40.

56 *Cf.* GODWIN, *op. cit. supra* note 52, at 129-46.

57 *Id.* at 97.

58 *Id.* at 143. Professor Fritz Zwicky contemplates an even more revolutionary method for making Mars habitable—changing the orbit of the planet and thus creating desired climatic conditions. CLARKE, *op. cit. supra* note 55, at 148-49.

59 GODWIN, *op. cit. supra* note 52, at 152.

60 See note 54 *supra*. See also DEL REY, *op. cit. supra* note 39, at 132; HOLMES, *op. cit. supra* note 44, at 243-48; VASSILIEV, *op. cit. supra* note 51, at 149.

clouds)—that it completely hides the surface from view. About all that is known with certainty are the dimensions of Venus (a diameter of 7,610 miles and a mass of some 82 percent of the Earth's), its orbit, and its period (about 225 Earth days). The accuracy of most other data about this planet is open to question. The extent of uncertainty and speculation among the astronomers may perhaps best be illustrated by the following summary contained in a recent NASA publication:

> There are two prevailing theories about life on Venus. One—the most widely held—is that since there is no trace of water vapor or water in the atmosphere of Venus it may be a dry and barren desert.
>
> The second theory is that the carbon dioxide atmosphere seen from Earth may be a shell around the planet—and that under this shell there may be an atmosphere containing both water and oxygen. This could make Venus a veritable global greenhouse—warm and wet with at least the possibility of luxuriant vegetable growth.[61]

Because of these monumental uncertainties, it is not surprising to find such an eminent scientist as Professor DuBridge suggesting, not so long ago, the possibility that the first explorers of Venus may land on oil,[62] and a no less eminent expert than Dr. von Braun, anticipating that "some of the famous European spas will be competing with new 'spas' on Venus." [63]

In 1961, a Soviet instrumented satellite was sent towards Venus to obtain more data about this mysterious neighbor of the Earth, but the breakdown in spacecraft radio system prevented the success of the mission.[64] However, the 1962 voyage of the United States spacecraft Mariner II in the vicinity of Venus was more successful and resulted in some remarkable discoveries.[65] The most important information sent back to the Earth by Mariner spacecraft showed that the surface temperature of Venus is about 800 degrees F. (and not as previously believed—some 600 degrees F.), both on the sunlit and the

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[61] SPACE: THE NEW FRONTIER 13.

[62] DUBRIDGE, INTRODUCTION TO SPACE 62 (1960).

[63] Von Braun, *What I Believe*, 1 SPACE WORLD 20 (Nov. 1960).

[64] On February 12, 1961, the Soviet Union launched Sputnik VIII into Earth orbit, from which it sent the Venus satellite on its course.

[65] Mariner II was launched by NASA from Cape Canaveral on August 27, 1962. After a journey of 109 days, during which it covered 180.2 million miles, the spacecraft passed within 21,000 miles of Venus on December 14, scanning with its instruments the planet for some 35 minutes. NASA News Release, Feb. 26, 1963.

darkened sides, that the planet is dry, with only a small amount of water at best, and probably without the carbon dioxide layer that some astronomers had thought might exist above the clouds.[66] The findings of this single exploratory trip by an unmanned satellite, especially when contrasted with a still enormous extent of our ignorance about Venus, make it thus obvious that the first and most important task of initial expeditions to Venus will be the gathering of more knowledge about this planet.

d. Mercury

From contemporary perspectives, the main interest in the planet Mercury is motivated by its similarities with the Moon. Both are believed to have similarly barren surfaces, without atmosphere, holding a key to the understanding of the origin of our solar system because no significant transformations have occurred in them for billions of years.[67] But, for astronauts, similarities end here. Mercury is considerably less hospitable to human explorers than the Moon. Temperatures on its side perpetually facing the Sun are estimated at well over 700 degrees F., capable of melting some of the metals.[68] Mercury's dark side, on the other hand, offers extremes in cold, perhaps as low as minus 450 degrees F. Although such conditions are hardly conducive to human settlements, both the landings and scientific observatories could be established on Mercury, in a narrow zone between the extremes of heat and cold.[69] Being closest among the planets to the Sun, some 36 million miles as opposed to the Earth's 93 million miles, Mercury's significance for the study of our star is obvious.

e. The Outer Planets

The so-called outer planets of our solar system—Jupiter, Saturn, Uranus, and Neptune—may be dealt with together because of their apparent similarities. They are, in one description, of "a very low density; have atmospheres composed of the light gases, hydrogen, methane, and ammonia; turn very rapidly on their axes; and are extremely cold." [70] It is this hostile environment rather than the

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[66] NASA News Release, Feb. 26, 1963.

[67] POSIN, LIFE BEYOND OUR PLANET 92 (1962).

[68] Vassiliev actually assumes that there are "lakes of molten metal" on Mercury. VASSILIEV, *op. cit. supra* note 51, at 162.

[69] *Ibid.; accord,* DEL REY, *op. cit. supra* note 39, at 136; CLARKE, THE EXPLORATION OF SPACE 130 (rev. ed. 1959).

[70] *Id.* at 132.

state of technology which makes, from present perspectives, the surface exploration of the outer planets extremely difficult.[71] Presumably, the lack of reliable information about them will provide a strong incentive for future exploratory voyages in their direction. Somewhat less hostile, and potentially quite useful to early explorers, appear to be the twenty-eight satellites of the outer planets. The four major satellites of Jupiter—Io, Europa, Ganymede, and Callisto—exceed in size our Moon and have been suggested as possible sites for establishing bases from which to study the planet itself.[72] Saturn's giant satellite Titan, almost as big as Mars, is believed to be enveloped by methane atmosphere, which might be used as "an excellent propellant for atomic rockets," thus making Titan "an invaluable refueling point" for the exploration of the more remote reaches of our solar system.[73] Looking into the more distant future, Professor Stanyukovich of the Soviet Union envisages the possibility of using the satellites of Jupiter or Saturn for interstellar voyages:

> It is quite probable that one of the satellites of Saturn or Jupiter, or perhaps a large asteroid, will be proposed as the basis for the interstellar ship. A requisite amount of antisubstance will be delivered to it, a gigantic engine will be installed on it, and one fine moment this heavenly body will leave its eternal route in the solar system and will rush into the black abyss of the universe. Of course, neither the "combustion chamber" nor the "jet" of this engine will resemble anything we know in the present-day engines. In all probability these will be annular magnetic fields regulating streams of matter and photons.[74]

Not much is known about Uranus and Neptune aside from what has been said above. Each has several large satellites, both are considerably bigger than our Earth and even colder than their neighbors Jupiter and Saturn.

Pluto, located at the far end of our solar system is, next to Mercury, the smallest and least known planet. Because of its enormous

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[71] While not excluding the possibility of landing upon the outer planets, Vassiliev warns of the hazards:

> The solid core of all these planets is at great depth, far below the strata where pressure reaches a degree that will transform the gases into compressed liquid. A space ship subjected to the gravitational pull of Jupiter would sink into its atmospheres and be destroyed by the titanic gas pressure . . . as soon as it had penetrated a tenth of the potent atmosphere of this huge planet.

VASSILIEV, *op. cit. supra* note 51, at 167.

[72] *Cf.* GODWIN, *op. cit. supra* note 52, at 155; DEL REY, *op. cit. supra* note 39, at 137.

[73] CLARKE, THE EXPLORATION OF SPACE 133 (rev. ed. 1959); *accord,* GODWIN, *op. cit. supra* note 52, at 156-57.

[74] VASILYEV & GUSHCHEV, *op. cit. supra* note 35, at 212.

distance from the Sun—some 3.7 billion miles—Pluto is thought to be exceedingly cold and in perpetual darkness, darker than "the darkest unclouded night on Earth." [75] Again, this most recent (1930) important discovery in our solar system, because of our lack of knowledge about it, may be expected to continue to attract the attention primarily of astronomers. When technological, biological, and related obstacles, presently limiting the range of man's exploration of space are solved, Pluto might eventually furnish a convenient base for investigations of the vast outer edges of our solar system.[76]

5. Asteroids

Between Mars and Jupiter astronomers have discovered thousands of relatively small celestial bodies of varying dimensions, ranging from the largest, Ceres, with a diameter of 480 miles, to the smallest known which has a diameter of a mile or two. Their topography, chemical composition, and other characteristics are unknown. The true number of these objects, including those too small to be discovered with existing telescopes, may be almost countless. There is, however, a complete consensus that they cannot pose any serious danger to space navigation in our part of the solar system.[77] The more optimistic speculations about potential usefulness of asteroids to space exploration and colonization anticipate relatively easy landing for spacecraft, materials permitting extraction of water and fuel supplies, and even "immense deposits of useful minerals [which perhaps] will be available without mining." [78]

B. Participants

Ultimately all the more important actors in the Earth-space social process can be expected to become claimants to the enjoyment and acquisition, when acquisition is permissible, of space resources. As uniquely important as nation-states are today in the beginnings of exploration, international governmental organizations, private asso-

[75] DEL REY, ROCKETS THROUGH SPACE (rev. ed. 1960).

[76] GODWIN, *op. cit. supra* note 52, at 161. This author also believes that the probable frozen gas deposits on Pluto could, with the aid of atomic energy, yield rocket fuel. *Id.* at 160.

[77] *Id.* at 152; CLARKE, THE EXPLORATION OF SPACE 132 (rev. ed. 1959); DEL REY, *op. cit. supra* note 75, at 137.

[78] GODWIN, *op. cit. supra* note 52, at 152. Vassiliev relates an even more optimistic potential use of the asteroids:

> They will be used as "ocean-going ships" which could carry sloops, canoes and other light craft on long voyages. Thus, anchored to the captive asteroid a space ship could undertake journeys of considerable length. In certain cases the space trip on an asteroid would offer more room than a simple trip in a man built ship.

VASSILIEV, *op. cit. supra* note 68, at 168.

ciations, mixed governmental and private organizations, and probably even the individual human being, qua individual, will all over a period of time increasingly insist upon being accorded a competence to claim, enjoy, and acquire. In the more distant future, new communities, permanently established in space, may also assert demands.

Similarly, though space capabilities are for the moment severely limited to only a few states, many states, and other participants will eventually acquire the necessary capabilities. The only realistic long-term expectation must be of the utmost pluralism among capable claimants to the enjoyment of the resources of space.

C. Objectives

The objectives of claimants to the resources of space will probably embrace, as have those of claimants to the resources of the oceans, demanded outcomes with respect to all values. Though initial demands may relate primarily to enlightenment, power, and respect, eventually wealth and other values will be equally sought.

The objectives of claimants will also probably continue to exhibit, as in the past Earth arena, many varying emphases upon minimum order, in the sense of minimization of unauthorized violence, and optimum order, in the sense of promoting an abundant production and wide distribution of values. Similarly, particular claimants will probably continue to express in their demands many differing degrees of inclusivity and exclusivity—of willingness to share—as resources and contexts vary.

D. Situations

Claims made to resources will be attended and affected, no less than other important claims to authority, by many varying features in cosmography, time, institutional structure, and expectation of violence.

The resources sought to be enjoyed, most importantly, are all located in the domain of shared competence of the void, which affords all claimants equal opportunity for access in accordance with capability. Within this domain, the relevant resources are, however, concentrated and dispersed in many different modalities and degrees, and at many different distances from the bases of potential claimants. Concentration or dispersal and distance will not only affect the exploitation of a particular resource, but may also determine the order in which different resources are reached and exploited.

The vast new dimensions in time made relevant, as well as the immensity of the domain to be explored and exploited, have important implications for both costs and potential gains.

Man's inherited institutional forms, scarcely adequate to securing even minimum order on earth, may for a time severely limit his enjoyment of the resources of space. The tremendous demands upon base values which the exploration of space may impose could require the invention of new organizational forms.[79]

The expectations of imminent, comprehensive violence—characteristic of the contemporary divided world arena—may continue to stimulate demand for exploitation of space resources, even while, by emphasis upon exclusivity, retarding achievement.

E. Base Values

The base values necessary to the effective exploitation of space resources are as diverse as those which have been found important in the exploitation of earth resources. These values—enlightenment, skills, and wealth, in particular—are widely, but very differentially, distributed among existing territorial communities. The accumulation of these values in larger aggregates through some new form of organization, may be required for the most productive exploitation of even presently accessible resources.[80]

Among the most essential assets for any claimant must of course be spacecraft and supporting technology. While the oceans can for many different purposes be exploited without ships, spacecraft are required for even such relatively modest activities as weather forecasting and intercontinental television.

Eventually new base values will of course be secured in space, and, conceivably, space resources could serve, as ocean resources have served in the past, as a great "equalizer" between different territorial communities.

F. Strategies

The strategies employed by participants in pursuit of the resources of space may, because of the immensity of the void and of the surfaces of the celestial bodies, be largely parallel, joint and non-competitive.

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[79] Apart from the financial and technological requirements which by themselves may well exceed the capabilities of any single state or private corporation, there are more difficult and more complex international regulatory and operating problems that will undoubtedly require unique arrangements before new technology can be optimally used. For an illuminating discussion, see Silk, *The Impact on the American Economy*, in OUTER SPACE 64, 78-82 (Bloomfield ed. 1962); Feldman, *Communications Satellites: Business in Billions Is Forecast*, 8 MISSILES AND ROCKETS 17 (May 22, 1961); STAFF OF SENATE COMM. ON AERONAUTICAL AND SPACE SCIENCES, 87th CONG., 2D SESS., COMMUNICATIONS SATELLITES: TECHNICAL, ECONOMIC AND INTERNATIONAL DEVELOPMENTS 97-107 (Comm. Print 1962).

[80] Some idea of the extent of such accumulation in past and present United States space undertakings is offered in Silk, *supra* note 79, at 65-78.

Only with respect to non-abundant, consumable resources will strategies of necessity be competitive.

Since the strategies of participants will probably continue to reflect many varying degrees of coercion and persuasion, with the same strategies serving the purposes both of coercion and of peaceful exploitation, the making and honoring of claims with respect to the enjoyment of resources will have inescapable impacts upon the maintenance of minimum order in the whole Earth-space arena.

G. Outcomes

The outcomes in the shaping and sharing of particular values which participants may achieve in their increasing efforts to harness the resources of space to their purposes must of course depend upon the resources which are actually found to be exploitable and upon the scale and efficiency with which exploitation is organized and executed. The potential with respect to minimum order obviously ranges between the extremes of a much enhanced collective security and the destruction of the globe. The potential in terms of optimum order could range between a much more abundant production and wider distribution of all values, such as has been made possible by the shared enjoyment of the oceans, and an increasing dissipation of the already scarce resources of the earth.

II. Probable Types of Claims

The principal participants in the initial stages of man's exploration of, and advance into, space—that is, nation-states—will no doubt also be the first claimants before constitutive processes of decision exist for the honoring of claims to the acquisition and enjoyment of resources. As technological advances diminish the difficulties of access and facilitate exploration, we may, however, reasonably expect that claimants will eventually exhibit a variety comparable to that involved in the acquisition and exploitation of resources on Earth. This possible variety of claimants will range from large international multistate organizations, through lesser international and national private associations and various types of independent and dependent communities established in space, to the individual prospector, whether Earthly human or non-Earth sentient being.

The immediate objective of claimants will be of course to secure from established decision-makers both recognition of the lawfulness of their various claims and the application or authorization of community sanctions adequate to protect their recognized interests from arbitrary interference by others. More ultimate objectives will embrace manage-

ment of the interests so protected as base values for the maximazation of all the values they seek in the comprehensive Earth-space community process.

The specific types of claims which states, and their successors or agents, will make with respect to space resources can be expected, because of abiding similarities in the characteristics of resources and social process, roughly to parallel those which have been made in the past with respect to terrestrial resources. For more detailed presentation, such claims may be conveniently dichotomized as those relating to the degrees of inclusivity or exclusivity with which resources may be appropriated by particular claimants, and those relating to the modalities by which a claimant may establish exclusive appropriation of a resource subject to such appropriation.[81]

A. Claims Relating to Whether Resources Are Subject to Exclusive Appropriation

Perhaps the most insistent claim which can be expected with respect to many space resources, as already richly demonstrated with reference to the void of space, is the claim, made on behalf of all, that the resource is not in any degree subject to exclusive appropriation, but must be maintained as open for inclusive use by all, with complete equality in shared competence.[82] The diametrically opposing claim will be of course that the resource may be exclusively appropriated by a single participant, with all interests in access and enjoyment being subjected to the comprehensive, continuing, unilateral competence of that participant. This latter claim to comprehensive competence over a resource, as a continuing base of power during a period of indefinite duration, may, for indicating its full significance, be contrasted with the claims, which are commonly termed "jurisdictional" and which were discussed in the previous chapter, for a competence to prescribe or apply with respect to isolated, particular events,—claims which can be honored even in a domain of shared competence, such as upon the oceans.

The prototypes of probable claims to inclusive enjoyment extend back to the demands, in primitive societies, of nomadic tribes for in-

[81] It will be observed that we do not introduce claims relating to the transfer of a previously appropriated resource from one participant to another. The degree to which the context of interaction in space may require changes in traditional modalities would appear to be too highly speculative to permit fruitful discussion.

For a useful summary of traditional methods of acquiring territory, see GOULD, AN INTRODUCTION TO INTERNATIONAL LAW 350-58 (1957).

[82] For this type of claim see Resolution on International Cooperation in the Peaceful Uses of Outer Space, U.N. GEN. ASS. OFF. REC. 16th Sess., Supp. No. 17, at 6 (A/5026) (1962).

clusive access to broad grass lands,[83] and encompass, in more contemporary times, the whole range of claims to inclusive use of and competence over the oceans of the world, the air space over the oceans, international rivers, and the polar regions. Similarly, the prototypes of the probable claims to exclusive appropriation can be traced back to the first demands of peoples in an agricultural stage of development for the continuous and exclusive possession of the lands of their harvest,[84] and today embrace the claims, characteristic of the nation-state, for exclusive control over land masses, closely proximate waters and airspace, and internal rivers.

The possible influence of these various prototypes upon probable claims with respect to space resources, and the various forms which such claims can be expected to take, is the subject matter of our further inquiry.

B. Claims Relating to the Modalities of Establishing Exclusive Appropriation

Even when a general community consensus prevails that certain types of resources may under certain conditions be subjected to exclusive appropriation by a single participant-state, the question remains by what modalities and under precisely what conditions may such exclusive appropriation be effected. The probabilities appear excellent that the general community will not regard many of the more important resources of space as subject to exclusive appropriation. For completeness of inquiry, we must, however, make the contingent assumption that exclusive appropriation may be tolerated of some consequential resources. From experience in the allocation of Earth resources, it would appear that claims for the exclusive appropriation of space resources might, in the beginning at least, take two different forms: claims based merely upon discovery and symbolic acts and claims based upon effective occupation and use.

1. Claims to Establish Exclusive Appropriation on the Basis of Discovery and Symbolic Acts

Though in the history of the allocation of the continents of the world claims to exclusive appropriation based solely upon discovery and symbolic acts have seldom been honored in high degree, such claims have been frequent since the Age of Discovery[85] and still

[83] SEAGLE, THE HISTORY OF LAW 53-54 (1946).

[84] *Ibid.*

[85] See generally KELLER, LISSITZYN, & MANN, CREATION OF RIGHTS OF SOVEREIGNTY THROUGH SYMBOLIC ACTS 1400-1800 (1938); Von der Heydte, *Discovery, Symbolic Annexation and Virtual Effectiveness in International Law*, 29 AM. J. INT'L L. 448 (1935); Orent & Reinsch, *Sovereignty Over Islands in the Pacific*, 35 AM. J. INT'L L. 443 (1941).

occasionally occur. A most recent example was provided by the Soviet Union which based its claim to "rights" in Antarctica almost exclusively upon alleged discovery of this continent, in 1819-1820, by the two Russian navigators, Bellingshausen and Lazarev.[86] In the aftermath of Lunik II, a rocket bearing the Soviet national emblem which struck the Moon on September 13, 1959, fears arose, despite the absence of any Soviet claims to that celestial body,[87] that the USSR or others might eventually make claims based upon symbolic activities.[88]

2. Claims To Establish Exclusive Appropriation on the Basis of Effective Occupation

The claim to establish exclusive appropriation of a resource by its effective occupation and use has a history, almost immemorial, in the contexts both of the allocation of resources between territorially organized communities and of allocation between the individual members of a particular community.[89] The notion that lawfulness attends effective occupation and use is at least as ancient as the concept of property and has been employed not only to honor the appropriation of hitherto unpropriated resources but even to sanction, when coupled with lapse

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[86] Movchan, *The Legal Status of Antarctica: An International Problem*, 1959 SOVIET YEAR-BOOK OF INTERNATIONAL LAW 342 (1960). See also JESSUP & TAUBENFELD, CONTROLS FOR OUTER SPACE AND THE ANTARCTIC ANALOGY 157 (1959) [hereinafter cited as JESSUP & TAUBENFELD]; Archdale, *Claims to the Antarctic*, 12 THE YEAR BOOK OF WORLD AFFAIRS 242, 256 (1958).

[87] *Cf.* Statement made by Chairman Khrushchev before the National Press Club in Washington on September 16, 1959. N.Y. Times, Sept. 17, 1959, p. 18, col. 6.

[88] Thus, the Department of State issued on September 14, 1959 the following statement:

> The placing of national insignia would not of course constitute a sufficient basis to found a claim of sovereignty over unoccupied land masses.
>
> In the case of celestial bodies there is also a question as to whether such bodies are capable of appropriation to national sovereignty.
>
> If so, acts beyond the placing of national insignia which would be adequate to found a claim of sovereignty in the case of such a body would have to be determined.
>
> All of these questions will be the subject of serious discussion before their resolution becomes necessary as a result of human settlement and exploitation of resources of celestial bodies.

N.Y. Times, Sept. 15, 1959, p. 20, col. 7.

[89] Professor Goebel, in describing this modality, states:

> It was the method of original acquisition as distinguished from derivative acquisition of title, and being regarded by the Roman jurists as a principle of natural law, it was believed to reach back into remotest antiquity, antedating formal law. In other words, the idea of occupation was as old as human reason itself and was the basis consequently of custom that expressed a certain universal human experience. The ready application by states of these principles for the regulation of the international status of newly discovered territory is itself testimony of the fundamental nature of these principles.

GOEBEL, THE STRUGGLE FOR THE FALKLAND ISLANDS 70 (1927).

of time, the transfer of competence over a resource from one appropriator to another. It would be most surprising if a mode of establishing appropriation, with such deep roots in the policies both of the general community and particular communities, should not also be invoked with respect to the resources of space which come to be regarded as open to exclusive appropriation.

III. Basic Community Policies

The basic community policies which require clarification relate to both major types of claims, those which raise the question whether certain resources are to be held open for inclusive enjoyment or made subject to exclusive appropriation, and those which assert with respect to such resources as are made subject to exclusive appropriation, the lawfulness or unlawfulness of certain modes of acquisition. We begin with the former and return to the latter.

A. Inclusive Enjoyment Versus Exclusive Appropriation

The rational determination within common interest of what space resources should be regarded as sharable, open to inclusive enjoyment by many or all participants, and what should be regarded as non-sharable, subject to exclusive appropriation, must obviously turn, as it has in respect to earth resources, upon many complex variables. "Sharable" is not a static concept reflecting some reified essence of a particular resource. It refers rather to a judgment about how in a particular context preferred outcomes with respect to the enjoyment of a resource may be maximized. By a sharable resource we mean one with respect to which, within a given context, the greatest production and widest distribution of values can be achieved through inclusive use, and by a non-sharable resource one with respect to which this same outcome can best be achieved by use that is exclusive.

The resources of outer space can be expected to change in significance for the general community, which allocates and enjoys them, as values and institutions change. Hence the policy of the world community toward any category of physical resources need not be regarded as fixed; no "once and for all" judgments can be made on these matters. Sudden leaps in available values such as skill and enlightenment, along with changes in technology, may bring hitherto neglected physical features into great prominence, and counterwise, relegate historically imposing areas to wasteland. No matter how obvious it appears at any specific cross section in the stream of history that a given set of environments will remain sharable or non-sharable, no critical advisor

on policy performs his functions responsibly unless he whispers a word of doubt and helps to keep community policy from self-defeating rigidity.

Thus, a particular resource may in certain contexts be sharable for one type of use and non-sharable for another. For instance, where a certain use would exhaust only extremely small quantities of a resource, leaving more than enough for everyone for that type of use, the resource might, other factors in the context permitting, be regarded as sharable; for another type of use requiring larger quantities, the maximization of values might, on the other hand, best be achieved through exclusive use. Similarly, a resource might also be regarded as sharable when employed within one value process, but as non-sharable within another. When, for instance, power was the predominant consideration in regard to Antarctica, the majority of participants considered the resources as non-sharable. Yet, when through IGY enlightenment became the predominant consideration, claimants to areas of exclusive control opened their sectors to the scientists of other nations.[90] The values available through shared use were so impressive that the principal claimants have, through the Antarctic Treaty, for a time at least removed this resource from immediate power considerations and restricted its use to purposes of enlightenment, while providing for inclusive access by all.[91] In some situations, further, inclusive access may be most appropriate for certain types of use, while exclusive access is honored for others.[92] In situations where two types of use are incompatible, a decision must of course be made to elect the use which will produce outcomes most in accord with community policies. The sharability of a resource may even vary within the same type of use depending upon context. Thus, where the resource is relatively difficult to exploit, the greatest production of values may result from some type of enterprisory activity, allowing for the pooling of capital, equipment, and skills; while the same resource, under conditions allowing easy exploitation, might yield maximum production of values through exclusive use.

Decision from community perspectives about whether a particular resource in a particular context should be regarded as sharable or non-sharable must, therefore, be made to depend upon comprehensive in-

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90 JESSUP & TAUBENFELD 167-71.

91 For text of the Antarctic Treaty, Dec. 1, 1959, see [1961] 1 U.S.T. & O.I.A. 794, T.I.A.S. No. 4780, 54 AM. J. INT'L L. 477 (1960). A comprehensive account of the IGY scientific results appears in SULLIVAN, ASSAULT ON THE UNKNOWN (1961); WILSON, IGY: THE YEAR OF THE NEW MOONS (1961).

92 Thus, for an example from the Earth, in ocean areas proximate to a state, all states are regarded as having inclusive rights of navigation, while the coastal state is protected in exclusive access to the mineral resources of the continental shelf.

quiry into all phases of the process of interaction by which resources are enjoyed, as well as its larger context. It must be determined both whether the particular resource technologically admits, by appropriate physical accommodations, of shared use and whether such use in fact affords higher promise of the demanded outcome of the greater production and wider distribution of values. In the absence of appropriate experience in the allocation and enjoyment of space resources, resort must perforce be had to the closest comparable experience with respect to earth resources. All recommendations must, further, necessarily be most tentative, both because the characteristics of space resources may not actually parallel those of earth resources and because the whole Earth-space community process may change so drastically as to make new variables relevant.

1. The Resources Claimed

The most important variable relates of course to the physical characteristics of the resources which are claimed. The resources of the Earth exhibit a great range of characteristics with different bearing upon the potentialities of shared use, and it is hardly to be expected, as our survey above has demonstrated, that the resources of space will be less variegated. Some broad classification of resources in terms of their relevant characteristics would appear indispensable to economic inquiry. The most helpful classification we have discovered is that of Professor Ciriacy-Wantrup who, for purposes of inquiry about conservation, divides resources into two major groupings: renewable or flow resources and nonrenewable or stock resources.[93] If to these categories we add a third category, that of "spatial-extension" resources, we may be able to achieve a comprehensive categorization designed to serve community policy in the allocation of resources between inclusive enjoyment and exclusive appropriation.

By flow resources Professor Ciriacy-Wantrup refers to resources whose distinctive characteristic is that

> . . . different units become available for use in different intervals. These successively available quantities constitute the "flow." The flow, without use, may increase or decrease continuously or discontinuously at either a constant or a varying rate. The present flow (which should not be confused with use) does not diminish future flow, and it is possible to maintain use indefinitely provided the flow continues.
>
> Many flow resources can be stored. A given store of a flow resource can, of course, be treated as a stock. The

[93] CIRIACY-WANTRUP, RESOURCE CONSERVATION: ECONOMICS AND POLICIES 35 (1952).

> availability of a flow for replenishing the stock, however, differentiates stored flow resources from stock resources proper.[94]

Flow resources are further divided by Professor Ciriacy-Wantrup into two classes: those which are not significantly affected by human action and those which are. With respect to the former, he states:

> In the first class, human action in one interval does not significantly affect the flow in future intervals. Most flow resources in this class have a constant or cyclical flow, the duration of which for purposes of the economist may be assumed to be infinite.[95]

Examples of such resources are the oceanic waters and tides and solar and other space radiations. Their physical characteristics of flow and relative immunity to the acts of man would suggest that these resources be presumed to be sharable. Because of their vastness and replacement by flow, use by one participant does not diminish, and seldom interferes with, use by another or with future rates of use; instead, the total production and sharing of values increases in direct proportion to the number of participants.

The second class of flow resources are those which "human action in any given interval may decrease or may increase some or all future rates of flow." [96] This class is further categorized by Professor Ciriacy-Wantrup into two subdivisions: those which have, and those which do not have a "*critical zone*." [97] By a "critical zone" is meant "a more or less clearly defined range of rates below which a decrease in flow cannot be reversed *economically* under presently foreseeable conditions." [98] "Frequently," the exposition continues, "such irreversibility is not only economic but also technological." [99]

In terms of these categorizations, flow resources significantly affected by human action would appear best made presumptively subject to organized inclusive use. This type of use could be managed both to promote an increase in flow when desired and to safeguard against methods which cause an unnecessary decrease in flow. Such organized inclusive use would appear particularly important for those resources having a critical zone, in order to insure appropriate conservation measures.

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[94] *Id.* at 37-38.
[95] *Id.* at 38.
[96] *Ibid.*
[97] *Id.* at 38-40.
[98] *Id.* at 39.
[99] *Ibid.*

A stock resource is defined by Professor Ciriacy-Wantrup as one whose characteristic is that the "total physical quantity does not increase significantly with time." [100] Hence, "with the total stock limited in quantity, each rate of use diminishes some future rate." [101] For our purposes we divide stock resources, the most common of which are minerals, into two types: "abundant" resources which exist in sufficient quantities to meet the demands of the present and foreseeable future, and "scarce" resources which do not exist in such quantities.[102] The factor most relevant to policy about the allocation of inclusive or exclusive use of an abundant stock resource is probably the quantity within any given reservoir of supply in relation to the demand. A tentative presumption might be indulged that abundant stock resources be made subject to inclusive use. Where the quantity of the resource is sufficient to meet the requirements of all participants, it is probable that the greatest production and widest distribution of values will be achieved through unlimited access. Thus if a mineral is found distributed widely and in large quantities over the surface of a celestial body, we would recommend that it be made sharable.

Whether scarce stock resources should be regarded in community policy as sharable or not must, again, depend upon varying characteristics of the social context. To the extent, for example, that private investment is necessary to secure the exploitation of a resource, and investment can be forthcoming from users with an exclusive claim, without damaging other community interests, such resources may safely be made non-sharable. To the extent that these factors are absent, community goals might be better served by considering scarce stock resources to be sharable.

A certain type of mineral might be made sharable upon one celestial body, but non-sharable upon another, depending upon various features of the context and especially upon the quantities of the mineral available on the different bodies. Again the same mineral might be made sharable at one period of time but non-sharable at another, depending upon whether fluctuations in demand resulting from such factors as the discovery of new uses of the mineral or better substitutes for it would require a reclassification of the mineral as abundant or scarce.

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[100] *Id.* at 35.

[101] *Id.* at 36.

[102] Professor Ciriacy-Wantrup divides stock resources into those which do not decrease or deteriorate through non-use, such as metal ores *in situ* and coal, and those which do, such as gas and oil. *Ibid.*

The relevance of this distinction to the resources of space cannot at this time be determined.

Whether or not any particular stock resource is classified as abundant or scarce, where the context is such that the resource becomes of strategic character in the sense of high importance to several potential users, we would recommend that it be sharable. A resource might be regarded as strategic in this sense when various factors in the context make access to that resource essential to important future activities upon the celestial body where it is located. For example, a resource might be classified as strategic if it could be used economically to produce rocket fuel, food, water, or oxygen upon a celestial body, or was capable of being used in the production of nuclear energy. Such resources might be subjected to organized inclusive use, under the direction of some international body capable of allocating a fair share to each claimant.[103]

In suggesting still a third category of resources, described as "spatial-extension," the reference we make is to those resources whose most distinctive characteristic is their utility as media of transportation and communication. Among the most striking examples of this reference are the land and ocean surfaces, air space, and the void of outer space. The land masses obviously contain various stock and flow resources, as do the oceans and air space and outer space. The particular reference we make is, however, to the spatial or extension quality of the resource which makes it a highly advantageous medium of transportation and communication; for present purposes, the material aspects of these resources are relevant, not for their characteristics as flow or stock resources, but because they form a surface or extension which can be made use of for movement. The recommendation we would make is that, since one use of a spatial-extension resource need not interfere with another or reduce its productivity and since the more participants who engage in use the greater the potential production, there should be a strong presumption in general community policy that a spatial-extension resource is open to inclusive enjoyment by all. This presumption would of course have to yield when important flow or stock resources are so inextricably combined with a spatial-extension resource that a rational community policy for the former could not be achieved without impairing the inclusive use of the latter or when a peculiar constellation of factors in the more comprehensive community process otherwise required limitation upon inclusive enjoyment. Common interest would, however, appear best to be served by initial indulgence of the presumption of inclusivity, with modification only upon demonstrated necessity.

[103] It may require caution that the word "strategic" is used here and elsewhere in this Chapter to indicate "high importance" not merely with respect to military security but with respect to any value.

In the following table we project a classification of the resources of space, now known or anticipated, in terms of their distinctive physical characteristics and include very tentative suggestions as to potential sharability, based upon such characteristics. It may be emphasized that the classification we recommend is only presumptive, subject to modification in accordance with other features of the whole context of interaction.

I. SPATIAL-EXTENSION RESOURCES

The void of space
Surfaces of celestial bodies
Contiguous space surrounding celestial bodies

Presumption as to sharability: Sharable through even unorganized inclusive activity.

II. FLOW RESOURCES

A. Those not significantly affected by human action

Cosmic rays
Other radiations in space
Magnetic and gravitational forces
Gases
Meteorites
Asteroids
Atmospheres of celestial bodies

Presumption as to sharability: Sharable through unorganized and organized inclusive activity.

B. Those significantly affected by human action

1. *Those not having a critical zone*

Widely and abundantly distributed forms of life having a high rate of reproductivity.
Possibly some supplies of water.

Presumption as to sharability: Sharable through unorganized and organized inclusive activity.

2. *Those having a critical zone*

Forms of life where reproductivity will not swiftly replace quantities which are used.

Presumption as to sharability: Sharable through organized inclusive activity.

III. Stock Resources

A. Abundant

Relatively inexhaustible supplies of minerals or other useful materials found on celestial bodies.

Presumption as to sharability: Sharable through unorganized and organized inclusive activity.

B. Scarce

Limited supplies of minerals and other useful materials found on celestial bodies.

Presumption as to sharability: Sharable where the resource is of a strategic nature. Nonsharable where context of interaction is such that exclusive use encourages development without injury to the interests of other participants.

2. Participants

The number and capabilities of potential participants in exploitation will be as relevant with respect to space resources, as they have been with respect to earth resources, for determining community policies about sharability. The most important lesson from experience with most earth resources has been that the greater the number of participants who, with appropriate accommodation, engage in exploitation, the greater the production of values. Where there are many participants with capability, organized inclusive use may, further, be the only method of ensuring a fair distribution, and efficient employment, of strategic resources such as those from which food, oxygen, water, and rocket fuel can be manufactured and which may be either essential or extremely important in carrying out space activities.

Where the participants singly having potential capabilities are, on the other hand, few, inclusive use through enterprisory activities may further achieve a greater production and wider distribution of values by allowing participants to pool capital, skills, and other base values and thus achieve capability. Where there is great inequality among participants, inclusive opportunities may stimulate states not having capability, to more vigorous activity and to develop their technology and institutions. The small state, for instance, may encourage its students and institutions of learning to specialize in space physics if it knows that it can participate through an international organization.

Inclusive use should of course be favored when it may encourage the emergence of new communities and new types of participants, including nongovernmental organizations.

3. Objectives

The more general objectives sought by the effective participants in Earth-space social process must very directly affect community choices between inclusive and exclusive enjoyment and competence. As man moves into his expanding habitat, objectives that relate to minimum public order will have high priority in view of the dangers that arise from any projection of a divided arena of world affairs into the new environment. Hence, policies in regard to resources that emphasize the inclusivity of interests among the participants in the changing polity of outer space will be essential. To the extent that these early minimum order problems are surmounted, the path will be open to engage in the more direct and active cultivation of optimum order in the production, accumulation, and enjoyment of all values that can be implemented by natural resources. The balance to be struck, and continually adapted, between inclusive and exclusive use and competence can proceed in a setting that benefits from the security of whatever level of achievement has been attained in pursuing the basic objectives of minimum order.

4. Situations

The geographical location of resources, whether upon Earth or in space, may also be relevant to community decisions about inclusive or exclusive use. Thus, where resources are highly concentrated within certain areas, inclusive enjoyment would appear preferable as diminishing the probability of a monopoly situation becoming entrenched. Further, where a certain resource becomes peculiarly strategic because of its location, as for example when satellites of celestial bodies prove invaluable as relay stations for interplanetary travels,[104] inclusive use would again appear most appropriate. Where, however, a resource, because of its location in relation to a particular participant, is of strategic importance to that participant but not to others, exclusive use may be the most productive of values.

In contexts in which expectations of emergency or crisis are high, inclusive use is especially to be desired. Past experience in the allocation of the resources of the Earth has shown that minimum order is far more easily maintained where the pattern of use and competence is

[104] This possibility is explored by GODWIN, THE EXPLORATION OF THE SOLAR SYSTEM 142-43 (1960).

inclusive, since the authorization of exclusive acquisition often leads to arbitrary grabbing, with each state trying to acquire as much as possible, as quickly as possible, limited only by the coercion it can impose upon others. In an Earth-space arena where the expectations of violence are already high, attempts unilaterally to lay claim to all or parts of the Moon or other celestial bodies could easily result in a breakdown of minimum order. Where resources are highly concentrated within border or buffer zones, between areas occupied by great powers, shared enjoyment may diminish opportunity for conflicting claims.

5. Base Values

In the exploitation of the resources of the Earth, inclusive access and competence have often both encouraged the assembling of large aggregates of base values for use in productive enterprise and permitted a flexible combination and recombination of base values in efficient operations, with appropriate account being taken of the differing capabilities of differing communities. Since the need for assembling large aggregates of base values, and for efficient flexibility in the management of such values, would appear no less urgent in the future exploitation of many space resources, a strong presumption for this indispensable phase in processes of exploitation would again appear to favor the utmost inclusivity in access to and competence over space resources.

The probable advantage to the community of shared access and competence is most clearly evident in exploitation which, for technological or other reasons, requires large scale operations. This advantage has been demonstrated in the management of Earth resources with respect to such problems as those involved in integrated river valley development and in large land reclamation schemes, and it is probable that similar exigencies and a comparable promise of advantage may arise with respect to many space resources.

In many contexts, the net gain within the process of use of a resource may be increased by reducing the amount of base values required to produce each unit of goal value. This would suggest a community preference in favor of organized cooperation in activities in which the amount of base values exhausted in production can be decreased, as in the construction and use of launching and landing sites and of manufacturing plants upon celestial bodies.

6. Strategies

When strategies in the enjoyment of a resource can be maintained as noncompetitive, experience in the management of earth resources

suggests again that inclusive access and competence may best promote net gain in community values. By noncompetitive strategies we mean those which prevail when, because of the vastness or other features of the resource, many different participants may engage in exploitation with a minimum of mutual interference in the management of their respective base values.

The presumption in favor of inclusivity is of course highest when strategies in exploitation are nonconsumable. By a noncomsumable strategy we mean one which does not exhaust or change the nature of the resource in the process of production of values. Nonconsumable strategies are most commonly employed in the enlightenment process or in the enjoyment of spatial-extension resources, used as a medium of transportation or communication. Since one use does not consume or decrease the amount of the resource available for another use, the larger the number of participants, the greater the production of values. Without diminishing the future potentialities of the resource, any particular use adds to the total over-all production of values. Thus, the more the ocean is traveled the greater the production of values, as such use by one participant does not interfere with equal use by others. Similarly, it matters not how many scientific teams study the ice, temperature, or rock formations in the polar zones; each team may add to the total quantity of accumulated knowledge. In certain contexts, as when characterized by potential monopoly conditions or by extraordinarily high costs of development, even when strategies may be both competitive and consumable, it may be in the community's best interests to exploit the resource through organized inclusive strategies.[105]

7. Outcomes

The final, critical variable relevant to determinations of general community policy about the sharability or non-sharability of particular resources is of course the outcomes achievable in the different kinds of use. Experience with Earth resources, which technologically admit of sharing, would appear again to establish that inclusive use and competence make possible a larger net total in quantity of values produced, more certainly secure fairness in the distribution of values, and facilitate the adoption of any necessary measures in conservation. Such use and competence would seem, further, to make much easier the task of maintaining minimum order.

When the greatest possible production of values is desired, and this production depends upon the cooperation of many different par-

[105] Organized inclusive strategies will be more fully examined in Chapter 8 of the forthcoming book of which this Article is a chapter.

ticipants, with appropriate incentives, in making relatively full use of a resource which admits of shared enjoyment, inclusive use and competence would, therefore, seem most clearly indicated. The honoring in such a context of exclusive appropriation by a single participant of a part or the whole of the resource could, as it has with respect to the oceans and airspace, seriously disrupt cooperative activity and greatly diminish the net total creation of values. Though a single participant may on occasion, in disregard of the community interest in cooperative exploitation, be able to secure for itself a larger immediate net gain by a policy of exclusive grabbing, its ability to hold these gains must depend upon other states not adopting comparable policies—a forbearance which is hardly to be expected.

Similarly, when assurance is explicitly sought that whatever values are created in the enjoyment of a resource are equally, or otherwise fairly, distributed among the participants in general community process, the presumption in favor of inclusivity would appear to be strengthened. Communities which actually participate in the activities of production and distribution have a better chance to secure their own interests, and certainly cooperative participation in production and distribution, and inclusivity in the decisions by which these activities are regulated, are more conducive, than monopolistic control, to perspectives of demand on behalf of, and of identification with, all community members.

Inclusive competence and control may be equally indispensable for appropriate conservation of a resource. In the case of stock resources and renewable or flow resources significantly affected by human action, particularly those having a critical zone, conservation may be an important factor in the maximization of values. Conservation, a concept often obscured, is usefully defined by Professor Ciriacy-Wantrup as follows:

> [T]he concept "conservation" is tied . . . to a particular aspect of use: its intertemporal distribution. Conservation is concerned with the *when* of use.
>
> More specifically, "conservation" and its logical corollary but economic opposite, "depletion," are defined in terms of *changes* in the intertemporal distribution of use. In conservation, the redistribution of use is in the direction of the future; in depletion, in the direction of the present.
>
> Conservation always implies comparison of two or more time distributions of use. We may compare expected use if new practices are adopted with what use would have been if the old practices had been continued.[106]

[106] CIRIACY-WANTRUP, *op. cit. supra* note 93, at 51.

The regulation of rates of use is thus relevant to the maximization of values from a resource in that some modes of exploitation may give a longer period of future use by requiring less expenditure to produce a given quantity of values. The maximization of all values can, furthermore, best be promoted through the projection of an "optimum state of conservation" for any resource, which for our purposes is that time distribution of use rates which will afford the greatest production of values within all processes in which the resource is a relevant factor.[107] In the case of flow resources having a critical zone, this rate of use will naturally always be less than that which would deplete the resource to the critical level. The interdependences in the enjoyment of a particular resource may often be such that a comprehensive, integrated program of conservation, in this sense, cannot be achieved in the absence of inclusive control over the whole of the resource.

Inclusive competence over the enjoyment of resources is especially important when choices must be made between potentially conflicting uses. Sometimes, for instance, the use of a resource to achieve one value may make the resource unusable, or impaired in its use, within another value process. For example, the use of a forest for timber may destroy its utility as a public resort or park. In some instances the use of one resource may also be seriously impaired by the use of another resource. Such, for instance is the case where strip mining makes the soil unusable for agricultural purposes, or where the use of a river for a power project would jeopardize the salmon industry within the same area.[108] Already concern has been expressed that certain types of uses of the Moon may impair its value as a source of enlightenment.[109] It is possible that important decisions will have to be made in

[107] The conception of an optimum state of conservation which Professor Ciriacy-Wantrup recommends is "that time distribution of use rates that maximizes the present value of the flow of (expected) net revenues." *Id.* at 77. Elsewhere he recognizes the relevance and importance of "extramarket values." *Id.* at 85.

[108] See Royal, *The International Fraser River Sockeye Salmon Fishery*, in U.N. PAPERS PRESENTED AT THE INTERNATIONAL TECHNICAL CONFERENCE ON THE CONSERVATION OF THE LIVING RESOURCES OF THE SEA 243, 254-55, (A/Conf. 10/7) (1956).

[109] Thus the delegate of China appealed in the United Nations to "save celestial bodies for science" and warned that "unless proper precaution is taken, a probe may bring some living organisms from the earth . . . [and] such an accident may cause damage to science that is beyond repair." U.N. Doc. No. A/C.1/PV.985, at 32 (Nov. 14, 1958). The U.N. *Ad Hoc* Committee on the Peaceful Uses of Outer Space in its report referred to hazards of contamination as follows:

> Scientific studies indicate that certain activities related to lunar and planetary impacts might result in biological, chemical, and radiation contamination jeopardizing subsequent physical and chemical studies and endangering possible living organisms. Release of chemical markers, radioactivity resulting from nuclear explosions, generation of gases in connexion with "soft" landings and the spreading of terrestrial micro-organisms carried within space vehicles represent possible sources of contamination to the moon and planets.

U.N. GEN. ASS. OFF. REC. 14th Sess., Annexes, Agenda Item No. 25, at 18 (A/4141) (1959). See also Gatland, *Contribution*, in FIRST SPACE LAW COLLOQUIUM 63, 64-65 (1958).

the future in regard to what types of use space resources will be put to, and whether or not one resource will be exploited at the expense of another. These decisions may involve preferences among the values of enlightenment, wealth, and power, with important consequences for the common interests of all peoples.

The position, potential, and expectancy of all participants in terms of security are, finally, most obviously enhanced in contexts in which all enjoy access to and competence over resources which are not only sharable, but also strategic in the sense that exclusive control by a single participant and its allies would be regarded by other participants as imposing an intolerable threat. Thus, exclusive control by a single participant over the oceans or the void of outer space could hardly be considered tolerable by other participants, and a similar situation may come to prevail with respect to other resources, such as the celestial bodies. In addition to promoting the outcomes associated with optimum order, inclusive access may, accordingly, on occasion be indispensable to minimum order.

B. Effective Occupation and Use Versus Symbolic Activities

The clarification of general community policies about the modalities which should be authorized for establishing exclusive appropriation of space resources, when community decision has been taken that certain resources are to be subject to such appropriation, happily can again draw upon a rich experience with respect to earth resources about the same problem. Indeed, in the light of our present anticipations about the probable characteristics of space resources and the processes by which they may be exploited, two different bodies of experience would appear relevant to the solution of probable future controversies, both that in relation to the allocation of the continents or major land masses among the peoples of the world and that in relation to establishing claims to minerals within a single territorial community.

The more ultimate policies sought by the general community in its honoring or dishonoring of various asserted techniques for establishing exclusive claim to unappropriated earth resources have included, as with respect to other problems, aspects of both minimum and optimum order. Minimum order has been sought both negatively, in the sense of emphasis upon the goal of minimizing unauthorized coercion in the processes of allocation, and positively, in the sense of emphasis upon the goal of promoting a general stability in people's expectations that resources are to be allocated by peaceful procedures and that values may be safely shaped and shared by persuasion, without dangers of arbitrary coercion. Optimum order has been sought in emphasis upon the broad-

est goal of promoting maximum utilization, and upon related sub-goals in terms protecting equality of access, imposing requirements of a reasonable degree of use as a precondition to the maintenance of exclusive claim, placing limitation upon the quantity which may be acquired, imposing requirements of development within a reasonable time, and so on.

The detailed procedures honored by the general community for establishing exclusive claims have clearly reflected these more general policies.[110] This has meant the rejection, in most instances, of claims to exclusive appropriation based merely upon discovery or symbolic activities, such as the planting of a flag or leaving a suit of armor or marking foliage. Conversely, it has also meant that genuine effective occupation and use of a hitherto unappropriated resource has been regarded as sufficient in modality to establish exclusive claim against subsequent comers, but the occupation and use so honored in legal consequences has commonly been required to extend beyond a mere single act, or blow *uno ictu,* to a comprehensive process of enjoyment and utilization, made known to all the world.

This comprehensive process of enjoyment which the general community has come to require, as the "occupation and use" necessary to found exclusive appropriation of a hitherto unappropriated resource, may be observed to extend through the various familiar phases from initial entry and enunciation of entry to final outcome in the establishment of effective control and display of the activities of a state. It includes, in summation of the requirements of many decisions, an identifiable participant taking effective control of the resource, as effectiveness may be determined by the varying characteristics of the resource and context, giving notice to the world through appropriate ceremonials or otherwise of its intent to acquire, asserting authority over the resource in its management as a continuing base of power, and employing the resource in strategies appropriate to its characteristics in the production of values.

The service to the more ultimate community policies of each of these phases in the required process is clear. Thus, notice promotes stability of expectation by furnishing evidence of intention to establish a claim. It further diminishes sources of conflict by making available to other participants knowledge of the bounds of the area claimed, thus preventing them from unknowingly claiming the same area, and giving them opportunity to express conflicting claims in order that adjustments can be made before interests become entrenched. Similarly, the requirements of occupation of the resource, of establishment of authority, and of carrying out a reasonable degree of use, particularly enhance the

[110] For an analytical survey of such procedures see sources cited note 85 *supra.*

policy of optimum order, since they promote maximum utilization, both by preventing hoarding and by facilitating a wider access to resources.

In view of the strong general community policy favoring inclusive enjoyment of space resources, no good reason appears why policies any less exacting than those historically demanded with respect to the modalities of exclusive appropriation of earth resources should be honored in the modalities to be established with respect to space resources.

IV. Claims Relating to Whether Resources Are Subject to Exclusive Appropriation

A. Trends in Decision With Respect to Comparable Resources

For survey in somewhat more detail of past trends in general community decisions about the allocation of resources between inclusive enjoyment and exclusive appropriation, and for identification of at least some of the variables in the process of interaction which appear to have affected these decisions, the most convenient mode of organization would appear to be in terms of the same three-fold categorization of resources which we found helpful in the clarification of basic community policies: spatial-extension, flow, and stock. The general community decisions in the allocation of resources which we seek to describe and account for have, in the absence of appropriate centralized governmental institutions, perforce been in the modality of traditional customary international law—that is, in the form of claims made by particular participants with promise of reciprocity to other participants for like claims and of the honoring of these claims by most other participants either in acquiescence or by the making of the anticipated like claims. It should not, therefore, be surprising that in this historic process of reciprocal claim and mutual deference, with all its built-in exigencies for the genuine clarification of long-term common interests, established decision-makers have been affected in high degree in their choices between inclusivity and exclusivity both by the relevant characteristics of the claimed resources and by the other features in processes of exploitation which we have found significant for basic community policies.

1. The Spatial-Extension Resources

The more important spatial-extension resources of the Earth-space arena, presently accessible, are of course the land masses of the Earth, and their superincumbent air space, the oceans, the airspace over the oceans, the polar areas, and the rivers. It is knowledge too familiar to

require more than casual summary that general community decisions have, in response to the claims of particular states, established that some of these resources are open only to inclusive enjoyment, not subject to exclusive appropriation, while others may under certain conditions be subjected to exclusive appropriation and brought under the comprehensive, continuing exclusive competence of a single state.

The resources which have been held open in large measure for inclusive enjoyment only include, as we have already noted, the oceans, the air space above the oceans, international rivers, the polar areas, and the void of outer space. Though the struggle for free enjoyment of, and shared competence over, the oceans was waged bitterly and often precariously for centuries, in modern times claims to exclusive access and competence have been honored in consequential degree only in the areas immediately proximate to the land masses of states—areas denominated as "internal waters", "territorial sea" and "contiguous zones" and in which all states have parallel common interests in protecting the integrity of the community processes on their land masses—while claims to inclusive access and competence have been honored and protected with respect to the great bulk of the oceans known as the "high seas".[111] This policy favoring inclusivity was, fortunately, so firmly established when the airplane first came into use, its extension from the waters and their surface to the airspace above was achieved without noticeable dissent.[112] The general community's establishment of inclusive enjoyment and competence for international rivers—that is, rivers which cross or border more than one state—still exhibits some elements of uncertainty and precariousness, but a consensus appears to be crystallizing that, among all riparians at least, claims concerning enjoyment and competence must be determined in accordance with the criteria of "reasonableness", so ubiquitous in the handling of controversies about streams within the more mature states.[113]

With respect to the polar areas, the pattern in claim and decision has been somewhat more complex. The original pattern in relation to the Antarctic continent was exclusive, with several countries making territorial claims which other countries accorded only limited recognition.[114] In December of 1959, the Antarctic Treaty was signed by

[111] For a systematic and comprehensive account see McDOUGAL & BURKE, THE PUBLIC ORDER OF THE OCEANS 730-1007 (1962) [hereinafter cited as McDOUGAL & BURKE].

[112] See Chapter 3 of the forthcoming book of which this Article is a chapter.

[113] For a more complete discussion of this point see pp. 580-83 *infra*.

[114] For general discussion of claims to the Antarctic see JESSUP & TAUBENFELD 137-90; Taubenfeld, *A Treaty for Antarctica*, INTERNATIONAL CONCILIATION No. 531 (Jan. 1961); Hanessian, *Antarctica: Current National Interests and Legal Realities*, 1958 AM. SOC'Y INT'L L. PROCEEDINGS 145; Lissitzyn, *The American Position on Outer Space and Antarctica*, 53 AM. J. INT'L L. 126 (1959); Waldock, *Disputed Sovereignty in the Falkland Islands Dependencies*, 25 BRIT. YB. INT'L L. 311 (1948). See also HAYTON, NATIONAL INTERESTS IN ANTARCTICA (1959).

twelve countries, thus opening up the continent to inclusive access by all participants and for the immediate future setting aside claims to exclusive control.[115] The land masses of the Arctic have, in contrast, been regarded as sufficiently comparable to the other land masses of the Earth to be subject to exclusive appropriation. The Arctic basin, however, has commonly been regarded as subject only to inclusive access and competence. Though certain Soviet publicists have voiced the claim that the basin should be subject to the exclusive control of those nations which border it, this claim has never officially been made by the Soviet Union, and its activities in this area are clearly incompatible with such a claim.[116] The Soviet Union has carried out landings of planes for research purposes in all parts of the basin and has established research stations on ice flows which have been allowed to drift through the so-called "sectors" of several different countries.[117]

The contemporary consensus that the void of outer space is as open to inclusive use and competence as the high seas has already been amply documented.[118]

The resources which have been held to be subject to exclusive appropriation are those commonly regarded as indispensable components of a nation-state: land masses, the immediately superincumbent airspace, internal waters, and closely proximate ocean areas. The sum of the decisions by which exclusive access and competence was established as lawful with respect to these resources is of course coextensive with the historic rise of the nation-state to be the dominant unit of interaction in contemporary world social process.

The important considerations for clarifying a future policy about space resources relate of course not so much to the minute details of familiar past decisions about comparable resources as to the characteristics of the resources and the other factors in the varying contexts of

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115 See Taubenfeld, *supra* note 114; Hayton, *The Antarctic Settlement of 1959*, 54 AM. J. INT'L L. 349 (1960); *Hearings on the Antarctic Treaty Before the Senate Committee on Foreign Relations*, 86th Cong., 2d Sess. (1960).

116 See Lakhtine, *Rights Over the Arctic*, 24 AM. J. INT'L L. 703 (1930). For a summary of the writings of Soviet publicists with a critical analysis of these claims see TARACOUZIO, SOVIETS IN THE ARCTIC 348-66 (1938). Both the Soviet Union and Canada have, however, advocated the "sector principle" which purports to prescribe that any undiscovered land in the Arctic will belong to the nation in whose sector it lies. This principle has not been relied upon, however, as the basis of claim to a single island in the Arctic. For further discussion of the "sector principle" see SMEDAL, ACQUISITION OF SOVEREIGNTY OVER POLAR AREAS 54 (1931); Svarlien, *The Sector Principle in Law and Practice*, 10 POLAR RECORD 248 (1960); Svarlien, *The Legal Status of the Arctic*, 1958 AM. SOC'Y INT'L L. PROCEEDINGS 136; Waldock, *op. cit. supra* note 114, at 339-46; Franklin & McClintock, *The Territorial Claims of Nations in the Arctic: An Appraisal*, 5 OKLA. L. REV. 37 (1952).

117 For details see *Soviet Drifting Stations in the Arctic Ocean, 1955*, 8 POLAR RECORD 27 (1956); Treshnikov, *The Soviet Drifting Station SP-3, 1954-55*, 8 POLAR RECORD 222 (1956); *Soviet Drifting Stations in the Arctic Ocean, 1959-60*, 10 POLAR RECORD 278 (1960).

118 See Chapter 3 of the forthcoming book of which this Article is a chapter.

social process which appear to have affected such decisions. In review of these characteristics and factors, we begin with the resources which have been reserved for inclusive enjoyment and competence, and then proceed to the resources with respect to which exclusive appropriation has been honored. It will be convenient to note first certain characteristics and factors common to all the resources reserved for inclusive use, with subsequent brief indication of any characteristics or factors unique to the different resources.

a. Resources Held Open for Inclusive Enjoyment

1. Physical Characteristics

The physical feature most characteristic of the various spatial-extension resources allocated to inclusive enjoyment by general community decisions is their vastness. The surface of the oceans is an immense two-dimensional plane covering three-quarters of the globe, and the waters of the oceans permit of subsurface travel of equal extent and of a considerable vertical range from surface to depths. The airspace above the oceans is of a comparable vastness, reaching from the surface of the water upward toward outer space. The Antarctic has an area of nearly 6 million square miles; and the Arctic basin is of about the same size. The void of space appears infinite in extent, allowing for movement in every direction. Only international rivers are sufficiently limited in areal domain to pose possible problems of congestion with respect to the number of participants and types of strategies of use, but with minor accommodation, they too may be made accessible to an abundance of participants for different uses.[119] The vastness of all these resources has made them sufficient to meet the needs of all participants who have had the capabilities to use them. The total production of values and the range of their distribution have been observed to increase directly in proportion to the number of participants and their aggregation of base values, and the recognition has been general that since an increase in participants does not diminish the returns of any single participant, the world community

[119] To secure such plurality and efficiency in use of international rivers, the Convention and Statute on the Regime of Navigable Waterways of International Concern, signed at Barcelona, April 20, 1921, 7 L.N.T.S. 35, 51, provides in Article 10 of the Statute:

> Each riparian state is bound, on the one hand, to refrain from all measures likely to prejudice the navigability of the waterway, or to reduce the facilities for navigation, and on the other hand, to take as rapidly as possible all necessary steps for removing any obstacles and dangers which may occur to navigation.

See generally BERBER, RIVERS IN INTERNATIONAL LAW (1959); GLOS, INTERNATIONAL RIVERS: A POLICY ORIENTED PERSPECTIVE (1961).

has had much to gain and no participant anything to lose through the sharing of these resources.

2. Participants

In the case of each of these resources, except the void of space, practically every participant, excluding possibly the extremely small or undeveloped states, have had the technological capacity for use. The large number of participants with relatively equal capacity has produced a demand for inclusive access and competence which no single state or group of states has been able to resist. On the other hand, in the case of the void of outer space, the reverse situation, in which only two participants have had space capability, has in fact also produced the same result in that states not presently having the necessary technological capability can foresee the future possibility of their eventually achieving such capability, and therefore demand that this vast resource be regarded as sharable, in anticipation of their future capabilities of enjoyment.

3. Objectives

The objectives sought in the use of these resources have, fortunately, been inclusive in the sense suggested above, that participants realistically recognize their interdependences, identify their common interests, and assert all their specific claims with a promise of reciprocity. Whether related to minimum order or optimum order, objectives of this kind obviously encourage decisions favoring inclusivity.

4. Situations

The fact that enjoyment of the whole domain, or at least a considerable portion, of the various spatial-extension resources is indispensable to the greatest production of values, particularly those of wealth, power, and enlightenment, has greatly favored inclusive access. A participant could not carry out consequential international trade if restricted to a small part of, or excluded altogether from, the ocean. Under conditions of limitation or exclusion, oceanic cables could not be laid, ocean currents could not be studied, intercontinental flights could not be undertaken. No proper study of the movement of ice in the Arctic basin could be made if the sector claims were valid, and no satellite could be lawfully put into orbit if each participant was limited to only the outer space above its territory. For the lawful carrying out of these various activities, permission or license would have to be obtained from every little state having a small area under its exclusive

competence. Whatever interferes with the speed of movement, travel, and communication may sharply increase their costs and risks. A chain of mutual interferences might, therefore, rapidly develop, capable of imposing difficult barriers. Exclusion not only could become a weapon of coercion by powerful states, but even the most insignificant dictator might be able to disrupt transportation, communication, and scientific study. Inclusive use, however, has been found to give each participant the benefit of the entire resource, while exclusive appropriation might largely destroy its value for all.

The fact that no single participant has been able to control the whole domain of spatial-extension resources has also been an important factor in influencing inclusive decisions. It would be ludicrous for any state to even attempt effectively to enforce exclusive policies through patrolling the oceans, the airspace above the oceans, or the void of space. The costs and hazards would be fantastic, with but speculative benefits. International rivers perhaps on occasion admit of exclusive control at less cost. In many instances, however, the reciprocities and retaliations are such as to make the costs of exclusive control high even with respect to such resources, and the costs of inclusive access are commonly as little as the advantages are many.

The frequency of periods of high expectations of violence in recent history has been a further factor favoring inclusivity. Exclusive use has often meant boundary disputes, arguments over trespasses, conflicting claims, and attempted aggrandizement.[120] There have, however, been few cases of conflict when these resources are accepted as sharable. When Britain, Argentina, and Chile were attempting to enforce exclusive claims to the use of areas of the Antarctic, expectations of local violence were sufficiently high that the parties agreed to refrain from sending warships in the area for fear of a serious incident.[121] However, in the period since the Antarctic treaty established inclusive use, opportunity for similar difficulties to arise has been practically non-existent.

5. Base Values

The differential distribution of base values for the enjoyment of these resources has also influenced decisions towards inclusivity. Relatively small countries such as Japan and England have been able to import raw materials, use their factories and technological skills to manufacture finished products, and then carry them to all parts of the

120 For illustrations relating to the land masses see LINDLEY, THE ACQUISITION AND GOVERNMENT OF BACKWARD TERRITORY IN INTERNATIONAL LAW (1926); HILL, CLAIMS TO TERRITORY IN INTERNATIONAL LAW AND RELATIONS (1945).

121 *Cf.* Taubenfeld, *supra* note 114, at 278.

world; while large countries, such as Canada, rich in natural resources but less highly industrialized, have been able easily to exchange such base values for others which they lack. Those states not having ships have been able to have their imports and exports transported by the ships of other countries, and the rich flow resources of the sea have been made available to all.

The mobility of such base values as ships and planes, and the efficiency of the scientists of many different communities in acquisition of knowledge concerning these spatial-extension resources, have been greatly increased through inclusive use. The exchange of scientific information has been greatly encouraged since each state knows that with all having equal access, other participants will probably be able to gain the information in any event if they refuse to share it. These advantages have clearly been an important factor in stimulating the making of inclusive claims with offers of reciprocity, and the corresponding recognition of these claims by authoritative decision-makers.

6. Strategies

The fact that noncompetitive and nonconsumable strategies have been possible, because of the physical characteristics of these resources, has also been an important factor in the promotion of decisions recognizing inclusive claims. Since an increase in the number of participants and amount of use has served only to increase production and sharing, and since these strategies in the main have not physically interfered with the comparable strategies of others, inclusive use has had no detrimental effect upon the value processes of any state, but everyone has stood to gain. Thus, the more ships which have travelled the sea or international rivers, the more planes using the airspace, the more satellites in the void, the more scientific research stations established in the Antarctic, the greater has been the production and sharing of values.

7. Outcomes

The rich outcomes which have been secured through the sharing of these resources have also greatly stimulated predispositions toward inclusivity. Essential avenues of transportation and communication have been made available to all participants having the capabilities to use these resources. Access to the resources has also given each participant the opportunity to exploit the rich flow and stock resources found within any particular resource. Vast areas of man's environment have been opened to the scientists of every nation for the study of numerous natural phenomena and forms of life, thus yielding enlightenment for

enriching nearly every value process. This tremendous production and wide distribution of values has, therefore, been a prime factor affecting decisions in favor of inclusivity.

Turning to specific spatial-extension resources and the factors which uniquely affect decision about them, we find that the resource exhibiting the most enduring shared enjoyment and the richest dividends from sharing is the oceans.[122] The most important factors unique to this resource would appear to be the great variety and vast quantity of values available from its shared use. This resource furnishes still the principal avenue for the transportation of goods, and an extremely important avenue for travel by people. In addition, the oceans remain one of the major sources of the world's food supply.[123] The surface, although the most important, is only one of the several spatial-extension resources made available by the oceans. All participants also have free access to the immense body of water for such uses as submarine travel and study of marine life, and to the bed of the sea for the laying of submarine cables and pipelines, and for scientific research.

Practically without exception, every state in varying degrees and ways has made use of, or had benefits from, the oceans. The early recognition by these participants of their inclusive interests in the enjoyment of the oceans was, as indicated in our first broad clarification of policies, encouraged by the prospects of avoiding value deprivation arising from piracy, capricious interference, burdensome tolls, multiple regulations, and kindred nuisances. The cost of special or even exclusive interests were conspicuous; and the benefits that justify costs were insufficiently obvious to win widespread support for the perpetuation of disorder. Those who attempted to interfere with this freedom of access and use were in such a notorious pursuit of a special interest that they obtained little encouragement. Not only has inclusive use produced a vast quantity and wide distribution of values, but these values have been so essential to the functioning of the social processes of such a large number of participants that exclusive acquisition has been tolerated only in modest degree.

The airspace over the oceans is of a vastness comparable to that of the oceans underneath and affords avenues for transportation and communication, the use of which by one participant does not cause a diminishing return in the values of any other participant, but instead permits each participant, in accordance with capability, to add to the total values produced from the resource. In general, therefore, factors of common interest which have led to inclusive policies in regard to the

122 See McDOUGAL & BURKE 14-28.

123 *Id.* at 457-58.

seas have been equally present in regard to airspace above, and have therefore led to the allocation of such airspace to inclusive use.[124]

Factors affecting decisions about the sharability of the polar zones have been somewhat different in relation to the Antarctic, the Arctic basin, and the land masses of the Arctic. The factors which have recently led to the substitution of inclusive for exclusive policies with regard to Antarctica are extremely significant since this area, of all the Earth spatial-extension resources, bears the closest resemblance to the surfaces of the celestial bodies in nearest proximity to the Earth. The Antarctic continent is covered with a massive layer of ice, on occasion as much as 10,000 feet deep, with the only exposed land being some coastal areas and bare mountain peaks. The recorded temperatures vary from a low of minus 127 degrees F. to a high of about 32 degrees F. The only vegetation found on the land mass are certain species of lichens and moss. The coastal waters abound in seals, whales, and bird life, but the only animal form found on the land is insects. Many different minerals have been discovered, though, as yet, no deposits of a commercial value.[125] However, even if such deposits were to be found, the hostile physical features of Antarctica would at this time make development of these resources highly unprofitable. Thus, the acquisition of knowledge is presently the most important value sought on this ice-covered continent.

The basic considerations which led in 1959 to the conclusion of the Antarctic Treaty and the resulting inclusive use relate both to minimum and optimum order. With respect to the former, the overriding factor was the entrance of the Soviets into Antarctica.[126] The extent of the Soviet Union's interest in the area became clear when in a Memorandum of June 7, 1950, the Soviet government demanded full participation in any negotiations about the regime of the Antarctic,[127] though, until IGY, the USSR's activities in the region had been largely

[124] WASSENBERGH, POST-WAR INTERNATIONAL CIVIL AVIATION POLICY AND THE LAW OF THE AIR 101-05 (1957); McDOUGAL & BURKE 782.

[125] For additional information about the Antarctic, see SULLIVAN, QUEST FOR A CONTINENT (1957); GOULD, ANTARCTICA IN WORLD AFFAIRS (Foreign Policy Ass'n Headline Series No. 128, 1958); AIR FORCE RESERVE OFFICERS TRAINING CORPS, MILITARY ASPECTS OF WORLD GEOGRAPHY 523-35 (1959); JESSUP & TAUBENFELD 137-39.

[126] Hayton, *The Antarctic Settlement of 1959*, 54 AM. J. INT'L L. 349 (1960); Taubenfeld, *A Treaty for Antarctica*, INTERNATIONAL CONCILIATION No. 531, at 272 (Jan. 1961).

[127] For a comprehensive account, see Toma, *Soviet Attitude Towards the Acquisition of Territorial Sovereignty in the Antarctic*, 50 AM. J. INT'L L. 611 (1956). For Soviet viewpoint see MOLODTSOV, SOVREMENOE MESHDUNARODNO-PRAVOVOE POLOZHENIE ANTARKTIKI (1954); Movchan, *The Legal Status of Antarctica: An International Problem*, 1959 SOVIET YEAR-BOOK OF INTERNATIONAL LAW 342 (1960); INTERNATIONAL LAW 192-94 (Kozhevnikov ed. 1961). It appears that, chronologically, the first Soviet official intervention in the Antarctic politics occurred on January 27, 1939, the date of a Soviet note to Norway in which note the USSR "reserved its position on the question of sovereignty over areas in Antarctica discovered by Russian navigators." *Id.* at 193.

limited to whaling.[128] Large-scale Soviet penetration of the Antarctic, however, coincided with IGY, when they established a number of bases, all in a zone claimed by Australia.[129] When the Soviet intentions of continuing these bases after the termination of IGY were revealed, any continued attempt to maintain exclusive use would have meant an inevitable dispute between Australia and the USSR, in addition to the continuation of the bitter controversies between Britain, Argentina, and Chile. The knowledge that the United States, the Soviet Union, and Britain would continue with extensive activities also influenced the smaller claimants to favor inclusive policies rather than to attempt to strengthen their claims by similar activities at tremendous expense. The unregulated activities of the various powers thus threatened the maintenance of minimum order, creating the grave danger of the continent becoming involved in the cold war and increasing the possibilities of its militarization. Concern was, for example, expressed that in the event of war and destruction of the Panama Canal, hostile submarines could operate from the Antarctic bases threatening the shipping and other vital interests of the whole southern hemisphere.[130]

With respect to optimum order, the most important factor contributing to the Antarctic Treaty were the great benefits in terms of enlightenment obtained through cooperative efforts within IGY. This experience in Antarctica demonstrated that, as in the enjoyment of other spatial-extension resources, free access, unhampered travel, cooperation, and the exchange of information bring the greatest accumulation and widest distribution of knowledge. During IGY, 48 bases for scientific research were established by eleven states in Antarctica,[131] and after its conclusion the Special Committee on Antarctic Research (SCAR) was to continue to coordinate scientific activities of the various participants.[132] Thus, inclusive access to Antarctica came as a result of the participants recognizing their common interests in keeping the area from becoming more deeply involved in the power conflicts and in promoting scientific exploration.[133]

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128 JESSUP & TAUBENFELD 157.

129 For map showing Soviet IGY bases in the Antarctica see JESSUP & TAUBENFELD 144-45.

130 As to the realism of this concern, see an appraisal by JESSUP & TAUBENFELD 162-63.

131 Britain had the largest number of bases—14—followed by Argentina and the United States—each having 8—and the Soviet Union—6. At one time, there were about 5,000 persons on the continent. See SULLIVAN, ASSAULT ON THE UNKNOWN 306 (1961).

132 *Id.* at 412-13; Hanessian, *Antarctica: Current National Interests and Legal Realities*, 1958 AM. SOC'Y INT'L L. PROCEEDINGS 145, 147-59.

133 An excellent comprehensive review of IGY activities on Antarctica is offered in SULLIVAN, *op. cit. supra* note 131, at 290-343. "It is safe to say," observes Sullivan, "that never in the history of exploration has there been, in size, composition, or scope of inquiry, an effort to compare with this international assault on a virtually unknown continent." *Id.* at 306.

Explicit recognition of these common interests appears in the opening paragraphs of the Antarctic Treaty.[134] The main body of the agreement provides that Antarctica shall be used "for peaceful purposes only" and prohibits any military activities, specifically the establishment of military bases, maneuvers, and weapons testing.[135] Invoking the practices followed during IGY, the Treaty proclaims "freedom of scientific investigation in Antarctica" and calls for the cooperation and exchange of scientific information and personnel "to the greatest extent feasible and practicable."[136] With respect to different territorial claims to the continent, the Treaty preserves the status quo.[137] Moreover,

> No acts or activities taking place while the present treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present treaty is in force.[138]

Whatever its imperfections may be—the conferment upon the original twelve signatories of a privileged status,[139] and the cumbersome decision-making procedures for the implementation of its principles and objectives[140] are the more obvious ones—the Antarctic Treaty represents a major step toward the promotion of both minimum and optimum order in that polar continent. As Professor Hayton very appropriately remarks,

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[134] The preamble of the Antarctic Treaty reads:

> The Governments of . . . .
>
> Recognizing that it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord;
>
> Acknowledging the substantial contributions to scientific knowledge resulting from international cooperation in scientific investigation in Antarctica;
>
> Convinced that the establishment of a firm foundation for the continuation and development of such cooperation on the basis of freedom of scientific investigation in Antarctica as applied during the International Geophysical Year accords with the interests of science and the progress of all mankind;
>
> Convinced also that a treaty ensuring the use of Antarctica for peaceful purposes only and the continuance of international harmony in Antarctica will further the purposes and principles embodied in the Charter of the United Nations;

Antarctic Treaty, Dec. 1, 1959, [1961] 1 U.S.T. & O.I.A. 794, T.I.A.S. No. 4780, 54 AM. J. INT'L L. 477 (1960).

[135] Art. I, [1961] 1 U.S.T. & O.I.A. 795, 54 AM. J. INT'L L. 477 (1960).

[136] Arts. II-III, [1961] 1 U.S.T. & O.I.A. 795-96, 54 AM. J. INT'L L. 478 (1960).

[137] Art. IV, para. 1, *ibid.*

[138] Art. IV, para. 2, *ibid.*

[139] Arts. X, XII, para. 1 (a), [1961] 1 U.S.T. & O.I.A. 799, 54 AM. J. INT'L L. 481 (1960).

[140] Art. IX, paras. 1, 4, [1961] 1 U.S.T. & O.I.A. 798, 54 AM. J. INT'L L. 480 (1960).

> [W]ithin the context of current reality the treaty is an unusual example of diplomatic and political service to the goals of science and the general international interest. The treaty's high principles do help keep alive a hope for the eventual peaceful accommodation of differences. The document is a worthy, if imperfect, step toward that end.[141]

The Arctic zone, in contrast to Antarctica, is principally an ocean approximately one-sixth the size of the Atlantic, surrounded by continents and covered, except around the edges during a short period in the summer, with various types of ice formations. This area has traditionally been subject to inclusive access, and like Antarctica, its main use has been in the enlightenment process, although power considerations are rapidly growing in importance.[142] Both the Soviet Union and the United States in recent years have carried out extensive studies in regard to meteorology, oceanography, and the study of the ice and its movements,[143] much of this information being of military value. Common interest in the acquisition of knowledge concerning the Arctic region has largely prevented claims to exclusive use from being pressed since no participant could carry out effective research concerning such factors as ocean currents, ice drifts, and air movements, if restricted to one sector. Nature has been quite oblivious to man's attempts to chop up the resource into segments.

The principal use to which international rivers have been put as a spatial-extension resource is navigation. The factors which have influenced decisions about the degree of shared use to which such rivers are subject have, however, been more complex than in the case of the other spatial-extension resources. This is because use for this purpose is affected by other uses of the rivers as flow resources. Many activities other than navigation are carried out by riparian states, and multiple purpose use raises many difficult problems related to improvements, dredging, clearing, and maintenance. The main factor promoting shared access and competence is, however, the same as with respect to the other spatial-extension resources, that use of a river for navigation purposes does not interfere with use for the same purpose by other states (assuming problems of congestion can be accommodated) but serves only to increase the total production of values, while exclusive use would result in mutual interference, decreasing efficiency, and increasing costs.

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141 Hayton, *supra* note 126, at 367. By 1962 both the United States and the Soviet Union had ratified the treaty.

142 See, *e.g.*, Svarlien, *The Legal Status of the Arctic*, 1958 AM. SOC'Y INT'L L. PROCEEDINGS 136-43; AIR FORCE RESERVE OFFICERS TRAINING CORPS, MILITARY ASPECTS OF WORLD POLITICAL GEOGRAPHY 172-213 (1959).

143 A comprehensive account of these activities, especially during IGY, is offered in SULLIVAN, *op. cit. supra* note 131, at 253-73.

The most recent experience of mankind in the allocation of a sharable resource relates of course to the void of outer space. As has been demonstrated in Chapter 3, recognition of the common interest of all peoples in achieving the most efficient exploitation, with the optimal production and widest distribution of values, has resulted in a consensus establishing inclusive use and competence. This consensus has been expressed in the practice of states and is supported by an important United Nations resolution, as well as by the statements of high national and international officials and of leading publicists. The factors uniquely affecting this quick recognition of common interest and establishment of consensus have already been sufficiently emphasized.

b. Resources Made Subject to Exclusive Appropriation

The factors which have influenced decisions favoring exclusive enjoyment with respect to the territorial sea, the airspace over land masses, internal rivers, and the land mass of the Arctic are inseparably connected with the factors which have influenced comparable decision with respect to the land-masses of the Earth. Hence we first examine the latter and then briefly note the former.

1. Physical Characteristics

The most significant difference between the land masses and other spatial-extension resources is that the land masses are relatively solid, while the other resources, except for parts of the polar regions, lack this quality. This relative solidity of the land masses has of course facilitated the establishment of permanent sedentary communities with exclusive claim. Another significant difference is the fact that the land masses are filled with natural barriers such as mountain ranges, streams, bodies of water, deserts, and forests. These barriers have had the effect of reinforcing the parochial nature of organizations arising from blood, family, and racial ties, and thus intensifying man's tendency to organize into territorial communities. Such natural barriers do not, in contrast, exist in the other spatial-extension resources, and with technological development these resources have become avenues of, rather than roadblocks to, communication and movement. Although transportation modalities of the modern era have now in some areas of the world overcome these barriers, the social organization of mankind into territorial communities has been much too firmly established to be suddenly changed.

2. Participants

The participants in the process of acquisition of the land masses of the Earth have been from prehistoric times organized together upon

the basis of first family, then tribal and racial, and finally cultural ties, and inherent in this structure has been the exclusion of the stranger and groups not sharing these common characteristics. Thus, the land masses slowly became organized along territorial rather than functional lines.

3. Objectives

The objectives of the participants with respect to the land masses have been largely parochial and exclusive. Minimum order has been sought through the exclusion of the stranger and the strengthening of identifications along territorial lines, thus favoring exclusive decision. The achievement of optimum order has been sought in terms of the individual community rather than on a regional or global scale, consequently objectives in this regard have often been exclusive rather than inclusive.

4. Situations

Probably the most important factor influencing developments favorable to exclusivity has been that much of the land masses of the Earth are in a geographical relationship with other resources which facilitates a sedentary type of social structure. Where land is rich in stock and flow resources, the relevant uses of the land are commonly of a more permanent nature than in the cases of other areas of land masses, such as deserts, or of other spatial-extension resources, such as the oceans or airspace. A vessel or aircraft may quickly pass over the oceans or through the airspace; but, in the case of land, the houses, communities, and cities are so constructed as to make it impossible for the same space to be used by other participants. Where most territorial communities have developed, there have been a plentiful supply of water, moderate temperature, a variety of plant and animal life, rich supplies of stock resources, such as minerals and soil nutrients, and naturally a breathable atmosphere. Under such circumstances the spatial-extension quality of the land mass has been subordinated to the enjoyment and development of the various resources which it contains. The Antarctic, in contrast, a land mass lacking such conditions and resources, and presenting resources which cannot be economically exploited, has recently been recognized as sharable in high degree.

Land masses, otherwise lacking in appropriate conditions and resources, may still be regarded as non-sharable because of their close proximity to areas of established exclusive use. This proximity may both cause activities carried out upon the resources to be of a strategic significance and permit a single participant, having large quantities of

base values close by, to achieve by exclusive use a disproportionate production of values. Such factors have led, quite differently from the outcome with respect to Antarctica, to the exclusive use of Arctic land masses.

5. Base Values

The intense concentration of base values in terms of control over resources, people, and institutional practices, which characterizes the contemporary nation-state has obviously been facilitated by the honoring of exclusive control over land masses. The land masses have been the permanent core from which the other base values in resources and peoples have been employed in creating a complex network of institutions for the shaping and sharing of values. It should not, therefore, be surprising that a resource so indispensable to the principal participant in world power processes should be guarded with a jealous exclusiveness.

6. Strategies

Because strategies in the use of land masses are closely related to the resources which the land contains, strategies of use are often both consumable and competitive, thus favoring exclusive decision. Strategies in the use of most land masses are, further, today an integral part of the social processes of the different nation-states directly affecting their most comprehensive security, and hence are made exclusive for reasons of defense.

7. Outcomes

In the context of the contemporary world arena, with its great divisions and expectations of violence, the peoples of the different communities have quite understandably regarded relatively exclusive control over their land masses as making important contribution to their security and other values. In a world so divided, the deconcentration of power achievable by such exclusive control may have served the purposes of freedom, as well as of experimentation and development. However, in a less divided world in which the sharing of power is secured by appropriate inclusive organization, resources now regarded as non-sharable might be made sharable. Thus, regional planning might be undertaken in accordance with inescapable geographic, technological and utilization unities, and whole river valleys could be developed as an economic whole;[144] even certain highways might come

144 Advantages of and need for regional planning are explored in DIRECTIVE COMM. ON REGIONAL PLANNING—YALE UNIVERSITY, THE CASE FOR REGIONAL PLANNING (1947).

to be open to inclusive use and control such as international rivers are. The recent trends towards larger economic units such as the European Common Market, may indicate that the peoples of the world are beginning to recognize that their common interests lie in the substitution of inclusive for exclusive policies.

The airspace over the land masses, the territorial seas, and internal rivers, have been regarded as generally non-sharable because of their physical proximity to, or intimate interdependence with, the land masses of the nation-state. This proximity and interdependence have made all use, and potential use, of such resources an integral part of the social process of the land masses they attend. Neither the security, nor the protection and appropriate development, of the various value processes upon the land masses could have been achieved without a high degree of exclusive control over these auxiliary resources. Even though modern developments in weapons make contiguity of considerably less relevance to military security than in the past,[145] some degree of exclusive control over such resources remains necessary for the protection of many common exclusive interests.

2. Flow Resources

a. Resources With Flow Not Significantly Affected by Human Action

The principal resources in this category are cosmic rays, solar radiations, gases, atmospheres of celestial bodies, the winds, the oceanic waters and tides, the minerals dissolved in the waters, and gravitational and magnetic forces. Claim and decision with respect to resources of this type have, fortunately, largely favored inclusivity. The various factors in processes of exploitation affecting claim and decision have been similar to those observed with respect to spatial-extension resources. Quick allusion to some of the more important features will, therefore, serve our present purposes.

1. Characteristics

The most relevant physical characteristic of these resources is of course their flow quality. This quality in the case of the waters of the oceans, the gases in the atmosphere, and gravity is constant; while in the case of the wind and the tides, it is cyclical. These resources are, like spatial-extension resources, vast in extent and relatively limitless in quantity; the ever-present flow quickly replaces quantities removed through use. The rays of the Sun flood the entire Earth with

[145] McDOUGAL & BURKE 517.

life-giving heat, energy, and light; the oceans cover over two-thirds of the Earth's surface at an average depth of more than two miles, and abound in richness of many different kinds;[146] the atmosphere envelops the Earth in a blanket several hundred miles thick; and the energies of the tides, winds, and gravity are too vast to be accurately measured.

2. Participants

Since resources of this type are not affected by human activity, an increase in the number of participants does not cause, any more than with spatial-extension resources, any diminution of values for any other participants; instead each participant again adds to the total values produced. The more the participants, therefore, the greater the production and the wider the sharing of values.

3. Situations

Except for possibly tides, and ocean waters, these resources are available to everyone, no matter what their location upon the Earth. The Sun, wind, gravity, and atmosphere are all around us; even the oceans and the tides are convenient to all but land-locked states. Because of their vastness, and their dispersal throughout the Earth, any attempt to establish exclusive appropriation would be relatively futile and pointless.

4. Base Values

These resources, depending upon the type of use, may be enjoyed with but few base values. One needs only breathe the air, bask in the sunshine, or drop an object, to employ the force of gravity. Salt from the sea has been extracted by man for centuries; and the use of the wind for propelling ships, or as a source of power, is equally ancient. Other uses, however, require developed technology. In expert estimate, the ocean's supply in various minerals is virtually inexhaustible.[147] The United States, for example, extracts "all of its magnesium and 80 per cent of its bromine from sea water."[148] Small wind generators

[146] See generally COWAN, FRONTIERS OF THE SEA (1960).

[147] Thus the *Stanford Study* reports:

> Enormous potential resources are available in the oceans, which cover 71 percent of the surface of the earth. We are aware that sea water contains practically inexhaustible amounts of dissolved salts. On the coastal shelves are extensive mineral deposits such as ilmenite, magnetite, monazite, rutile, garnet, diamond, zircon, and quartz. The sea bottom is known to have extensive manganese and phosphate deposits in the form of nodules which it may be possible to collect economically. Near the surface of the sea live enormous populations of marine organisms—potential new foods for mankind, some of which are well known, some practically unstudied.

SENATE COMM. ON FOREIGN RELATIONS, 86TH CONG., 1ST SESS., STANFORD RESEARCH INSTITUTE STUDY 24 (Comm. Print 1959).

[148] COWAN, *op. cit. supra* note 146, at 260.

have been used for a number of years in isolated rural areas for generating power, but the production of electricity on a large scale with huge wind turbines is now economically feasible.[149] The extraction of a number of minerals from sea water, the use of solar power for generating electricity or heating buildings, the channeling of the energy of tides, and the large scale use of wind power, are all technologically possible, but as yet, in most instances, cannot economically compete with more conventional sources of minerals and energy. Whether the amount of base values required for enjoyment is small or large, these resources obviously remain equally susceptible to shared use.

5. Strategies

Strategies of use, though in some cases consumable, still favor inclusive decision. Because of the flow of these resources, consumption by one participant does not affect the amount available to other participants. The strategies remain, therefore, as in the case of the spatial-extension resources, largely noncompetitive.

6. Outcomes

The shared use of these resources in many instances dates, as noted, back into prehistoric times. These centuries of experience have demonstrated both that inclusive use produces the greatest production and widest distribution of values and that there can be little advantage to any participant in attempting to establish exclusive use. Both claim and decision have, therefore, been as easily inclusive as in the case of spatial-extension resources.

b. Resources With Flow Significantly Affected by Human Action

The resources within this category may be subdivided into those not having, and having, a critical zone. A resource is said to have a critical zone, it may be recalled, if use beyond a certain rate may result in a decrease in flow which is either impossible or economically unfeasible to reverse. The most common examples of resources not having a critical zone are the waters of rivers and lakes, fish, and precipitation. Common examples of resources with a critical zone are agricultural land, soil nutrients, forests, wildlife, the mammals of the

[149] For information as to the potential uses of wind power see, *e.g.*, Thomas, *Harnessing the Wind for Electric Power*, in 3 PROCEEDINGS OF THE UNITED NATIONS SCIENTIFIC CONFERENCE ON THE CONSERVATION AND UTILIZATION OF RESOURCES 310 (U.N. Pub. Sales No. 1950.II.B.4) (1951); *Report on the Utilization of Windpower in the Netherlands*, in *id.* at 319; Fardin, *Windpower: Its Advantages and Possibilities*, in *id.* at 322.

ocean, and a few species of fish, such as salmon.[150] Since the factors in processes of enjoyment which may affect claim and decision about all these resources are, apart from the presence or absence of a critical zone, much the same, we may consider these two subtypes together, and then discuss separately the various specific resources, pointing out any unique factors affecting claim and decision.

1. Characteristics

Like the resources not significantly affected by human action, this group has the physical characteristic of a flow, with different units becoming available for use in different intervals of time. The difference is that with respect to these resources, human activities may cause important increase or decrease in the rate of flow; as a corollary, these resources may not be so incomprehensibly vast, and the units available for use at any given time may be uneven in quantity. When there has been more than enough flow to meet the demands of a large number of participants, there has been a strong presumption that these resources are sharable; but, on the other hand, when there has not been enough flow to meet the demands of all participants, decisions have tended either to limit access to a few participants, or to establish the resource as open to organized use by everyone, with limits upon the rate of use.

2. Participants

With respect to most of these resources, an increase in participants may take place up to a certain point before the value production of any participant is decreased; beyond this point further increases in the rate of use may cause depletion. The production of values from these resources has sometimes been sought, therefore, through the sharing of the resources by a limited number of participants rather than by the entire world community, the number and selection of participants being made to depend upon other variables in the process of interaction.

3. Objectives

Since there is a point with respect to practically all these resources at which an increase in the rate of present use will cause a decrease in future rates of use, the maximization of values in enjoyment of a par-

[150] For amplification see CIRIACY-WANTRUP, RESOURCE CONSERVATION: ECONOMICS AND POLICIES 38-43 (1952).

One flow resource mentioned by Professor Ciriacy-Wantrup, and which may be significantly affected by human action, "special locations that form the basis of site value," might become of especial importance in the exploitation of space.

ticular resource can be obtained only by maintaining use at the point where the greatest production of values can be achieved over a given time period. Because, however, the value of or demand for the resource may be higher in one value process than another, a greater over-all production of general community values may be achieved through a rate of use which may sacrifice future production for present needs. The optimum state of conservation has been described, it may be recalled, as that temporal distribution of use rates with respect to a particular resource which will give the greatest production of values within all value processes.[151] It has, accordingly, been recognized with respect to some of these resources that the maximization of community values, whether the community be that of a single state or of all states, requires a high degree of organized inclusive competence.

4. Situations

Where the total flow of these resources takes place within the territory of a single participant, the resource is usually, because of the nature of the territorial state, subject to exclusive use. Such is the case with timber reserves and agricultural land. However, some of these resources, such as rivers, may be located in close relationship to more than one participant, and more than one participant may be in a position to have easy physical access. In such cases, the resource has usually been shared by the several participants. In some instances, because of its location, the resource has been of strategic value to a number of participants and, hence, has been regarded as open to their inclusive use. Even in the absence of such strategic significance, an obvious interdependence among users has sometimes stimulated the same decision.

5. Base Values

Often the combinations of base values of more than one participant will increase production; again, the base values of one participant can be made to benefit the value processes of another. Thus, the damming of a river in one state may allow an excess flow of water during certain periods to be saved and released at an even rate, thereby increasing the power potential of hydroelectric works in downstream states. Where such is the case the sharing of the costs of such works may increase the values of both participants. Often, particularly in the case of international rivers, the costs of construction of various types of works are so great that the works are more likely to be undertaken if the costs are shared.

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[151] See note 100 *supra* and accompanying text.

6. Strategies

Strategies in the use of these resources are usually consumable and often competitive. With respect to resources having a critical zone, therefore, and found beyond the confines of the nation-state, inclusive use through organized strategies has often resulted in the greatest production and widest distribution of values.

7. Outcomes

Past experience with respect to the allocation of resources of this type, not contained entirely within the territory of a single state, clearly demonstrates that the greatest production and widest distribution of values can be achieved through organized inclusive use. This will be illustrated in the discussion of particular resources which follows.

(i) *Resources Not Having a Critical Zone*

International Rivers

Until the arrival of the modern industrial era, the flow of water in most international rivers was sufficient to meet the requirements of all participants, and the unilateral diversion of water, when technologically possible, caused few difficulties between different communities. With the development of highly industrialized societies, large urban centers, and irrigation technology, the flow of water in many rivers has come to be insufficient to meet all the needs of all claimants, especially in the absence of appropriate development and management. The pattern of claim and counterclaim and the factors affecting decision about particular streams have consequently become much more complex. Fortunately, because states have recognized their common interests in the unified management of the flow resources, as well as the spatial-extension uses of international rivers, such rivers have in many instances been subjected to a high degree of inclusive enjoyment and competence.

The most significant factor promoting the inclusive enjoyment and control of international rivers has been perhaps the multiple, important uses of which such rivers admit,[152] and which have been claimed by different participants in the process of their exploitation. For peoples living along its banks, and sometimes even for more distant peoples, the waters of a river may serve as the principal source of domestic supply, for both drinking and sanitation purposes. In con-

152 For a systematic catalogue of many different uses, see GLOS, INTERNATIONAL RIVERS: A POLICY ORIENTED PERSPECTIVE 18-42 (1961).

temporary times this familiar "domestic use" has expanded into "municipal use" for whole communities and many new purposes. Industrial enterprises may require and demand water for use in manufacturing processes in a multitude of ways, as well as for the deposit of industrial wastes. Agricultural enterprises may demand water not merely for such traditional purposes as the watering of livestock but also for irrigation, requiring extensive systems of water storage, supply and administration. The movement of the waters may also be employed as an economic source for generating electrical power, required for many different community purposes. Improvements in the control of the stream may be demanded for preventing losses from floods and for facilitating soil and forestry conservation. International rivers may also be valuable sources of fish and wild life and may constitute important recreational resources.

The most important consequences of all these potential, and demanded, multiple uses of international rivers is the establishment within every particular drainage basin of certain unique unities or interdependences. Thus, because of the physical unity of a river basin, activities carried out upstream may affect the processes of use of the downstream state. For instance, soil erosion, removal or planting of vegetation, and development of water sheds may all affect the quantity, quality, and rate of flow. Other uses made of the water upstream may, further, affect the downstream uses, either by improving or by adversely affecting these same features of the stream. The use of water as a depository for industrial waste or domestic sewage may, for example, make the water less suitable for drinking purposes. Extensive removal of water for irrigation may also leave a smaller quantity for downstream use. The damming of water upstream may, on the other hand, increase the production potential of downstream uses by storing the surplus water during spring runoff and making possible a higher level of sustained continuous flow. The storing of water upstream may, similarly, confer downstream flood control benefits. Beyond all this, many different uses of the water may affect, beneficially or adversely, other activities such as navigation, fish and wild life protection, and recreational facilities. All these physical and utilization unities create, in turn, certain further engineering unities, making comprehensive, integrated regional planning necessary for the greatest production and widest distribution of values.[153]

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153 For fuller account see Cooke, *Physical and Functional Relationships, Headwaters Control and Use*, reproduced in part in McDOUGAL & HABER, PROPERTY, WEALTH, LAND: ALLOCATION, PLANNING AND DEVELOPMENT 983 (1948); Thomas, *Changes in Quantities and Qualities of Ground and Surface Waters*, in MAN'S ROLE IN CHANGING THE FACE OF THE EARTH 542-58 (Thomas ed. 1956).

It is from these unities or interdependences within any particular drainage basin that effective sanctions for a measure of shared enjoyment and competence derive. They increase both the promise of reward from cooperation and the threat of retaliation for unrestrained, egocentric taking. Thus, the comprehensive integrated regional planning, which promises the greatest reward, requires the cooperation of all states through which a river passes and such cooperation cannot be secured without the sharing of benefits. The Sudan, for example, was encouraged to enter into an agreement for the distribution of the waters of the Nile by recognition that the building of the Aswan dam would give the Sudan a share in the surplus water and effectively secure its vital interests in the river.[154] In contrast, the unilateral appropriation of water by an upstream state for irrigation purposes may be prevented by the threat by the downstream state to close the river for navigational purposes. Where participants share the waters of several international rivers running in both directions, as in the case of the United States and Canada, mutual tolerance and reciprocity in regard to claims and counterclaims have been more easily maintained since any attempt by one state unilaterally to appropriate water to the detriment of the other may lead to a similar appropriation by the latter from streams originating with it.[155]

Since the variables in the process of use of each river basin differ widely and affect a limited number of participants, the most important decisions about sharability are found not so much in general multilateral conventions,[156] as in a large number of specific treaties entered into by only the riparian states. The use of the majority of international rivers is now covered by such treaties, and even where such treaties do not exist, as in the case of the Jordan river, the waters are often shared, and negotiations are in process in many instances.[157]

[154] See Garretson, *The Nile River System*, 1960 AM. SOC'Y INT'L L. PROCEEDINGS 136. The problem of the Nile River basin in its wider context is also explored in Pompe, *The Nile Waters Question*, in SYMBOLAE VERZIJL 275 (1958). See also MINISTRY OF IRRIGATION & HYDRO-ELECTRIC POWER, THE NILE WATER QUESTION (1955).

[155] For details see BLOOMFIELD & FITZGERALD, BOUNDARY WATERS PROBLEMS OF CANADA AND THE UNITED STATES (1958). See also Cohen, *Some Legal and Policy Aspects of the Columbia River Dispute*, 36 CAN. BAR REV. 25 (1958); Johnson, *The Columbia River System*, 1960 AM. SOC'Y INT'L PROCEEDINGS 120.

[156] The best known attempts to regulate multilaterally the use of international waters are the Convention on the Regime of Navigable Waterways of International Concern, April 20, 1921, 7 L.N.T.S. 35, and the Convention Relating to the Development of Hydraulic Power Affecting More Than One State, Dec. 9, 1923, 36 L.N.T.S. 76. For text of the most relevant provision of the Barcelona Convention, see note 119 *supra*.

[157] *Cf.* BERBER, RIVERS IN INTERNATIONAL LAW 52-159 (1959). For an interesting summary of the more important provisions of such treaties, covering a period of almost 150 years, see SMITH, THE ECONOMIC USES OF INTERNATIONAL RIVERS 159-221 (1931). See also Kenworthy, *Joint Development of International Rivers*, 54 AM. J. INT'L L. 592 (1960).

Support for perspectives of inclusive enjoyment and control may also be found in the recent arbitral decision of the Franco-Spanish controversy about Lake Lanoux.[158] Municipal decisions, such as those by the United States Supreme Court in regard to disputes between states concerning interstate rivers, also tend toward inclusivity.[159] Finally, the writing of publicists and the resolutions of professional societies increasingly reflect community expectations of shared competence and control.[160]

From all these sources, two principles seem clearly in process of establishment. The first is that no participant has an unqualified right by its own activities unilaterally to affect the interests of another participant to its detriment. This principle is evidenced by the many treaties containing a clause to the effect that no state can make any changes which substantially affect another state without its consent or agreement. The second principle is that the division of waters and the priorities of uses should be decided on the general basis of reasonableness. This principle is often referred to as that requiring "equitable apportionment." These principles and community expectations are concisely summarized in a statement of principles of law by the Committee on the Uses of Waters of International Rivers, of the American Branch of the International Law Association, which reads:

> A riparian is under a duty to refrain from causing a change in the existing regime of a system of international waters which could interfere with the exercise of a co-riparian of its right to share on a just and reasonable basis in the benefits of the system without first giving the co-riparian an opportunity to object; and if objection is made, to refrain from causing the change so long as the co-riparian demonstrates its willingness to reach a prompt and just solution by the pacific means envisaged in the Charter of the United Nations, including a determination by the International Court of Justice or other agreed tribunal.[161]

Fishery Resources of the Oceans

The fishery resources of the seas have long been recognized as a sharable resource open to all participants anywhere, except within the

[158] Arbitral Award of November 16, 1957 in the Matter of the Use of the Waters of Lake Lanoux, digested in 53 AM. J. INT'L L. 156 (1959). See also BERBER, *op. cit. supra* note 157, at 162-67.

[159] See, *e.g.*, Wyoming v. Colorado, 286 U.S. 494 (1932); New Jersey v. New York, 283 U.S. 336 (1931); Connecticut v. Massachusetts, 282 U.S. 660 (1931); Wisconsin v. Illinois, 278 U.S. 367 (1929), 281 U.S. 179 (1930); Kansas v. Colorado, 185 U.S. 125 (1902), 206 U.S. 46 (1907); Missouri v. Illinois, 200 U.S. 496 (1905).

[160] *Cf.* BERBER, *op. cit. supra* note 157, at 271; INTERNATIONAL LAW ASS'N, REPORT OF THE FORTY-NINTH CONFERENCE 33-61 (Hamburg 1960); INTERNATIONAL LAW ASS'N, REPORT OF THE FORTY-EIGHTH CONFERENCE 72-101 (New York 1958).

[161] INTERNATIONAL LAW ASS'N, PRINCIPLES OF LAW AND RECOMMENDATIONS ON THE USES OF INTERNATIONAL RIVERS 6 (1958).

internal waters or territorial sea of another state. The factors affecting this predominant decision in favor of inclusivity have been fully outlined elsewhere.[162]

The factor of overriding importance has of course been the reproductive habits and capacity of the fish. Most fish reproduce on such a scale that there is little danger of a biological limit on the yield being reached through over-fishing. Exploitation ordinarily becomes uneconomical long before the existence of a species is endangered. When it is added that most fishery resources are able within a short time to replenish themselves, it becomes obvious that limitations on the number of participants, if any are required, will stem from considerations other than the biological or physical characteristics of the resource.[163]

It is of course possible for fishing to reach a point at which an increase in the number of participants may cause a diminution in benefit to any single participant. This may be compensated for, however, through the adoption of more efficient methods of fishing. Exclusive access, in contrast, although possibly permitting a temporary increase in the yield of one participant, might cause a vast loss in the values of many others, which would far outweigh the gains of the single user of the resource. Any honoring of exclusive access in one participant might lead, further, to similar claims by others and the complete destruction of common enjoyment.

Since the fishery resources of the ocean are so abundant and widely distributed, and since the strategies of the various participants can be made not to interfere with each other, the results of the shared use of the resources have been a production and distribution of values which have far surpassed what would have been possible through exclusive use.

Despite this historic experience, however, one of the factors accounting for recent claims to a wider territorial sea has been the demand of certain states to exclude others from areas off their shores which are rich in fish. This potential encroachment upon shared enjoyment has also been fully discussed elsewhere.[164] We need only mention here that the necessary studies to establish that any participant's value processes would be enhanced through the exclusion of foreign fishermen from neighboring waters, have not been made, while the deprivations to the excluded participants and general community are obvious. The 1960 Conference on the Law of the Sea was unable to reach agreement on this issue. The Canadian-American joint proposal of a six-mile territorial sea and an additional exclusive fishing zone of another six miles

162 McDOUGAL & BURKE 446-564, 923-40.

163 For documentation see *id.* at 478-82.

164 *Id.* at 446-564, 923-40.

failed by one vote to get the required two-thirds majority.[165] Concern about fisheries was, however, but one of a number of factors motivating this decision.

(ii) *Resources Having a Critical Zone*

The principal flow resources having a critical zone which have been held to be non-sharable are agricultural land and soil nutrients, forests, and wild life. Since these resources are found most often permanently within the bounds of some nation-state, no new reasons for exclusivity, beyond what has been said about the allocation of the land masses of the Earth, need be given. Certain types of migratory wild life which cross state boundaries, such as various species of birds, are, however, often protected by international conventions.

The flow resources having a critical zone which have been held to be sharable are the mammal resources of the sea and certain anadromous species of fish. The most important factor leading to inclusive decision has, of course, been the fact that all participants in world social process have inclusive access to the oceans, their natural habitat. An examination of experience in the exploitation of pelagic seals and whales may afford sufficient illustration of the factors affecting decision.

Pelagic Seals[166]

When the prevailing method of taking seals in the open sea threatened the extinction of the herds, the United States attempted, by claiming property in the seals even while in the oceans, to limit hunting to land areas. This would have in effect given the United States and Russia exclusive access, since the mating grounds of the seals were principally upon Russian and American islands. When Great Britain opposed the United States' claim, the dispute was submitted to an arbitration tribunal, which held that the United States had neither the right to prevent other states from hunting seals upon the high seas nor the competence to require them to abide by its unilateral regulations. This decision has commonly been regarded as an authoritative reiteration of the doctrine that the freedom of access to the seas which all people enjoy includes also freedom of access to the animal resources of the sea.

When faced, however, with the possible total extermination of the seal herds, Russia, the United States, Britain (representing Canada), and Japan, the only states which had been active in exploiting this resource, signed in 1911 a treaty whereby the killing of seals was confined to the areas within the control of the various participants.

[165] *Id.* at 540-48.
[166] For fuller account see *id.* at 942-43, 948-50, and sources cited therein.

Under this plan a limited number of males was to be killed each year. Since the great majority of seals would be taken by the United States and Russia, Great Britain and Japan were to receive a share of the animals taken, as well as a sum of money. In 1941, the Japanese withdrew from the agreement, and between 1941 and 1957 sealing was carried on under a bilateral agreement between the United States and Canada. In 1957 a new agreement was, however, signed between the U.S.S.R., the United States, Canada, and Japan, providing for arrangements similar to those of the treaty of 1911. Thus, organized, inclusive use has not only prevented the extinction of the species, but has allowed more economic exploitation.

Whales [167]

Attempts to achieve organized, inclusive use of the whale resources of the oceans, as in the case of other resources, has had two objectives: the preservation of various species, and the maintenance of a profitable level of use. Regulations were at first self-imposed by the private groups hunting the animals, but conventions were eventually signed by interested states in 1931 and 1937. The present Convention of 1946 establishes a total rate of use for all participants combined, allowing each state to take as much as it can until the general limit is reached. The repeated efforts of the principal exploiters to establish national quotas appear to remain unsuccessful.

3. Stock Resources

Since the most important stock resources of the Earth, mineral resources, are most often found as an integral part of land masses located within the territory of nation-states, the same decisions which have made the land masses subject to exclusive appropriation have also embraced these resources. Even within the internal processes of allocation of the nation-state, these resources have, further, been made largely available to exclusive appropriation by individual participants.

The factors which have influenced decisions favoring exclusive appropriation of mineral resources begin with the physical characteristics of such resources and extend through various features of the processes of exploitation. As stock resources, minerals are both limited in quantity and nonrenewable. Supplies are seldom sufficient to meet all demands, and present rates of use diminish future rates. To open a scarce stock of minerals to free access by all participants with capabilities for exploitation might be to invite a mad scramble in which each par-

[167] See *id.* at 943-44, 950-52.

ticipant seeks to grab as much as possible without concern for impact upon others or common interest. The strategies of exploitation of any one participant in such a mad scramble might obviously interfere with those of other participants, creating destructive conflicts. The exploitation of such scarce resources may also on occasion require extensive expenditures of capital, which in turn create a demand for exclusive use in order that participants may be guaranteed a return on their investments. The right to exclusive use has, further, in some instances been required as an important incentive to exploration for the discovery of new supplies of stock resources. Thus, the implementation of general community policy both in the maintenance of minimum order and in the promotion of optimum order has from earliest times been thought to require that the exploitation of the stock resources of the Earth be established through the modalities of exclusive acquisition and control.

The ownership of all minerals under Roman law was originally vested in the owner of the land in which they were contained, but a decree of the Emperor Gratian later made precious metals the property of the state.[168] This system appears to have spread with the civil law throughout Europe, and a similar system was also adopted by England.[169] In some countries, however, all minerals have been made the property of the state.

On the North American continent, with its vast extent of public land, the exclusive right to mine within specified areas has been given to individuals following certain procedures. In many instances where states have granted public land, they have retained the mineral rights for separate granting. In the first years of the California gold rush, law and order were not sufficiently established to permit government officials to regulate the taking of gold, therefore the miners themselves, rather than to allow a situation to remain where everyone had access to take gold anywhere, whatever the interference with others, made their own regulations, which provided for exclusive access to claims, established minimum requirements of exploitation, and outlined the circumstances under which a claim could be considered to be abandoned.[170]

B. Probable Developments and Recommendations With Respect to Space Resources

The present deep schisms in world public order, exhibiting not only the major polar contenders but also various splinter groups, make

[168] See Campbell, *Principles of Mineral Ownership in the Civil Law and Common Law Systems*, 31 TUL. L. REV. 303, 307 (1957); 1 LINDLEY, AMERICAN LAW RELATING TO MINES AND MINERAL LANDS 20 (3d ed. 1914).

[169] Campbell, *supra* note 168.

[170] LINDLEY, *op. cit. supra* note 168, at 72-76. COSTIGAN, AMERICAN MINING LAW 2-8 (1908).

it somewhat improbable that comprehensive international organization will in the near future play an important role in the exploitation and development of space resources. The very tentative projections and recommendations which we here make are, accordingly, based upon the assumption that the nation-state, as the predominant participant in world power processes, will continue for a time to be both a principal disposer and a principal claimant with respect to space resources. We organize our discussion, as in the previous consideration of relevant policies and past trends in decision, about the three main types of probable resources: spatial-extension, flow, and stock.

1. Spatial-Extension Resources

The principal spatial-extension resources now known or anticipated are, as we outlined above, the void of space, the surfaces of celestial bodies, and the contiguous space which surrounds such celestial bodies. The void of space has been the subject matter of Chapter 3, and since like the airspace over the land masses, the contiguous space surrounding celestial bodies will likely be subject to the same degree of sharing as the surfaces beneath, we may safely confine our speculations largely to the surfaces of the celestial bodies.

Like the spatial-extension resources of the Earth, the celestial bodies of space, including even the Moon, are relatively vast in extent, and strategies in use by any one participant are not, therefore, likely seriously to interfere with the strategies of others. An increase in the number of participants can accordingly be expected to bring an increase in production and distribution of values. The extreme difficulties in maintaining exclusive control over vast areas, and the high costs involved in comparison to the benefits achievable, should, further, in space, as on Earth, cause participants to prefer inclusive access.

High expectations of violence could be as important in affecting decision in favor of inclusive access to the celestial bodies as they were in promoting the recent Antarctic settlement. The best method of reserving the celestial bodies for peaceful use would appear to be for all participants to have equal access. Such access would not only eliminate potential areas of dispute but might make unnecessary any elaborate inspection system and remove large barriers to disarmament. Any unique advantages in terms of power which any one participant might be able temporarily to secure by asserting exclusive claims could only stimulate comparable claims by others, increasing the insecurity of all.

Most of the factors influencing decision in favor of exclusive control of the land masses of the Earth would appear to be absent in regard to the celestial bodies. There would appear, on the other hand, striking

similarities in relevant features with Antarctica. Neither Antarctica nor the more immediately accessible celestial bodies have, as far as we know, a permanent population. Both areas are unsuitable for the type of habitation established in the temperate regions of the Earth. From neither area is man likely for some time to be able to extract the basic necessities of life in sufficient quantities; such necessities must be transported great distances at extremely high costs. In both areas, it is probably necessary for man to live within special shelters—in the case of Antarctica for protection against the intense cold, and on the celestial bodies for protection against extremes in temperature and even for purposes of breathing. Research stations and settlements both in Antarctica and on the celestial bodies will therefore likely be few and dispersed through vast expanses for many years to come. In both areas, the extraction of minerals and other riches will probably continue to be technologically difficult, thus increasing the importance of enlightenment as the objective of exploration. With respect to the celestial bodies, as with respect to Antarctica, the spatial-extension quality of the resources is not, therefore, likely to be subordinated in importance to attendant flow or stock resources, and may thus happily escape the exclusive embrace of the territorially organized community.

Inclusive access would also appear both to enhance the total aggregation of base values made available for, and to increase the potential flexibility of their employment in, the exploitation of the spatial-extension resources of the celestial bodies, as of the Earth. The exchange of scientific data clearly could prevent the unnecessary duplication of vast expenditures by different participants. The more important strategies of use would also appear again, as with respect to the spatial-extension resources of the Earth, to be in the main nonconsumable and noncompetitive.

Fortunately, a realistic understanding of these probable features of the process of exploring and exploiting the celestial bodies appears to be widespread among the peoples of the world, and general community perspectives are rapidly crystallizing which insist upon inclusive access and competence. Indeed, it may not be premature to suggest that general community expectations have already crystallized into a consensus that exclusive appropriation would be unlawful and that inclusive access and competence must be maintained.

The best evidence of this emerging consensus may be found in the United National General Assembly Resolution on International Cooperation in the Peaceful Uses of Outer Space, of December 20, 1961. Adopted with the support of the United States and the Soviet Union and without a single dissenting vote, this Resolution specifies: "Outer

space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation." [171]

This resolution was not, however, without anticipation in the consistent utterances of state officials, international officials, and publicists. Thus, Chairman Khrushchev, shortly after the Soviets struck the Moon with their rocket, stated:

> I represent a Socialist country where the word "mine" has long receded in the past and the word "our" has taken its place, and therefore when we launched this rocket and achieved this great thing, we look upon this as our victory, meaning the victory not only of our country but of all countries of all mankind.[172]

On a more recent occasion, Mr. Khrushchev has confirmed this position: "The Soviet Union has no aims of conquest in general and with regard to the moon in particular." [173] Similarly, President Eisenhower in his address to the General Assembly of September 22, 1960 stated: "I propose that: . . . We agree that celestial bodies are not subject to national appropriation by any claims of sovereignty." [174]

The comparable expectations of the officials of other states were clearly expressed at the Thirteenth General Assembly of the United Nations, held at the end of 1958, when this body first discussed the legal problems posed by the exploration of space. Many delegates stated the opinion that outer space should be open for the free use of

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[171] U.N. GEN. ASS. OFF. REC. 16th Sess., Supp. No. 17, at 6 (A/5026) (1961).

[172] N.Y. Times, Sept. 17, 1959, p. 18, col. 6. One day earlier Mr. Khrushchev stated:

> We have no doubt that the excellent scientists, engineers and workers of the United States of America who are engaged in the field of conquering the cosmos will also carry their pennant over to the moon. The Soviet pennant as an old resident, will then welcome your pennant and they will live there together in peace and friendship, and as all people should live who inhabit our common mother earth, who is so generous to us all with her gifts.

N.Y. Times, Sept. 16, 1959, p. 18, col. 4.

These statements have been taken by Soviet publicists as a recognition by their government that celestial bodies are not subject to unilateral appropriation. See Romashkin, *Technical Progress and Soviet Law*, SOVIET STATE AND LAW 14, 24 (Jan. 1960); Korovin, *Peaceful Co-operation in Space*, INT'L AFFAIRS 61, 63 (March 1962). See also *Conquest of Outer Space and Some Problems of International Relations*, 1961 SYMPOSIUM 1072, 1073-75, originally published in INT'L AFFAIRS 88 (Nov. 1959).

[173] *Interview of Chairman of USSR Council of Ministers Nikita S. Khrushchev With Gardner Cowles, Editor of Look Magazine*, April 20, 1962, USSR Magazine, Supp., May 1962. Further indication of the Soviet position can be found in the USSR Proposal of a "Declaration of the Basic Principles governing the Activities of States pertaining to the Exploration and Use of Outer Space," submitted to the United Nations on June 6, 1962, which states *inter alia*: "2. Outer space and celestial bodies are free for exploration and use by all States; no State may claim sovereignty over outer space and celestial bodies. 3. All States have equal rights to explore and use outer space." U.N. GEN. ASS. (A/AC. 105/C.2/L.1).

[174] 1961 SYMPOSIUM 1009.

everyone, and made no distinction between the void of space and celestial bodies.[175] Some, however, referred specifically to the problem of whether the celestial bodies should be subject to inclusive use or exclusive acquisition. Thus, Professor Ambrosini, the Italian representative, suggested that:

> In this sense our opinion differs from that which considers outer space as *res nullius*. We are opposed to this principle, for it would permit States to claim portions of outer space with whatever satellites, such as the Moon, may be found therein, on a basis of permanent title and sovereign powers.[176]

The United Nations *Ad Hoc* Committee on the Peaceful Uses of Outer Space cautioned in its report that "serious problems could arise if States claimed, on one ground or another, exclusive rights over all or part of a celestial body." [177] The Committee then noted the various alternatives suggested to it, all of which embodied some form of inclusivity.

For illustration from utterances by international officials, the late Secretary General of the U.N., Mr. Hammarskjold, in an address in May of 1958 stated:

> It would be my hope that the General Assembly as a result of its consideration, would find the way to an agreement on a basic rule that outer space, and the celestial bodies therein, are not considered as capable of appropriation by any state.[178]

Sir Leslie Knox Munro, President of the Twelfth Session of the General Assembly expressed the general expectations in these words: "I do not think that any state, within the ambit of the world's present laws,

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[175] See Chapter 3 of the forthcoming book of which this Article is a chapter.

[176] U.N. GEN. ASS. OFF. REC. 13th Sess., 1st Comm. 56 (A/C.1/PV.982) (1958). Similar suggestions were also made by El Salvador, *id.* at 23-25 (A/C.1/PV.992), and Mexico, *id.* at 8-10 (A/C.1/PV.994). Mr. Schurmann of the Netherlands maintained that "there are, however, certain rules of international law that are based on notions and concepts which have no significance in outer space. To this class belong the rules concerning territory, sovereignty and occupation." *Id.* at 6 (A/C.1/PV.987). Mr. Walker of Australia also voiced the opinion that the body of legal rules allowing a state to acquire unoccupied territory was inapplicable in regard to celestial bodies. *Id.* at 53 (A/C.1/PV.986). Mr. Pinochet of Chile, after raising the problem of whether the Moon and other planets be declared common property or capable of being acquired by states, suggested that, "A logical step would be to hand over the control of outer space either to a body of the United Nations or to a body linked with the United Nations." *Id.* at 42 (A/C.1/PV.982). Cuba recommended that a resolution be passed prohibiting any state from laying territorial claims to celestial bodies. *Id.* at 7 (A/C.1/PV.988). A similar proposal was later made by Canada. U.N. GEN. ASS. OFF. REC. 14th Sess., 1st Comm. 289 (A/C.1/SR.1080) (1959).

[177] U.N. GEN. ASS. OFF. REC. 14th Sess., Agenda Item No. 25, at 25 (A/4141) (1959).

[178] Hammarskjold, *The United Nations and Outer Space*, 1961 SYMPOSIUM 263.

could lay claim to sovereignty over the moon or over any planet." [179] Among private organizations of lawyers, not one of those which have taken a stand on problems of space law has so much as suggested that celestial bodies be anything but freely open to inclusive enjoyment of all. The International Law Association, for example, unanimously adopted a resolution which affirms that outer space, including the celestial bodies, may not be subject to exclusive acquisition by any state.[180] Similarly, the American Bar Association recommended to the United States Government that it conduct its activities affecting outer space in accordance with certain principles, one being that "celestial bodies should not be subject to exclusive appropriation." [181]

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[179] Munro, *Law for the "Heav'n's Pathless Way,"* 1961 SYMPOSIUM 216. Mr. Oscar Schachter recommended as early as 1952 that outer space, including celestial bodies, be open to mankind, and drew a comparison with sedentary fisheries in the high seas where pearl, oyster, sponge beds, and coral deposits are the property of the state which has effectively used and exploited them; so in like manner, every state would have the freedom of travel and investigation on celestial bodies, but would be allowed exclusively to exploit mineral deposits discovered by it. See Schachter, *Who Owns the Universe?*, 1958 SYMPOSIUM 8, 11-12. Mr. C. W. Jenks, the Deputy Director of the ILO urged that the principle clearly be enunciated that claims to exclusive access or use of any extra-terrestial place or resource will not be recognized, and suggested that the enjoyment of celestial bodies proceed in three differing institutional stages: first a period of exploration where no unilateral claims are permitted; second, a period of cooperation under arrangements similar to those of the Antarctic Treaty; and third, control by the United Nations. Jenks, *The International Control of Outer Space*, 1961 SYMPOSIUM 734, 745-48; JENKS, THE COMMON LAW OF MANKIND 405 (1958).

[180] *Resolution Concerning Air Sovereignty and the Legal Status of Outer Space* § 3, in INTERNATIONAL LAW ASS'N, REPORT OF THE FORTY-NINTH CONFERENCE at xx (Hamburg 1960), reprented in 1961 SYMPOSIUM 679.

[181] *Report of the Committee on Law of Outer Space—Recommendations: 1959*, 1961 SYMPOSIUM 571, 572. These views are shared by a vast majority of the commentators. Thus Judge Jessup recommended that agreement be reached that planets are not subject to national claims. Jessup, *The International Opportunity*, in SCIENCE AND RESOURCES 228, 235 (Jarrett ed. 1959). Professor J. C. Cooper has advocated an international agreement declaring that no state can have sovereignty over any area of outer space including celestial bodies. Cooper, *Fundamental Questions of Outer Space Law*, 1961 SYMPOSIUM 764, 768. Professors Lipson and Katzenbach speak of celestial bodies as sharable assets of the whole community. LIPSON & KATZENBACH 20. In similar vein speak Hildred and Tymms, *The Case Against National Sovereignty in Space*, 1961 SYMPOSIUM 264, 268; CHAUMONT, LE DROIT DE L'ESPACE 116 (1960); Smirnoff, *The Role of IAF in the Elaboration of the Norms of Future Space Law*, 1961 SYMPOSIUM 642, 647; SEARA VAZQUEZ, INTRODUCCION AL DERECHO INTERNACIONAL COSMICO 125-26 (1961). For somewhat different views see Cheng, *Problems of Space Law*, 1961 SYMPOSIUM 666, 668; Jacobini, *Effective Control as Related to the Extension of Sovereignty in Space*, 7 J. PUB. L. 97 (1958); 1 SCHWARZENBERGER, A MANUAL OF INTERNATIONAL LAW 111 (4th ed. 1960).

The leading Soviet publicists, like most of their Western counterparts, oppose the making of claims to exclusive access to celestial bodies. Such writers as Professors Korovin, Zadorozhny, and Osnitskaya clearly miply that territorial claims may not be made to the Moon and other planets, and accuse the Americans of thinking otherwise. See Korovin, *Peaceful Co-operation in Space*, INT'L AFFAIRS 61 (March 1962); *Conquest of Outer Space and Some Problems of International Relations*, 1961 SYMPOSIUM 1072, 1073; Osnitskaya, *International Law Problems of the Conquest of Space*, 1961 SYMPOSIUM 1088, 1094. For a summary statement see STAFF OF SENATE COMM. ON AERONAUTICAL AND SPACE SCIENCES, 87TH CONG., 2D SESS., SOVIET SPACE PROGRAM; ORGANIZATION, PLANS, GOALS, AND INTERNATIONAL IMPLICATIONS 205-07 (Comm. Print 1962).

2. Flow Resources

The principal known or anticipated flow resources of space not significantly affected by human action are, as previously noted, the cosmic rays and other space radiations, meteorites, asteroids, and the atmospheres of celestial bodies. Like the flow resources of the Earth, these resources are vast in extent and limitless in quantity. The addition of new participants in their exploitation would only add to the total quantity of values produced, without adversely affecting any participant. Similarly, all these resources, except possibly gravitational and magnetic forces and atmospheres of celestial bodies, will be available in many different locations in space. Thus they can be conveniently enjoyed by all who acquire the necessary capabilities. The resources excepted from this generalization, since they are so closely related to the celestial bodies, will be available to all having access to these bodies.

Any attempt to establish exclusive appropriation of any of these flow resources of space, even if technologically possible, would be pointless. These resources, because of their special characteristics, remain equally sharable, whether the amount of base values required for enjoyment is large or small. The strategies by which they can be exploited will, further, probably be principally noncompetitive; even though some strategies with respect to some resources may be consumable, amounts consumed will always be replaced by the flow. Common interest would again appear to require, therefore, that these resources be held open for inclusive enjoyment by all.

The enjoyment, technologically, of these flow resources not significantly affected by human action, is so inextricably interrelated with access to the void of space and to the celestial bodies, that it would appear that the consensus which now establishes inclusive enjoyment and competence for the void and the celestial bodies might reasonably be regarded as also comprehending these attendant resources.

The flow resources of space, capable of being affected by human action but not having a critical zone, will include perhaps both sources of vital materials, such as the ice caps of Mars, and any widely and abundantly distributed forms of life having a high rate of reproductivity. Where the flow of such resources is more than sufficient to meet the needs of all participants who have or are likely to have space capabilities, as is the case with ocean fish, the greatest production and widest distribution of values can obviously be produced through shared enjoyment. Exclusive acquisition by one or a few participants could only mean that much of the flow would be wasted. Where, further,

because of physical, utilizational and engineering imperatives, there must be close interrelations and interdependences in the activities of different participants, as may, for example, be the case in exploitation of the ice caps of Mars, past experience in the management of international rivers would appear to document that both minimum and optimum order can best be achieved through inclusive use. If the celestial bodies which these unique resources attend are not to be regarded as subject to exclusive appropriation, no good reason would appear why participants should not recognize and implement their common interest in maintaining inclusive access to these resources.

Flow resources having a critical zone will perhaps include any forms of life, whether plant or animal, whose reproductivity does not swiftly replace quantities which are used. The major concern in the maximization of values from these resources may, therefore, be that of conservation, in even the limited sense of physical renewal. Conservation could of course, after the fashion of the Earth arena, be exclusively administered if such resources come to be contained within the confines of a single nation-state. Since, however, it is commonly expected that such exclusive enjoyment will not be established on the celestial bodies, conservation will probably best be carried out through organized inclusive use, similar to that presently projected for preservation of the mammal resources of the sea. If the forms of life on the celestial bodies prove to be sparse, their value in the enlightenment process will obviously be immense; the common interest of mankind would appear clearly to dictate that such resources be safeguarded by organized inclusive use.

3. Stock Resources

The principal stock resources of space will likely be the minerals found on celestial bodies. Where such minerals are abundant, that is, in a relatively inexhaustible supply, there would appear to be little to gain by subjecting them to exclusive acquisition. If their enjoyment is made sharable, an increase in participants would, as is the case with most other such resources, increase productivity and sharing of benefits without adversely affecting the value processes of other participants. If the stock resource is scarce and of strategic importance, then the resource might be shared by all participants, with equitable limits being placed upon the amount of use by each. The total exclusion of any single participant might have a serious adverse effect on its value processes. If however, the resource is scarce but not strategic, then exclusive acquisition might cause no injury to the interests of other participants. Sound policy reasons might warrant exclusive acquisi-

tion, further, when it would encourage exploration and exploitation. Thus, when private investment is necessary, exclusive rights might stimulate the provision of funds. In such instances, however, common interest might require that all states be accorded inclusive access to acquire exclusive use of quantities of stock resources. Strict regulations might also be imposed upon modes of establishing exclusive use, with both limits upon amount and controls upon methods of exploitation. Exclusive access to the stock resources ought not, in particular, to be allowed seriously to interfere with inclusive access to any area of a spatial-extension resource, especially for such uses as enlightenment.

V. Claims Relating to the Modalities of Establishing Exclusive Appropriation

Our anticipations of probable future decisions about whether space resources are to be made subject to inclusive or exclusive enjoyment and competence have quite obviously left a very small scope for potential claims relating to the modes of establishing original acquisition. It may be recalled that we have found the expectations widespread that all the spatial-extension resources and most of the various categories of flow resources will be held open for the inclusive enjoyment, both unorganized and organized, of all who achieve the necessary capabilities. In terms of these expectations, the only resources which may stimulate controversies about the appropriate modalities of original exclusive acquisition are the scarce, non-strategic stock resources, such as minerals, which may be found upon the celestial bodies.

It is possible, however, that our anticipations may be ill-founded and that other resources may be held subject to exclusive appropriation. Though the flow resources not affected by human conduct, which are found mostly within the void, are not likely—because of the virtual impossibility of excluding other participants—even to be claimed for exclusive appropriation, the resources of various types to be found upon the celestial bodies may create more difficulties for community decision. The outcomes in decision with respect to the surfaces, the spatial-extension resources, of such bodies may be crucial for decision about other types of resources. Experience in the allocation of the resources of the Earth suggests, as we have seen, that if the surfaces are made subject to exclusive enjoyment and competence, the same decision is likely to be taken with respect to the spaces immediately above and the various more material resources upon or below such surfaces.

The assumption upon which we must proceed is, accordingly, that the general community may tolerate, even honor, the exclusive appro-

priation of a considerable variety of important resources. The only special burden which this potential variety in the resources which may be made available for exclusive appropriation imposes upon our inquiry is, however, that of systematically and carefully noting what differences the varying characteristics of the different resources may have for community policies about the modalities of acquisition. It may safely be anticipated that the overriding general community policies relating to minimum and optimum order, outlined above, will largely transcend such varying characteristics of the different resources.

The two main bodies of experience upon which we may draw in the more detailed clarification of general community policies in relation to probable controversies about space resources include, first, the experience of the general community in the allocation of the major land masses of the world among different peoples, and, secondly, the experience within particular states in the allocation of mineral resources among individual claimants.

A. Experience in the Allocation of the Land Masses of the Earth

The relevant general community experience in the allocation of major land masses has its origins of course largely in the dawn of the Age of Discovery, since prior to that time the more important known lands were already inhabited by peoples with varying capabilities in defense, and general community expectation was more concerned with derivative than original acquisition. This experience extends beyond the historic parcelling out of the North and South American continents and Australia, among European claimants and the division of Africa amongst the colonial powers, to the more recent controversies about the regime of the polar areas and various oceanic islands.

From the beginning of the Age of Discovery to the present, the claims by states to establish exclusive right to particular land masses, regarded as open to appropriation, have been based upon many different factors in social process and supported by varying policy justifications. Some of the earliest claims, especially by Spain and Portugal, were based upon Papal grants[182] and upon mere discovery and symbolic

[182] According to Von der Heydte, the Papal Bulls forming the basis of the so called "Papal Grants," were never intended to be grants of territories but, instead "only legalized, recognized, sanctioned *ex post facto* territorial sovereignty which already existed in fact, or . . . gave assent, and thereby legal sanction *ex ante* to an intended occupancy, to a condition anticipated in the future." Von der Heydte, *Discovery, Symbolic Annexation and Virtual Effectiveness in International Law*, 29 AM. J. INT'L L. 448, 451 (1935). The content of the Papal Bulls seems to indicate that their primary purpose was the furtherance of the Christianization of the inhabitants of the new lands. Since this would not be possible without effective occupation, it is clear that it was understood that effective occupation was to follow. In any case, whether the original purpose of the Bulls was a grant of title to land, the

acts expressing an intent to appropriate. Later claims, especially by states opposing the early claims of Spain and Portugal, emphasized a more effective occupation, the proximity of lands claimed to other lands under effective control of the claimant, and the duration of effective control.[183] In an era in which ecclesiastical sanctions were rapidly losing their influence upon secular affairs and the organization of the most comprehensive arena by secular sanctions was still most primitive, it should not be surprising that claims based upon Papal grant or upon mere discovery and symbolic expression of intent to appropriate declined in importance. The claims by states first establishing effective occupation and use came to be regarded—in the light of a more general experience alleged to antedate even secular notions of law—as comporting more closely to general community policies about the maintenance of minimum order and the promotion of the optimum utilization of resources. Claims based upon justification in terms of the physical proximity or contiguity of lands and of the temporal duration of control or interest came also to be seen as mere adjuncts to the more comprehensive claim in terms of effective occupation and use.

It has, thus, for some centuries been as established in the law between states, as in the internal law of most mature territorial communities, that the effective occupation and use of an unappropriated resource, subject to appropriation, will suffice as a mode for the original acquisition of that resource.[184] The only genuine areas of dispute have been: first, whether anything less than effective occupation and use will suffice; and, secondly, what kinds of acts and degrees of activity are required for effective occupation and use. For convenience, we will explore these two continuing questions under the traditional headings of claims to establish exclusive appropriation on the basis of discovery and symbolic acts, and of claims to establish exclusive appropriation on the basis of effective occupation. In examining experience with respect to the latter claim, we will consider effective occupation and use as a comprehensive social process, often commencing with discovery and symbolic annexation, but being followed by actual use and enjoyment of the resource, and culminating in effective control for the exclusion of others and the display of governmental activities commonly regarded as characteristic of a state. What has been held to amount to effective

grant of an inchoate title to be perfected later through occupation, or merely a charge to convert the pagan, they were recognized only by Spain and Portugal. Although they formed the basis for the settlement of some disputes between these two states, they never became a part of the authoritative expectations of the European Community as a whole. *Cf.* HILL, CLAIMS TO TERRITORY IN INTERNATIONAL LAW AND RELATIONS 145-46 (1945).

183 See generally 1 OPPENHEIM, INTERNATIONAL LAW 555-63 (1955); HILL, *op. cit. supra* note 182, at 146-54.

184 HILL, *op. cit. supra* note 182, at 146-47.

occupation will be seen to vary with different features of the process of interaction, including especially the unique characteristics of the land mass claimed. Proximity and the duration of control will, from this perspective, not be treated as separate claims, but rather as important features in the process of interaction relevant to the claim of effective occupation and use.

1. Claims To Establish Exclusive Appropriation on the Basis of Discovery and Symbolic Acts

Discovery has sometimes been regarded as the mere sighting or visual apprehension of land masses. When discovery is so conceived, claims have seldom been made that it alone can effect an exclusive appropriation.[185] Claims have been made, however, that such discovery entitles a claimant to a reasonable time in which to establish exclusive use by some other modality. Most often, the discovery upon which claims to exclusive appropriation have been based has been accompanied by other acts, such as the landing of men followed by exploration of the interior, and especially by certain symbolic acts designed to announce an intention to appropriate. These symbolic acts may range from simple ceremonies, such as the planting of a flag or standard with an accompanying proclamation, to elaborate rituals.[186] Since some symbolic acts of this kind have nearly always accompanied discovery, the two features are often treated together as one unit of activity in grounding claims, and in some cases publicists have used the word "discovery" in comprehensive reference both to the bare fact of sighting land and to the accompanying symbolic acts.

One of the first countries to employ symbolic activities in aid of discovery, for announcing intent to appropriate, was Portugal. In 1481 Don Diego d'Azambija, as reported in an authoritative study,[187] made a discovery on the Guinea Coast and formally claimed to take possession in the name of Portugal by displaying the royal arms upon a tree, and building an altar underneath for the celebration of mass. Three years later, Diego Caon set up pillars of stone, bearing the Portugese royal arms, along the Congo River; and Vasco da Gama on his voyage to India erected a cross and a marble pillar bearing his sovereign's arms, near the Cape.[188] As the representative of Spain, Columbus purported to take possession of certain islands in the West Indies by a public

185 KELLER, LISSITZYN & MANN, CREATION OF RIGHTS OF SOVEREIGNTY THROUGH SYMBOLIC ACTS, 1400-1800, at 148 (1938); Von der Heydte, *supra* note 182, at 452.

186 For description of the various types of such ceremonies and rituals, see KELLER, LISSITZYN & MANN, *op. cit. supra* note 185.

187 *Id.* at 24. The facts which follow are summarized from this source.

188 *Ibid.*

proclamation and the planting of banners, and the Spanish explorers after him followed similar practices.[189] The Spanish sometimes engaged in the practice of having a notary make a record of the activities undertaken, with this record being signed by witnesses.[190] These ceremonies were common as late as in the latter half of the eighteenth century—as illustrated by the Spanish in claiming to take possession of the Easter Island,[191] and by Captain Cook, in claiming to take possession on behalf of Great Britain of the various places he discovered in the Pacific.[192]

From the inception of these practices in the symbolic assertion of intent to appropriate, the claim was made that they were of themselves sufficient to establish exclusive, original acquisition. This claim was, however, often met by countering assertions that symbolic acts alone were not sufficient and that effective occupation was necessary to establish exclusive right. The same state not infrequently asserted in different contexts both this claim and counterclaim—demanding in one context that exclusive right be accorded it upon the basis of symbolic activities, while in other contexts insisting that actual occupation was necessary to found the comparable claims of other states.[193]

The legal consequences which were in fact in early times attached to discovery and symbolic annexation are still a matter of dispute. Professor Goebel, for example, maintains that discovery and symbolic annexation alone were never recognized as giving right to permanent exclusive appropriation.[194] In his view, from an early date states accepted the principle, built upon the analogy of the Roman private law concept of *occupatio* for establishing ownership of a *res nullius,* that effective control was the only means by which unappropriated land masses could be exclusively acquired.[195] He explains the function of symbolic annexation as follows:

> The significance of this was purely feudal; it was the formal entry of the common law—the seisin without which a title was invalid in feudal law. But the seisin, of course, had significance only as an act where a derivative title was conferred. It had no importance as a means of original acquisition of title. Certainly, therefore, in international relations where various states might claim as original occupiers, a temporary entry was a mere formality and was inapplicable to a situation which

189 *Id.* at 33-48.

190 *Id.* at 37.

191 *Id.* at 43.

192 *Id.* at 88-99.

193 Von der Heydte, *supra* note 182, at 452; 1 HYDE, INTERNATIONAL LAW 326-30 (2d ed. 1945).

194 GOEBEL, THE STRUGGLE FOR THE FALKLAND ISLANDS 47-119 (1927).

195 *Id.* at 70-72.

> called for continuous and uninterrupted exercise of control over land. The formal taking of possession, therefore, was an attempt to apply a feudal custom to effect a result that would be internationally recognized. The attempt failed because the rules that creep into international law must bear an obvious relation to fact, the law being intolerant of theories that have no relation to realities.[196]

From such perspectives, the utmost consequence which symbolic annexation might have would be that of creating an "inchoate title," which would lapse unless followed within a reasonable time by effective occupation.[197] In a later magisterial review of practice and commentators, Professor von der Heydte, though somewhat equivocal at points, appears to come to the conclusion that this was indeed the only consequence of symbolic acts.[198] Keller, Lissitzyn, and Mann, on the other hand, affirm that symbolic acts alone, without supplementation by further acts of "effective occupation," were regarded as sufficient immediately to establish sovereignty.[199]

The more realistic interpretation of the historic practice reviewed by the contending authors would appear to support the view that, in their genuine shared expectations about required reciprocal conduct as contrasted with their occasional unilateral demands for special privilege, states did not regard the performance of symbolic acts alone as being sufficient to establish abiding exclusive appropriation of large land masses.[200] Certainly, the evidence is written large that states seldom regarded themselves as under legal obligation to refrain from entering and occupying lands which had previously been symbolically claimed by others, without accompanying actual occupation and use.[201]

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196 *Id.* at 94-95.

197 Thus, for example, the celebrated decision of the United States Supreme Court in Johnson v. McIntosh, 21 U.S. (8 Wheat.) 543, 573 (1823).

198 Von der Heydte, *supra* note 182.

199 These authors conclude their historic analysis with the assertion that

> the formal ceremony of taking possession, the symbolic act, was generally regarded as being wholly sufficient *per se* to establish immediately a right of sovereignty over, or a valid title to, areas so claimed and did not require to be supplemented by the performance of other acts, such as, for example, "effective occupation." A right or title so acquired and established was deemed good against all subsequent claims set up in opposition thereto *unless*, perhaps, transferred by conquest or treaty, relinquished, abandoned, or *successfully opposed by continued occupation on the part of some other state.*

KELLER, LISSITZYN & MANN, *op. cit. supra* note 185, at 148-49. (Emphasis added.) The italicized qualification would appear to raise some doubt about the soundness of the more general conclusion. See also 1 HYDE, *op. cit. supra* note 193, at 324-26, for views comparable to those of Keller, Lissitzyn and Mann.

200 *Cf.* LINDLEY, THE ACQUISITION AND GOVERNMENT OF BACKWARD TERRITORY IN INTERNATIONAL LAW 136-38 (1926); HILL, *op. cit. supra* note 182, at 146; Waldock, *Disputed Sovereignty in the Falkland Islands Dependencies*, 25 BRIT. YB. INT'L L. 311, 324 (1948).

201 1 OPPENHEIM, INTERNATIONAL LAW 558-59 (1955).

The royal patents and licenses issued in the early period of discovery to explorers appear to confirm the view that symbolic annexation was not even regarded by the monarchs issuing such patents and licenses as in itself providing a safe basis for exclusive title. Thus, for example, the patents issued to Columbus in 1493 urge him to "conquer," "master and hold" the lands which he had discovered, and to convert the natives to Christianity, which strongly indicates that in addition to discovery further action was considered necessary to complete a title to these areas.[202] Columbus is said to have in fact left a number of his men on the island of Hispaniola.[203] The practice of other principal exploring countries was comparable to that of Spain. Thus the instructions of Henry VII of England to Cabot authorized him, "to seeke out, discouer, and finde, whatsoeuer iles, countreyes, regions or prouinces, of the heathen and infidelles, whatsoeuer they bee, and in what part of the worlde soeuer they be, whiche before this time haue been vnknowen to all Christians," and "to set up our banners and ensignes in euery village, towne, castel, yle, or maine lande, of them newely founde," and to *"subdue, occupie and possesse"* the areas, "as our vassailes and lieutenantes, getting vnto vs the rule, title and jurisdiction of the same." [204] The "Charter of the Academy" of King Henry IV of France gave instructions "to make discoveries and to *exercise the royal power* over the regions between 40° and 46°." [205] The various patents of this period also gave instructions to refrain from entering countries "which already are in the possession of" foreign princes.[206]

In general, Spain and Portugal, who originated symbolic annexation of vast areas, relied more upon this basis for their claims, than did the later arrivals, such as France and England, who tended to insist that only effective occupation could establish title. In response to a complaint by Mendoza, the Spanish Ambassador to England, that the English were entering upon lands belonging to Spain, Queen Elizabeth made her famous answer that, "she would not persuade herself that [the Indies] are the rightful property of [Spain] . . . only on the ground that the Spaniards have touched here and there, have erected shelters, have given names to a river or promontory: acts which cannot confer property. So that . . . this imaginary proprietorship ought not to hinder other princes from carrying on commerce in these

202 GOEBEL, *op. cit. supra* note 194, at 89-91.

203 *Id.* at 90.

204 1 HYDE, *op. cit. supra* note 193, at 322 n.5. (Emphasis added.) GOEBEL, *op. cit. supra* note 194, observes that the language of John Cabot's patent is "strikingly" similar to that found in the patent of Columbus.

205 Von der Heydte, *supra* note 182, at 454. (Emphasis added.)

206 *Id.* at 455. See also GOEBEL, *op. cit. supra* note 194, at 58.

regions and from establishing colonies where Spaniards are not residing, without the least violation of the law of nations . . . ." [207] Since Spain claimed to monopolize access to its territories, it is significant, as Davenport summarizes, that from 1555 Englishmen maintained that they "had a right to visit such parts of the Indies as were not actually held by Spain . . . ." [208] The instructions to English commissioners of May 22/June 1, 1604 state accordingly:

> . . . wee are contented to prohibite all repaire of our subjects to any places where they are planted, but onely to seeke their traffique by their owne discoveries in other places, whereof there are so infinite dymensions of vast and great territories as themselves have no kind of interest, but do trade with divers great kings of those countryes but as forrayners and strangers, from which to barre ourselves by accord, seeing it is not in his power [the Spanish King] to do it by force . . . were both an unkindnesse and an indignitie to be offered.[209]

The most important evidence that symbolic annexation alone was not considered to give sovereignty over territory would appear to be this fact that states did not regard themselves as under an obligation to refrain from occupying and claiming areas which they knew previously to have been symbolically annexed by others. Thus England, France, and the Netherlands, despite Spanish and Portuguese protests, consistently occupied and traded with areas which had been symbolically annexed by the Spaniards and Portuguese; and the United States later took effective occupation of areas which had been symbolically annexed by the Spanish, French, and English.

The sequence of claims to Spitsbergen affords further illustration of common expectation.[210] The archipelago was first discovered in 1596 by the Dutchman, Willem Barents. James Poole, in the employ of the Muscovy Company of England, erected a cross on West Spitsbergen Island in 1610. In 1613 the English Captain Baffin, while on a voyage to Greenland, set up signs exhibiting the arms of the English monarch at several points on the island. The English for some time afterwards exercised a strict control over foreign vessels coming into the vicinity. In 1614 the English expedition of Benjamin Joseph symbolically annexed the area and tore down signs earlier erected by the

[207] 2 CAMDEN, ANNALES RERUM ANGLICAE ET HIBERNIAE 359-60 (1717), quoted in GOEBEL, *op. cit. supra* note 194, at 63.

[208] DAVENPORT, EUROPEAN TREATIES BEARING ON THE HISTORY OF THE UNITED STATES AND ITS DEPENDENCIES TO 1648, at 5 (1917).

[209] *Id.* at 247 n.4.

[210] The account which follows is summarized from KELLER, LISSITZYN & MANN, *op. cit. supra* note 185, at 78-84.

Dutch. Neither power occupied the islands and despite later activities by Danes, French, and Norwegians, the area was considered *terra nullius* until 1920, at which time the victorious allies agreed that Norway should occupy the island.

The case of Australia also illustrates that the symbolic annexation of *terra nullius* without effective occupation was not commonly regarded as establishing permanent acquisition. Australia appears to have been discovered in 1616 by the Dutch ship, *Eendragt,* whose landing party set up a post with a pewter plate.[211] After this first landing, visits by the Dutch were not infrequent, and the area became known as New Holland. The Dutch explorer, Tasman, who was in the employ of the Dutch East India Company, carried out extensive exploration of the Australian coast under instructions that read, "You are to take possession everywhere . . . by means of posts and plates, and declare an intention . . . to *establish a colony.*" [212] When the area was found to be unprofitable for trade, the Dutch lost interest and failed to establish effective possession. Britain took no real interest in the continent until 1770 when Cook explored the coastal regions and purported symbolically to annex certain territory, including some which had been earlier annexed by the Dutch in the same manner.[213] The English began uncontested effective occupation of Australia in 1788, with the establishment of a penal colony at Sydney.[214]

Whether these examples are explained upon the ground that symbolic annexation alone was not regarded as sufficient for exclusive appropriation, or upon the ground that if after a period of time land which had been symbolically annexed was not effectively occupied, it was regarded as having been abandoned, the outcome in decision is the same. Vattel, writing in the middle of the eighteenth century, long before experience in Africa had crystallized more contemporary perspectives, offers comprehensive summary of the expectations of his time:

> All men have an equal right to things which have not yet come into the possession of anyone, and these things belong to the person who first takes possession. When therefore, a Nation finds a country uninhabited and without an owner, it may lawfully take possession of it, and after it has given sufficient signs of its intention in this respect, it may not be deprived of it by another Nation. In this way navigators setting out upon voyages of discovery and bearing with them a commission from their sovereign, when coming across

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211 SCOTT, AUSTRALIAN DISCOVERY BY SEA, at xviii-xix (1929). According to JOSE, HISTORY OF AUSTRALASIA (1909), cited in Von der Heydte, *supra* note 182, at 461, the Portuguese should be credited with the discovery of Australia.

212 Von der Heydte, *supra* note 182, at 460.

213 *Id.* at 461. Copious extracts from Cook's diary describing this expedition can be found in SCOTT, *op. cit. supra* note 211, at 142-230.

214 SCOTT, A SHORT HISTORY OF AUSTRALIA 38-50 (1916).

> islands or other uninhabited lands, have taken possession of them in the name of their Nation; and this title has usually been respected, provided actual possession has followed shortly after.
>
> But it is questioned whether a Nation can thus appropriate, by the mere act of taking possession, lands which it does not really occupy, and which are more extensive than it can inhabit or cultivate. It is not difficult to decide that such a claim would be absolutely contrary to the natural law, and would conflict with the designs of nature, which destines the earth for the needs of all mankind, and only confers upon individual Nations the right to appropriate territory so far as they can make use of it, and not merely to hold it against others who may wish to profit by it. Hence the Law of Nations will only recognize the *ownership* and *sovereignty* of a Nation over unoccupied lands when the Nation is in actual occupation of them, when it forms a settlement upon them, or makes some actual use of them. In fact, when explorers have discovered uninhabited lands through which the explorers of other Nations had passed, leaving some sign of their having taken possession, they have no more troubled themselves over such empty forms than over the regulations of Popes, who divided a large part of the world between the crowns of Castile and Portugal.[215]

In more modern times, after the discovery of all the major land areas of the globe and a significant increase in the number of states capable of exploiting new lands, an even enhanced emphasis has of course come to be placed upon the necessity for effective occupation to establish exclusive claim. Thus, when in the last century disputes began to arise over the division of Africa and an international conference was called in 1884 at Berlin for agreement upon principles, it was apparently understood by all parties, as we will develop below, that effective control and occupation was an essential condition for the acquisition of territory within the area in controversy.[216]

It is not to be assumed, however, that symbolic annexation, though regarded as insufficient in most contexts to establish exclusive appropriation, has been entirely and always without legal consequences. Thus, in the Oregon controversy between Great Britain and the United States, the sovereignty of a large area of the northwest between the Rocky Mountains and the Pacific was the subject of a dispute which lasted from 1818 to 1845.[217] Britain based her claim on a voyage of

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[215] 1 VATTEL, THE LAW OF NATIONS OR THE PRINCIPLES OF NATURAL LAW §§ 207-08 (Fenwick transl.), in 3 CLASSICS OF INTERNATIONAL LAW 84-85 (1916).

[216] See pp. 622-24 *infra* for full development of this point.

[217] The ensuing factual description is from LINDLEY, *op. cit. supra* note 200, at 132-35. For a more detailed account of the dispute see 1 MOORE, HISTORY AND DIGEST OF INTERNATIONAL ARBITRATIONS 196-213 (1898).

Drake along the coast, during which he had made a formal claim in her behalf to the territory, certain voyages of Captain Cook, and the establishment of posts by the British North-West Company. She also placed reliance upon the voyage of Lieutenant Broughton who in 1792 navigated up the Columbia River for 100 miles and claimed possession of the area in the name of Great Britain. The United States based its claim upon a voyage by an American private trader, Gray, up the river just previous to that of Broughton, and on the Lewis and Clarke exploration of 1805-06. During the dispute, both countries were in agreement that mere discovery was not sufficient for establishing exclusive right and that other acts were necessary. The dispute was finally settled in 1846 by compromise, with the boundary being drawn along the 49th parallel. The relevance of the different acts of symbolic annexation invoked in this case, as precarious as it was, obviously derived from the fact that neither claimant had made effective occupation.

The more recent controversies in which claims have been based upon symbolic annexation have related principally to small and uninhabited, or sparsely inhabited, islands. In some of these controversies, especially in contexts in which the state asserting symbolic annexation has over a long period of time been the only state exhibiting any interest in the island, symbolic annexation appears to have had important influence upon community decision. In other instances, however, in which claims based upon symbolic annexation have had to compete with claims based upon actual occupation and use, symbolic annexation has come off decidedly second best.

Thus, in the *Caroline and Palaos Islands* case,[218] symbolic annexation was protected in the absence of a contesting claim based upon actual occupation. The dispute between Spain and Germany over the possession of the islands was submitted for arbitration to Pope Leo XIII. Spain claimed the islands on the basis of discovery in the 16th century and of certain acts carried out for the benefit of the natives. Germany sought to occupy the islands in 1884, claiming that they were *terra nullius*, since Spain had not taken effective possession as required by the custom of nations and the Berlin Conference. The Pope was unable to find that Spain had taken effective occupation according to the standards of the Berlin Conference, but he did not conclude that Spain had lost the rights which discovery and the subsequent acts had given her. He therefore suggested a compromise to the effect that Spain would receive sovereignty, but would be required to take immediate steps effectively to occupy the islands; Germany, in compensa-

[218] The facts of this case are taken from LINDLEY, *op. cit. supra* note 200, at 149-51.

tion, would be given certain concessions. This settlement met the approval of both parties, and Spain thereupon made effective occupation of the islands.

Similarly, the claims of Great Britain and the United States to some of the smaller islands of the Pacific, as Orent and Reinsch point out, have been based on little more than symbolic annexation.[219] Community tolerance of these claims has, however, perhaps been facilitated in most instances by the facts that these islands were uninhabited when symbolic annexation was asserted, that subsequent to symbolic annexation various acts of administrative authority were exercised by the claiming state, and that for a considerable time these claims were not contested by any other state. Three instances in which the United States and Great Britain have laid claim to the same areas may be considered, further, to indicate a continuing priority of effective occupation over symbolic annexation.

The first instance of competing claims related to Christmas Island, discovered by Captain Cook in 1777. In the 1850's guano deposits were found upon the island by Americans, though apparently organized exploitation commenced some time later. In 1879 formal possession of the island was claimed by the United States, but the island was not occupied, and in 1888, after some six years of minor private and official exploration, the United Kingdom took symbolic possession. The following year the British placed the island under the jurisdiction of their colonial administration and some time after 1919 established there an administrative office. The outcome which appears to be accepted is that the island belongs to Great Britain, despite the fact that the United States first made symbolic annexation.

In the second instance, Jarvis, Baker, and Howland Islands were symbolically annexed by the United States in the late 1850's and were thereafter occupied at various times only by guano operators. Great Britain formally annexed the areas in 1889. The islands were left deserted from the end of the 19th century until 1935, when the United States settled four Hawaiians on each island, commenced the erection of buildings and, again, in a ceremony took possession. These acts of the United States amounting to effective occupation were not formally protested by Great Britain.[220]

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219 Orent & Reinsch, *Sovereignty Over Islands in the Pacific*, 35 AM. J. INT'L L. 443 (1941). For the ensuing factual information with respect to these Pacific islands the authors are indebted to Orent & Reinsch, *supra* at 455-60.

220 Orent and Reinsch state that although Britain had not protested the American colonization of these islands, it had not relinquished her claims. *Id.* at 458. Since, however, another 20 years has passed without a dispute arising, we feel justified in stating that the American claim has been recognized.

The islands of Canton and Enderbury were, in the third instance, discovered in the early nineteen hundreds by American whalers. The Phoenix Guano Company took possession of the two islands between 1859 and 1860 and filed a bond under the United States Guano Islands Act. The two islands were, however, placed under the jurisdiction of the United Kingdom High Commissioner for the Western Pacific in 1877, and during the 1880's an English company engaged in the collection of the guano deposits. In 1936 Great Britain took symbolic possession of the area and erected a permanent cairn, and in 1937 the islands were incorporated in the Gilbert and Ellice Islands Colony. During 1937 Canton Island was visited at the same time by two scientific expeditions, one from the United States and the other from New Zealand, both arriving in naval vessels. Before leaving the island, the American expedition set up a permanent cairn bearing the U.S. national ensign. Great Britain immediately advised the United States of its claim with respect to Canton and Enderbury. Nonetheless, in 1938 a United States presidential decree placed both islands under the jurisdiction of the Department of the Interior, and a group of Hawaiians was landed to "maintain the sovereignty of the United States." In 1939 Great Britain and the United States reached an agreement whereby the islands were to be used jointly for purposes of facilitating international air transport. The status of the islands was apparently left unsettled.[221]

The inefficacy of mere discovery when opposed to more substantial acts of occupation is clearly demonstrated in the famous *Palmas Island* arbitration,[222] involving a dispute between the United States and the Netherlands over a relatively small, isolated, non-strategic, and economically unimportant island, inhabited by some 750 people. When the Americans, who regarded the island as a part of the Philippines, visited it in 1906 they discovered that the Netherlands considered herself as possessing sovereignty over it. After years of diplomatic correspondence, the parties agreed to submit the dispute to arbitration, and the case was heard by a single arbitrator, Max Huber. The United States was unable to show any type of occupation of the island or even the carrying out of any governmental functions, but based its title, as successor to Spain (by the treaty of cession of 1898), upon an alleged Spanish discovery of the island in the sixteenth century and upon con-

221 1962 INFORMATION PLEASE ALMANAC, ATLAS AND YEARBOOK 388 (Golenpaul ed. 1961) reports that Canton and Enderbury are jointly administered by the United States and Great Britain. Canton Island is now being used by the United States as one of its 18 worldwide stations for monitoring the flight of manned spacecraft. SENATE REPORT, *op. cit. supra* note 14.

222 The Island of Palmas, Arbitral Award (United States v. The Netherlands), 22 AM. J. INT'L L. 867 (1928). See also Jessup, *The Palmas Island Arbitration*, 22 AM. J. INT'L L. 735 (1928).

tiguity, asserting that the island was an integral part of the Philippine archipelago. The Netherlands, in brief, took the position that any rights by virtue of discovery that Spain may have had could not prevail over the continuing and uncontested display of authority by the Dutch over Palmas. The Netherlands was able to show various acts of governmental activity over a very long period, extending from at least 1700 until 1906, and this evidence proved decisive for the outcome of the controversy.[223]

The arbitrator ruled in favor of the Netherlands, insisting that effective occupation was not only necessary for the acquisition of territory but also for the continued maintenance of right. He stated:

> The growing insistence with which international law ever since the middle of the eighteenth century, has demanded that the occupation shall be effective would be inconceivable, if effectiveness were required only for the act of acquisition and not equally for the maintenance of the right.[224]

The arbitrator did not, however, conclude that the activities of the Netherlands fully satisfied the requirements of effective occupation. He said only that:

> These facts at least constitute a beginning of establishment of sovereignty by continuous and peaceful display of state authority, or a commencement of occupation of an island not yet forming a part of the territory of a state; and such a state of things would create in favor of the Netherlands an inchoate title for completing the conditions of sovereignty. Such inchoate title, based upon display of state authority, would, in the opinion of the arbitrator, prevail over an inchoate title derived from discovery, especially if this latter title has been left for a very long time without completion by occupation . . . .[225]

One important rationale of the opinion was, thus, that however little the Netherlands might have done toward effective occupation, the United States had done less; even conceding that Spain had first discovered the island, neither Spain nor the United States had engaged in any measures of effective occupation.[226]

The decision which perhaps comes closest, despite the explicit denial of the arbitrator, to recognition of symbolic annexation as an independent mode of acquiring sovereignty over the islands, can be

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223 The Island of Palmas, Arbitral Award, *supra* note 222, at 908.

224 *Id.* at 876.

225 *Id.* at 911.

226 See *id.* at 910-11.

found in the equally famous *Clipperton Island* case.[227] This case involved a dispute between Mexico and France over a small, uninhabited coral lagoon reef located in the Pacific Ocean. France's claim dated from 1858 when a lieutenant of the French Navy, from aboard a merchant vessel cruising one-half mile off the island, "proclaimed and declared that the sovereignty of the said island beginning from that date belonged in perpetuity to His Majesty the Emperor Napoleon III." [228] With some difficulty, several crew members were landed on the shore, but no sign of claim of sovereignty was left. The Consulate of France in Honolulu did, however, notify the government of Hawaii about the mission and the declaration of French sovereignty over Clipperton was published in a Hawaiian newspaper. When a French vessel visited the island in 1897, it found there three persons gathering guano for the account of an American company. In response to an inquiry, the United States assured France that it had neither granted concessions to that company nor intended to claim any rights over the island. Shortly thereafter, a Mexican gunboat visited Clipperton and hoisted the Mexican flag. Mexico claimed that the island had belonged until 1836 to Spain, by virtue of discovery, and since that date to Mexico as the successor of the Spanish state.

After protracted diplomatic exchanges, the two governments requested the King of Italy to arbitrate the controversy. The arbitrator, in deciding in favor of France, gave a concise summary of community expectations. He stated:

> It is beyond doubt that by immemorial usage having the force of law, besides the *animus occupandi*, the actual, and not the nominal, taking of possession is a necessary condition of occupation. This taking of possession consists in the act, or series of acts, by which the occupying State reduces to its possession the territory in question and takes steps to exercise exclusive authority there. Strictly speaking, and in ordinary cases, that only takes place when the state establishes in the territory itself an organization capable of making its laws respected. But this step is, properly speaking, but a means of procedure to the taking of possession, and, therefore, is not identical with the latter.[229]

The arbitrator recognized, further, that there might be cases in which it would be unnecessary to require such comprehensive measures. The dispute before him related to a small, desolate, uninhabited, and prob-

227 Clipperton Island, Arbitral Award (France v. Mexico), 26 AM. J. INT'L L. 390 (1932). See also Dickinson, *The Clipperton Island Case*, 27 AM. J. INT'L L. 130 (1933).

228 Clipperton Island, Arbitral Award, *supra* note 227, at 391.

229 *Id.* at 393-94.

ably uninhabitable island upon which there were little or no resources to be developed. It is not surprising that he added:

> Thus, if a territory, by virtue of the fact that it was completely uninhabited, is, from the first moment when the occupying state makes its appearance there, at the absolute and undisputed disposition of that state, from that moment the taking of possession must be considered as accomplished, and the occupation is thereby completed.[230]

Hence, though the "taking of possession" of the island which the arbitrator ascribed to France could only refer to the landing of the men and the proclamation from the ship—acts ordinarily regarded as amounting to no more than symbolic annexation—the real crux of the decision would appear to have been, again, that however little France had done by way of "effective occupation," Mexico had not proved symbolic annexation by Spain and had done even less by way of occupation.

It would, therefore, appear that general community expectation has not, certainly in the relatively recent past and apart from the possible instances of a few unimportant islands, commonly regarded anything less than effective occupation as a sufficient basis for establishing permanent exclusive right over unappropriated land masses. The bulk of past experience would appear to demonstrate that symbolic annexation alone does not constitute an independent mode for the acquisition of territory, but is rather merely a possible first step in making effective occupation of an area. Publicists have been too prone to stress the few instances of symbolic annexation in which effective occupation did not follow and which, hence, gave rise to conflict. They have thus failed to give appropriate emphasis to the more stable patterns in the practices by which the continents were allocated. Spain, for example, after making symbolic annexation of vast areas of Central and South America, proceeded as circumstances admitted effectively to occupy these areas. France, after purporting to make symbolic annexation of areas of North America, then brought in settlers and attempted to establish colonies. Great Britain similarly followed its assertions of symbolic annexation in North America with effective occupation. Important disputes were confined largely to the peripheries of the various territories claimed by these powers, to areas which they had not been able effectively to occupy; in contrast, areas in which symbolic annexation was promptly followed by use and settle-

[230] *Id.* at 394. Professor Dickinson commented that, "in effect, it is held that the occupation which is required is such an occupation as is appropriate and possible under the circumstances. It is a question of fact." Dickinson, *supra* note 227, at 133.

ment were seldom the subject matter of contention. This very fact that disputes were largely concentrated about the areas which had been only symbolically annexed, and not effectively occupied, is, as already suggested, the best evidence that symbolic annexation alone was not ordinarily regarded as an equivalent of effective occupation for establishing exclusive appropriation.

2. Claims To Establish Exclusive Appropriation on the Basis of Effective Occupation

For some centuries there has been, as we have seen, a broad community consensus that effective occupation is a lawful method by which states may establish exclusive acquisition of unappropriated land masses. The most difficult question which this formulation of lawfulness in acquisition poses is of course that of what, in particular contexts, amounts to effective occupation.

The recognition is general, as suggested by the arbitrator's reference in the *Clipperton Island* opinion to a "series of acts," that the effective occupation required in community consensus is not some single isolated act but rather a complex process which may include a wide variety of activities and extend over a considerable period of time.[231] The merest pretense to synoptic observation of the flow of claims and authoritative responses in recent centuries must reveal, further, that the kind of effective occupation which has been asserted and honored has not been uniform but has differed widely in degrees of completeness and other details, depending upon many variables in the process of interaction and, most especially, upon the characteristics of the resources claimed. Thus, the participants who have sought to engage in effective occupation have ranged from nation-states, through differing officials, to private individuals, such as traders, trappers, explorers, and missionaries, having varying degrees of authorization from their states; other group claimants have included religious orders, private groups seeking to escape religious persecution, and corporations, such as the Hudson's Bay Company, the Virginia Company, and the French East

231 The great range of activities which have played a role in establishing effective occupation may be indicated by the following non-homogenous itemization: the stationing of soldiers, erection of forts, maintenance of public order, cruising of warships in nearby waters, building of post offices, issuing of postage stamps, granting of licenses for exploitation of resources or exploration, granting of land and mineral rights, making of treaties with native populations, organizing of local forms of government, the exploration and mapping of the area, the carrying out of humanitarian and educational activities among the native population such as the establishment of missions, hospitals, schools, and research stations, trading with the native inhabitants, tilling the soil, bringing in settlers, and the building of communities, harbor installations, roads, and industries.

Indies Company.[232] The objectives exhibited by claimants have embraced the extremes, both of the most formal statement of *animus occupandi,* intent to appropriate,[233] through ceremonies and symbolic acts, such as discussed above, and of the most informal demands for transient trading rights, such as made for the temporary enjoyment of local resources.[234] The areas sought to be occupied have sometimes been in close proximity to other areas of unquestioned sovereignty, and on occasion at remote distances, even separated by vast oceans; sometimes the activities alleged to constitute occupation have endured through long periods of time, sometimes they have been most fleeting; often activities in occupation have been attended by intense expectations of violence or other crisis, while at other times by expectations only of continuing peaceful cooperation. The capabilities which claimants have had at their disposal for insuring the effectiveness of alleged occupation have varied historically as have the bases of power of the states which have come and gone in the world arena. The strategies employed by claimants have ranged over the whole panoply of diplomatic, ideological, economic, and military—exhibiting many varying degrees of persuasion and coercion, and of triviality and consequentiality. The outcomes in corpus of occupation achieved have, finally, included many differing degrees (from none to maximum) in effective control, the establishment of authority or display of the activities of a state in varying comprehensiveness and modality, and success or failure in the exploitation and development of resources in all possible degree.

It should not be surprising, considering the immensity and variety of the resources at stake, that states have made, and reciprocally honored, claims emphasizing many different features in this process of exploitation and allocation and representing equally various approximations to the completeness of occupation in outcomes of effective control and display of authority. Just as it has not always been economic for particular claimant states, bent upon maximizing their values by acquiring as much as possible for as little outlay as achievable, to make

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232 For a comprehensive discussion of the various types of participants in the historic process of acquisition see LINDLEY, THE ACQUISITION AND GOVERNMENT OF BACKWARD TERRITORY IN INTERNATIONAL LAW 82-122 (1926).

233 Referring to the requirements of effective occupation, Oppenheim asserts that it is necessary for the claimant state, to "take the territory under its sway (*corpus*) with the intention of acquiring sovereignty over it (*animus*)." 1 OPPENHEIM, INTERNATIONAL LAW 557 (1955). The similarity between these phrases and those used in the private law of *occupatio* should be noted. Professor Buckland states, "Acquisition of possession by one's own act is a fairly simple matter. It involves *animus* and *corpus.* The thing must be placed in our control, which does not necessarily mean about our person: effective control will vary with the nature of the thing." BUCKLAND, A TEXT-BOOK OF ROMAN LAW FROM AUGUSTUS TO JUSTINIAN 201 (1921). See also *id.* at 207.

234 For example, collection of guano, or fishing. LINDLEY, *op. cit. supra* note 232, at 158.

the most complete occupation technologically possible, so also it has not been politic for the general community, in implementation of its overriding goals in maintenance of minimum order and encouraging maximum utilization of resources, to insist upon a completeness in occupation beyond that necessary to promotion of these overriding goals. The more specific claims which states have contraposed against each other have commonly asserted, on the one hand, that the activities engaged in by some particular claimant state have been sufficiently comprehensive to constitute the effective occupation necessary to exclusive acquisition, and, on the other hand, either that the activities so put forward in justification of claim have not in fact attained the necessary degree of completeness or that some opposing state has done even more toward establishing the necessary elements of occupation. In the preceding discussion we have already dealt in measure with the claims based upon the least comprehensive degree of occupation, those asserting merely discovery or symbolic acts expressing intent to appropriate. In the discussion to follow we propose to examine the practice of states with respect to claims based upon more substantial degrees of occupation, considering again the claims based upon lesser degree only as may be necessary to completeness in presentation.

In the history of the allocation of newly discovered land masses among the states we may observe a pattern easily understandable in the light of community policies. The first areas sought to be acquired were those which contained a wide variety of resources and were suitable for settlement. These were the land masses of North and South America, Australia, New Zealand, and parts of Africa, which came to be subjected to the more comprehensive processes of the modern territorial state. Since these areas were capable of supporting a wide variety of activities, the principal mode of occupation was through full settlement. The next areas sought to be acquired were those not so easily conducive to settlement by Europeans, but which were still rich in resources and could be exploited principally through trade. Stress was, therefore, naturally put upon the establishment of a minimum governmental authority throughout the areas being acquired in order that existing rights could be protected, trade and commerce carried out, and minimum order maintained amongst the aboriginal population. Most of the African continent, not partitioned until near the end of the nineteenth century, was regarded as falling into this category. The last areas sought to be acquired were those whose characteristics did not admit of settlement and which appeared poor in resources. The land masses of this type include the polar regions and certain small islands. Less has been expected by way of exploitation of many of

these islands, and where the island has been barren and devoid of resources stress has been understandably placed upon merely the indication over a period of time of an intention to occupy. The only requirement with respect to integration into the processes of the state has been that the display of authority should be continuous and unchallenged. Effective occupation has generally been regarded as necessary with respect to the polar areas, particularly since world events and technological progress have given them a strategic significance.

During the period of the discovery and early settlement of the North and South American continents, vast areas of land were claimed, it may be recalled, on the basis merely of discovery and symbolic annexation. Since none of the participants had the necessary technological capacity and other resources, effective occupation of much of the territory so claimed was in the beginning impossible. The various claimant countries, including Spain, France, England, and eventually the United States, in North America, and Spain and Portugal, in Central and South America, did, however, proceed toward effective occupation as rapidly as their resources and other commitments permitted. States becoming capable and desirous of exploiting lands which other states had claimed by symbolic annexation, without effective occupation, did not, as we have noted, commonly regard themselves as under legal obligation to refrain from entering such lands, but rather felt free to make occupation despite the previous claims. This occupation was often accomplished without resort to violence, with the original claimant either abandoning the claim or ceding the territory to the state already exploiting the area. When a dispute arose between a claimant through symbolic annexation and a claimant in effective occupation, the outcome was inevitably, in implementation of the general community policy of achieving the maximum utilization of resources, that the claimant effectively occupying the area was preferred. When, however, a claimant followed symbolic annexation with effective occupation, its rights were commonly recognized by the general community, and disputes with others concerning the area seldom arose.

The effective occupation of the new world was commenced when Columbus, upon his first voyage, left a fortress and settlement of men on the island of Haiti or Hispaniola.[235] Upon his second voyage starting in 1493, Columbus carried men, sheep, seeds, wheat, and tools for the purpose of establishing colonies. Finding that the settlement at a place named Navidad, left on his first voyage, had been destroyed by

[235] HERRING, A HISTORY OF LATIN AMERICA 122 (1955). See also for a comprehensive account of the Spanish colonial activities in America, DOZER, LATIN AMERICA: AN INTERPRETIVE HISTORY (1962); HARING, THE SPANISH EMPIRE IN AMERICA (rev. ed. 1952); PRESCOTT, HISTORY OF THE CONQUEST OF MEXICO AND HISTORY OF THE CONQUEST OF PERU (The Modern Library ed. 1936).

the natives, he established a new one, called Isabella, in a different part of the island. From Hispaniola, the Spaniards proceeded to explore, conquer, and colonize the surrounding islands before turning to the mainland where they soon began to penetrate ever deeper into the newly discovered world. The larger Caribbean islands, such as Puerto Rico, Cuba, and Jamaica, were first occupied and settled; from these islands and Hispaniola settlements spread elsewhere. In the early decades of the 16th century, the Spaniards had gained effective control over most of the islands in the Caribbean and the Isthmus of Panama; in the 1540's they already controlled most of Mexico, Peru, and Chile and were making deep thrusts in the southern regions of the North American continent, attempting to start colonies. During the same period the Spaniards established settlements in many parts of South America, and between 1600 and 1800 they had occupied parts of California, New Mexico, and Texas. The demand for gold and other precious commodities was of course an important factor in this widespread exploration of the newly discovered world and accompanying subjugation of its native inhabitants. When plunder of the natives exhausted the supply of ready-made wealth, mining followed, with mines being opened from Peru to Mexico. Around such mines settlements grew up, missions were built, farms started, small industries sprang into existence, and trade developed.[236] Intensive farming often followed, with large-scale cultivation of sugar cane, grain, and later coffee.[237]

The Portuguese were much slower in commencing the exploration and occupation of the new world, presumably because of their reliance on the Treaty of Tordesillas. While, apparently, several voyages by Portuguese navigators were made to the coast of Brazil since the discovery of this land by Cabral in 1500, these expeditions were unofficial and left little or no trace. Eventually reports about the Spanish expansion throughout South America made Portugal realize that it would have to fortify its territorial claims based upon the Treaty of Tordesillas by actual settlement. To counteract the activities of the Spaniards, more immediately the establishment of a colony at Sancti Spiritu in 1527 by Sebastian Cabot exploring for the King of Spain, the Portuguese dispatched in about 1530 an official expedition to South America which explored the entire coast of present Brazil and established at Sao Vincente in 1532 a permanent European settlement. By the middle of the 16th century, the Portuguese succeeded in setting up a strong cen-

236 The city of Potosi, built in 1545, high in the Peruvian mountains for purposes of mining a 2,000-foot hill of silver, is thought to have had a population reaching 160,000 by the middle of the seventeenth century. HERRING, *op. cit. supra* note 235, at 199.

237 *Id.* at 201-02.

tralized administration which controlled a number of permanent settlements along the coast of Brazil.[238]

The French initially made only sporadic efforts to establish permanent settlements in the new world.[239] Probably their first attempt at settlement was by Jacques Cartier, in 1534 or 1535, near the present site of Quebec, but this soon ended in failure. In 1555, an attempt made to found a colony on the bay of Rio de Janeiro in Brazil similarly failed. A settlement established in 1564 in the northern part of Florida was quickly massacred by the Spaniards. Champlain appears to have started in the early 17th century a period of relatively successful French colonization in North America, but with Frenchmen showing little interest in migrating to Canada, further settlement in this area grew slowly. By the time of Quebec's surrender in 1759 to the English, New France had a population of only 70,000, mostly concentrated along the St. Lawrence River.[240] The French did, however, engage from the very outset in extensive exploration, with attendant claims of annexation.[241] Eventually, their explorers (La Salle, 1682) descended the Mississippi to the Gulf of Mexico, claiming the entire area for France, and by the early 18th century French settlements were established in present Louisiana.

The British colonization of North America is familiar knowledge. Emigrants from Britain started arriving on the eastern coast of the continent in large numbers as early as the 1630's and "their colonies soon outstripped both the French and the Spanish colonies in numbers of people." [242] In the far north, after the discovery of Alaska by Bering in 1741, the Russians formally annexed the area and followed eventually with the establishment of small outposts and settlements.[243]

The pattern of agreement and dispute emerging from these activities bears convincing witness to the importance of effective occupation. By the end of the 17th century, the title of Spain to virtually all of

238 See DOZER, *op. cit. supra* note 235, at 77-79.

239 A resumé of French colonial expansion in the Americas is offered by NOWELL, THE GREAT DISCOVERIES AND THE FIRST COLONIAL EMPIRES 81-95 (1954). For fuller account see BREBNER, THE EXPLORERS OF NORTH AMERICA 1492-1806, at 117-96 (1933); DESCHAMPS, LES VOYAGES DE SAMUEL CHAMPLAIN (1951); CREIGHTON, DOMINION OF THE NORTH 1-102 (1957).

240 BROWN, HISTORICAL GEOGRAPHY OF THE UNITED STATES 48 (1948).

241 It is thus reported that Jacques Cartier, the official explorer for the King of France, during his first voyage to North America, on July 24, 1534, "formally laid claim to the whole of this great new land [at the Gulf of St. Lawrence] by erecting a huge cross, thirty feet high, at the mouth of Gaspé harbour. Below the cross-bar they fixed a shield, with three fleurs-de-lys in relief, and above it a board with the words 'Vive le Roy de France' in gothic characters." CREIGHTON, *op. cit. supra* note 239, at 4.

242 BROWN, *op. cit. supra* note 240, at 49. The population of Massachusetts alone, for example, was 2,000 in 1632, 16,000 in 1643, and 30,000 in 1665. *Ibid.*

243 For details of Russian activity in Alaska see ANDREWS, THE STORY OF ALASKA 21-124 (1938).

South America, except Brazil, which was held by Portugal, Central America, Mexico, Southern California, and part of New Mexico, was undisputed. England had uncontested possession of the eastern coast of North America, and France of the Saint Lawrence River basin. The disputed areas included the vast Hudson Bay region, and much of Canada up to the Rockies, which was claimed by France and England; the area between the Appalachian Mountains and the Mississippi River, also claimed by both France and England; the southern part of Texas and Louisiana, claimed by France and Spain; and the northern part of Florida claimed by England and Spain.[244] The disposition of the Oregon country, a vast area west of the Rockies between Alaska in the north and the Spanish American possessions in the south, was later disputed by the rival claimants England, the United States, and Russia. It may be observed that the areas subjected to contest were those which had been left relatively unoccupied and unsettled.

In the dispute between England and France concerning the Hudson Bay regions, both countries relied upon discovery and symbolic annexation, but the decisive fact proved to be that the English were actually engaged in exploiting the area, while the French were not; after a time the French no longer maintained their claim.[245] Similarly, policies based upon effective occupation played an important role in settlement of the Nootka Sound controversy, a dispute which arose between England and Spain when Spain seized several English ships off the coast of British Columbia. Protesting the seizure, the British did not claim sovereignty over the area but rather the right to free access for commerce and fishing, as the country was not occupied by any European nation. The controversy was settled with the Nootka Sound Convention signed on the 28th of October, 1790, which provided in part:

> [T]heir respective subjects shall not be disturbed or molested, either in navigating or carrying on their fisheries in the Pacific Ocean, or in the South Seas, or in landing on the coasts of those seas, in places not already occupied, for the purpose of carrying on their commerce with the natives of the country, or of making settlements there. . . .
>
> It is agreed, that as well in the places which are to be restored to the British subjects, . . . as in all other parts of the northwestern coasts of North America, or of the islands adjacent, situate to the north of the parts of the said coast already occupied by Spain, wherever the subjects of either of the two powers shall have made settlements since the month of April,

244 HARPER'S ATLAS OF AMERICAN HISTORY 12 (1920).

245 See Simsarian, *The Acquisition of Legal Title to Terra Nullius*, 53 POL. SCI. Q. 111, 118 (1938).

> 1789, or shall hereafter make any, the subjects of the other shall have free access, and shall carry on their trade without disturbance or molestation.[246]

Spain never attempted extensive exploitation of the resources of the American Northwest and was, therefore, never able to establish exclusive rights in the area.[247] With the elimination of Spain from the claimants, the entire Northwest was left to Russia, England, and the United States. In her controversies with Russia over the area, England took the position that occupation was the test of sovereignty. By an exchange of memoranda between the two countries, it was agreed "that use and occupation constitute the best titles by which a state can lay claim to rights of sovereignty over any part of the continent," [248] and upon the basis of this principle, in 1825 a convention was signed between the two parties defining the boundary between the Russian and British possessions. The dispute about this region involving Russia and the United States was settled upon a similar basis.[249] By a convention signed in 1824, the 54th parallel was taken as the dividing line between the United States and Russian territory. Above this line Russia was left to contest her claims with Britain, and below it the United States was accorded similar opportunity. In 1846 the remainder of the territory was divided by Britain and the United States, approximately in half, along the 49th parallel.

The final settlement of Spanish claims in the southern part of the North American continent also tends to underscore the significance of relative comprehensiveness in occupation, although other factors played an important role in this settlement.[250] Spain, which claimed title to the territory of Louisiana on the basis of discovery and sporadic settlement, never succeeded in gaining a firm foothold over the area and was eventually forced to cede the region to France, whose settlers far outnumbered the Spaniards. Similarly in Florida, Spain was forced to abandon its claims in favor of the United States, whose exploitation and settlement of the area was rapidly outstripping Spanish activities. Unable effectively to occupy this region, and rather than fight a war, Spain finally ceded Florida to the United States in 1821. The experience with respect to the settlement of territorial claims to areas of North America thus demonstrates that in the main only those claims

246 *Id.* at 123. The summary account of this controversy is from the same source, at 121-23.

247 It is, in fact, reported that Spain failed to establish a single settlement on the Pacific coast north of California. 1 MOORE, HISTORY AND DIGEST OF THE INTERNATIONAL ARBITRATIONS 199 (1898).

248 Simsarian, *supra* note 245, at 124; 1 MOORE, *op. cit. supra* note 247, at 207.

249 For a detailed history of the settlement of the boundary of the Pacific northwest, see 1 MOORE, *op. cit. supra* note 247, at 196-236.

250 For a more comprehensive account see 1 *id.* at 433-45.

based upon discovery and symbolic annexation which were backed up by subsequent effective occupation—as exhibited in settlement, establishment of governmental authority, and use—were honored.

Additional evidence of the importance of relative comprehensiveness in occupation may be found in the British Guiana and Venezuela Arbitration of 1899. The boundary between the British colony and Venezuela had been in dispute, Lindley reports, since 1841.[251] In 1897 Great Britain, Venezuela, and the United States, the latter acting on behalf of Venezuela, signed an Arbitration Treaty which provided that the arbitrators should be governed by certain special rules and such principles of international law as were not inconsistent with the special rules. One special rule thus agreed upon declared that "[a]dverse holding or prescription during a period of fifty years shall make a good title" and that "political control . . . as well as actual settlement . . . [may be deemed] sufficient to constitute adverse holding. . . ." [252] Venezuela claimed the area as the successor to Spain, which had discovered it, and Great Britain claimed under the Dutch cession of the colony to her in 1814. Most of the argument revolved, therefore, about the question of how far the Dutch and Spanish had effectively occupied the disputed area. The British had made careful determination of just how far the Dutch had taken effective possession of the area, and based their claim upon this possession and the geographical features of the country. They asserted that the Dutch "had explored and developed the country; regulated the trade with the natives, the cutting of timber, and . . . the gold-mining; . . . had issued the passports, . . . entered into contracts, leagues and alliances with the Indians" etc.[253] In her argument, Great Britain defined effective occupation as, "the use and enjoyment of the resources of the country and the general control of its inhabitants, under the protection and by the authority of a Government claiming and exercising jurisdiction in that behalf." [254] Thus, Britain claimed that the use and enjoyment of the resources of an area, as well as mere political control, was necessary for occupation to be effective. Venezuela argued that the Spaniards had taken symbolic possession of the entire coast of Guiana and had perfected their title to the whole by the settlement and control over certain parts of the area and that, therefore, the Dutch, and the British through them, had acquired good title only to that territory which the Dutch had actually taken by conquest. She further

[251] LINDLEY, *op. cit. supra* note 232, at 152. The account of this case is from the same source, at 152-57.

[252] Article IV(a). *Id.* at 153.

[253] *Id.* at 155.

[254] *Id.* at 156.

argued that political control, without the actual use of the resources, was sufficient to constitute effective occupation.[255] Britain denied both Venezuela's sweeping claims made upon the basis of symbolic annexation and her contention that any territory not occupied by Holland necessarily belonged to Spain. The arbitrators, unfortunately, failed to explain their decision, but they awarded Great Britain substantially the area which she claimed except in two instances: one where Venezuela had been able to prove exploration and settlement, and the other where there had once been Spanish missions and later a Venezuelan post. Each claimant thus was awarded the area over which it had been able to show effective occupation by its predecessor in title.[256]

Following the settlement of the North and South American continents, the next great period in expansion of exclusive use over territory considered *terra nullius* exhibited the division and occupation of the African continent. As an integral part of the ancient world and the seat of an important civilization, Africa could scarcely be made subject to discovery. North Africa had, after the times of the Egyptians, been occupied first by Phoenicians, and then by Greeks, Romans, Vandals, and finally Arabs.[257] The outlines of the continent did not, however, become known to Europeans until the voyages of the Portuguese, who pressed down the African coast, exploring, carrying out symbolic acts for announcing their intention to occupy, and building forts and trading stations.[258] The range of activities engaged in by the Portuguese is graphically indicated by one historian:

> Before the close of the fifteenth century the Portuguese had erected forts at Arguin and El Mina, had established trading factories on the Senegal, the Gambia, the Rio Grande, on the Gold Coast and the Gulf of Benin, and on the Congo; had planted colonies on Madeira, and Cape Verde Islands, and the Island of St. Thomas. By about 1520 Portugal, as we have seen, had made herself mistress of all the coasts of Africa, except that of the Mediterranean and the Red Sea, and even in the latter, a few years later, attempts were made to obtain possession of Massawa and other ports, and to establish Portuguese influence over Abyssinia.[259]

The Portuguese, however, lacked sufficient resources effectively to occupy all parts of the vast coasts and interiors of Africa. Conse-

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[255] *Id.* at 154-56.

[256] *Id.* at 156-57.

[257] KELTIE, THE PARTITION OF AFRICA 4-31 (2d ed. 1895), provides an excellent account of this, as well as of subsequent developments in the colonization of Africa.

[258] *Id.* at 32-58.

[259] *Id.* at 59.

quently, other European states began to explore and trade in these areas. The attitude of these other states toward Portuguese claims to exclusive access is typified by a statement quoted in Keltie which complains of the

> arbitrary monopoly of the Portuguese on this coast, of such who, on account of conquering 40 or 50 miles here and there, certain fortresses or block-houses among naked people, think themselves worthy to be lords of half the world, and angry that others should enjoy the commodities which they themselves cannot wholly possess.[260]

For facilitating its trade with the East Indies, the Dutch East India Company in 1652 established a settlement on the Cape of Good Hope as a supply base for ships.[261] The Dutch government also encouraged immigration, and by the time the British in 1795 captured the Cape colony, the white population of South Africa had grown to something under 10,000 and had spread some 200 miles inland.[262] Describing the Dutch period, Keltie reports:

> The vine was introduced at an early date, and has been cultivated ever since; cattle and sheep rearing was encouraged, experiments were made with various cultures, and wheat was successfully grown and even exported. Occasional expeditions were sent into the interior.[263]

Thus, South Africa, having a temperate climate and a wide variety of resources, became quite early occupied in a degree of comprehensiveness comparable to that which existed in the temperate areas of North America.

In the more tropical regions, and as late as 1884, European states occupied only minor stretches of coastal areas where they carried on trading, with some development of local resources. Portugal still claimed a vast part of Africa but occupied only a small proportion of the area claimed. In specific controversy, however, Portugal was required, just as Spain had been in the Americas, to depend upon her effective occupation. Thus, when a dispute arose between Portugal and Britain as to the sovereignty over Delagoa Bay,[264] Portugal took the position in the arbitration of 1875 that at the time she acquired the area, discovery and symbolic annexation were sufficient basis for title,

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260 Richard Eden, quoted in *id.* at 64.

261 *Id.* at 72.

262 *Id.* at 79-80.

263 *Id.* at 79.

264 LINDLEY, THE ACQUISITION AND GOVERNMENT OF BACKWARD TERRITORY IN INTERNATIONAL LAW 135-36 (1926).

and therefore her present title could not be questioned. Great Britain questioned Portugal's contention and maintained that title could not be permanently acquired by mere symbolic annexation, without actual occupation. The British government argued:

> As far as the Governor of the fortress, in the name of his Sovereign, can and does exercise authority and jurisdiction, so far the country and its inhabitants are under the control and government of the country to which that fortress belongs.
>
> That control and government cease at the moment and at the places where the jurisdiction no longer exists, and the authority no longer is or can be exercised.[265]

The arbitrator found, however, that Portugal had effectively occupied the area.

The actual occupation of Africa was a leisurely process until Germany began to enter the continent, trading extensively with the natives, establishing factories, exploring, signing treaties with local tribal leaders, establishing colonies, and claiming large areas.[266] These activities by Germany precipitated a veritable explosion of claims and counterclaims by other European powers. The African Conference, held at Berlin in 1884, was an attempt to find a peaceful solution to the various claims and to establish criteria by which European states would acquire parts of the African coast. Article 35 of the General Act of the Conference proclaimed that:

> The Signatory Powers of the present Act recognize the obligation to insure the establishment of authority in the regions occupied by them on the coasts of the African Continent sufficient to protect existing rights and, as the case may be, freedom of trade and of transit under the conditions agreed upon.[267]

It should be observed that this article, as its wording suggests, did not purport to establish a new rule of international law; it merely affirmed that the signatory states recognized that an occupying state was already under obligation to establish its authority throughout the regions occupied. The British, French, and German governments all affirmed that the Convention made no change in international law. As expressed by the British Foreign Minister, "No attempt is made by the Conference to interfere with existing maxims of International

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[265] *Id.* at 142.

[266] KELTIE, *op. cit. supra* note 257, at 161-206.

[267] Quoted in LINDLEY, *op. cit. supra* note 264, at 144.

Law . . . and international duties on the African coasts remain such as they have been hitherto understood." [268] Another point requiring emphasis is that the obligation expressed in article 35 was made applicable to "regions occupied," indicating that the establishment of authority was not of itself regarded as constituting effective occupation, but was conceived as merely a part of a much larger process.

The scope of the Berlin Act was considered in a dispute which arose in 1887 between England and Portugal about an area in Central Africa which Portugal claimed but had not effectively occupied. Portugal argued, as reported by Lindley,[269] that the principle that effective occupation was necessary to acquire territory was rejected by the Berlin Conference with respect to the interior of Africa, and made applicable only to the coastal regions. Lord Salisbury for Great Britain insisted that it had "been admitted in principle by all the parties to the Act of Berlin that a claim of sovereignty in Africa can only be maintained by real occupation of the territory claimed," and that "The fact that the Act of the Berlin Conference laid down conditions in Articles 34 and 35 in relation to new occupations on the coasts of Africa did not in any way affect the well-established principles of International Law in regard to the occupation of lands in the interior." [270] Portugal replied that if effective occupation was necessary for the interior of Africa, England, Germany, and the Congo Free State would be unable to show a good title to their interior holdings. Lord Salisbury answered:

> [N]o paper annexation of territory can pretend to any validity as a bar to the enterprise of other nations if it has never through vast periods of time been accompanied by any indication of an intention to make the occupation a reality, and has been suffered to be ineffective and unused for centuries.[271]

Upon the basis of these principles, Great Britain ignored the claims of Portugal and continued to expand into and occupy territory which Portugal claimed but had not occupied. The dispute was terminated by an agreement between the two countries in 1891 which drew the boundaries between the British and Portuguese spheres, giving a considerable portion of the disputed area to Great Britain.[272]

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[268] *Id.* at 146.

[269] *Id.* at 151-52. For an historic account see KELTIE, *op. cit. supra* note 257, at 401-50.

[270] LINDLEY, *op. cit. supra* note 264, at 151.

[271] *Id.* at 152.

[272] See KELTIE, *op. cit. supra* note 257, at 420-33.

In final affirmation of the principle of effective occupation, Article 10 of the Convention of St. Germain-en-Laye of 1919, which superseded the Berlin Act, provided that:

> The Signatory Powers recognise the obligation to maintain in the regions subject to their jurisdiction an authority and police forces sufficient to ensure protection of persons and property and, if necessary, freedom of trade and of transit.[273]

This convention, unlike the one it replaced, was regarded as applicable throughout the entire African continent.

Early exploration of the Arctic regions may be attributed primarily to the search for new sources of wealth. So motivated, Russia slowly occupied and developed the resources of her northland, while various countries explored the polar seas in search for a northern passage to the Orient. In recent times, however, exploration has increasingly served security and scientific purposes, in addition to economic. More comprehensive occupation of the Arctic did not, however, occur before this century. The Soviet Union, accelerating Russia's historic interest, has engaged in extensive exploration and development, which, considering the nature of the area, would appear clearly to constitute effective occupation. Settlers were introduced, communities built, mineral resources exploited, industries established, transportation facilities constructed, and governmental authority maintained.[274]

Canada also, since the early part of the twentieth century, has exercised effective control and administration over a vast northland. Police posts, post offices, schools, and hospitals have been established. Government vessels periodically patrol the area, order has been maintained among the native population, natural resources have been developed, and extensive exploration, mapping, and scientific studies have been undertaken.[275]

Greenland was discovered about 900 A.D. and the first colonies were established by some Nordic tribes approximately one hundred years later.[276] While these colonies perished before 1500, there is

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[273] LINDLEY, *op. cit. supra* note 264, at 149.

[274] See generally SMEDAL, ACQUISITION OF SOVEREIGNTY OVER POLAR AREAS (1931). For details of Soviet activities in the Polar regions, see TARACOUZIO, SOVIETS IN THE ARCTIC 73-314 (1938).

[275] SMEDAL, *op. cit. supra* note 274, at 35-36. See also *Supply of Settlements in the Canadian Arctic, 1953*, 7 POLAR RECORD 391 (1955); *Arctic Patrols of the Royal Canadian Mounted Police, 1949-51*, 7 POLAR RECORD 405 (1955); *Arctic Patrols of the Royal Canadian Mounted Police, 1952-54*, 7 POLAR RECORD 499 (1955).

[276] Copious historic information concerning Greenland can be found in the judgment of April 5, 1933, of the Permanent Court of International Justice, Legal Status

evidence that in the meantime the King of Norway exercised an occasional control over them. The Danish-Norwegian Crown laid claim to the area upon this historical basis, at least as early as the beginning of the seventeenth century, and when Norway was ceded to Sweden in 1814, the Treaty of Kiel provided that Greenland would remain Danish. Denmark had further, a long record of activities in regard to this island, particularly in the western and southern coastal areas, including the establishment of local administration in 1860 composed of appointed officials and elected local representatives.

Since the time Denmark first established her authority in Greenland, towns have been constructed, schools and hospitals built, and a wide variety of industries established and encouraged. Most of these activities were carried out in the western and southern coastal areas where the majority of Greenlanders live. A colony was first established on the eastern coast in 1895, reportedly to save a primitive tribe of Eskimos from complete extinction.

The effective occupation by Denmark of the western and southern coastal area of Greenland, where most activities were undertaken, has never been questioned. A dispute arose, however, between Norway and Denmark concerning the eastern coastal regions, where Denmark's activities have been much less intensive. Norway, having itself engaged in various activities in the area, took the position that Eastern Greenland was *terra nullius* and, therefore, proceeded to confer police powers upon certain of her nationals in the area. When extensive diplomatic discussion failed to bring about agreement, the parties submitted the dispute to the Permanent Court of International Justice. Denmark based her claim upon the whole course of conduct. In the words of the Court:

> The Danish claim is not founded upon any particular act of occupation but alleges—to use the phrase employed in the Palmas Island decision of the Permanent Court of Arbitration, April 4th, 1928—a title "founded on the peaceful and continuous display of State authority over the island.[277]

Denmark stressed, more particularly, that for an extremely long period she had claimed sovereignty over the area and that her claims had not been, until the present case, disputed. In proof of this she offered evidence of a series of commercial conventions, excepting from their op-

of Eastern Greenland (Denmark v. Norway), P.C.I.J., ser. A/B, No. 53 (1933), also reported in 3 HUDSON, WORLD COURT REPORTS 148 (1938). See also 1 HYDE, INTERNATIONAL LAW 336-42 (2d ed. 1945); SMEDAL, *op. cit. supra* note 274, at 77-128. More recent events are described in ROYAL DANISH MINISTRY FOR FOREIGN AFFAIRS, GREENLAND (1961).

277 Legal Status of Eastern Greenland, *supra* note 76, at 45, 3 HUDSON at 170.

eration the area of Greenland, and a series of declarations which she had obtained at various times from other states, recognizing Danish sovereignty over all of Greenland.[278] Norway contended that Denmark had failed to occupy the area in dispute and that the word "Greenland" in the various documents which Denmark introduced as evidence of legislative and administrative activity, referred only to the western part of the island.[279] The Court pointed to the Danish exploration of the eastern coast, the granting of licenses and concessions relating to the area, the activities of the Danish "Eastern Greenland Company," [280] and the exclusion of Greenland from commercial conventions, and concluded that Denmark had "displayed during this period of 1814 to 1915 her authority over the uncolonized part of the country to a degree sufficient to confer a valid title to the sovereignty." [281] The perspectives which moved the Court are clearly reflected in one passage from the opinion:

> The conclusion to which the Court is led is that, bearing in mind the absence of any claim to sovereignty by another Power, and the Arctic and inaccessible character of the uncolonized parts of the country, the King of Denmark and Norway displayed during the period from the founding of the colonies by Hans Egede in 1721 up to 1814 his authority to an extent sufficient to give his country a valid claim to sovereignty, and that his rights over Greenland were not limited to the colonized area.[282]

It is evident from this passage, as from the opinion as a whole, that the Court was much influenced by the facts both that in areas adjacent to the territory in dispute Denmark had engaged in acts of comprehensive settlement and that the claims of Denmark to all the areas, upon an island which might appropriately be regarded as a geographic whole, had been made for a very long time, without other states exhibiting much interest in the area or making protest.[283] It is also

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[278] *Id.* at 50-51, 3 HUDSON at 175.

[279] *Id.* at 48-49, 3 HUDSON at 173.

[280] *Id.* at 34-35, 3 HUDSON at 161.

[281] *Id.* at 53-54, 3 HUDSON at 177.

[282] *Id.* at 50-51, 3 HUDSON at 175.

[283] The Court stated:

> Another circumstance which must be taken into account by any tribunal which has to adjudicate upon a claim to sovereignty over a particular territory, is the extent to which the sovereignty is also claimed by some other Power. In most of the cases involving claims to territorial sovereignty which have come before an international tribunal, there have been two competing claims to the sovereignty, and the tribunal has had to decide which of the two is the stronger. One of the peculiar features of the present case is that up to 1931 there was no claim by any Power other than Denmark

probable that the Court's willingness to find Denmark's activities sufficient for occupation of an area agreed to be unsuitable for settlement was increased by the fact that Norwegian Minister for Foreign Affairs Ihlen had in 1919 formally declared that his government would not cause any difficulties in the settlement of the question.[284]

The more recent experience with respect to Antarctica, taken in the aggregate, would appear to confirm that in contemporary expectation even for the polar areas something more than the periodic display of governmental authority is required to constitute effective occupation. This experience suggests, further, that when an area is regarded by a considerable number of states as of important concern, strategic or otherwise, even very grave difficulties in settlement and exploitation will not be permitted to negate the necessity for effective occupation in establishing exclusive claim.

In this century a number of states have made claims—based upon varying factors, such as discovery, symbolic annexation, and proximity by sector—to the exclusive appropriation of various areas in the south polar region. Great Britain appears to have been the first claimant to attempt effective occupation. The Governor of the Falkland Islands in 1906 issued regulations on whaling operations carried out from land stations on South Georgia and other islands in the area.[285] In 1908 Britain formally proclaimed a section of the Antarctic and four nearby groups of islands as the Falkland Island Dependencies, and brought the administration of the area under the authority of the Governor of the Falkland Islands.[286] From this period, Great Britain has enforced regulations concerning the whaling industry in the region, established post offices and issued stamps, constructed both temporary and permanent bases, operated wireless stations, policed the area, and carried out exploratory mapping, and scientific studies.[287]

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to the sovereignty over Greenland. Indeed, up until 1921, no Power disputed the Danish claim to sovereignty.

It is impossible to read the records of the decisions in cases as to territorial sovereignty without observing that in many cases the tribunal has been satisfied with very little in the way of the actual exercise of sovereign rights, provided that the other state could not make out a superior claim. This is particularly true in case of claims to sovereignty over areas in thinly populated or unsettled countries.

Id. at 46, 3 HUDSON at 171.

For a more recent judicial statement on the kind of activities considered relevant in the assessment of claims to sovereignty based upon effective possession, see Minquiers and Ecrehos Case (France and United Kingdom), [1953] I.C.J. Rep. 47, 68-70.

284 P.C.I.J., ser. A/B, No. 53, at 64-75, 3 HUDSON at 186-95.

285 Waldock, *Disputed Sovereignty in the Falkland Islands Dependencies*, 25 BRIT. YB. INT'L L. 311, 327 (1948).

286 *Id.* at 327-28.

287 *Id.* at 327-31. See also CHRISTIE, THE ANTARCTIC PROBLEM 239-62 (1951).

Some of the other claimants to different areas in the Antarctic have engaged in comparable activities, though less intensively.[288] Even the activities of Great Britain upon the Antarctic continent could, however, scarcely be said to constitute the effective occupation necessary to exclusive appropriation. In consequence, community consensus has never crystallized in support of any of the claims, and two major states, the United States and the Soviet Union, have categorically denied the lawfulness of all particular claims. The official position of the United States has been, for itself as for others, that sovereignty over Antarctic areas could only be acquired by a high degree of effective occupation. The most important articulation of this position is the well-known communication by Secretary of State Hughes:

> It is the opinion of the Department that the discovery of lands unknown to civilization, even when coupled with a formal taking of possession, does not support a valid claim of sovereignty unless the discovery is followed by an actual settlement of the discovered country. In the absence of an act of Congress assertative in a domestic sense of dominion over Wilkes Land this Department would be reluctant to declare that the United States possessed a right of sovereignty over that territory.[289]

The Soviet Union took a comparable position in denial of all particular claims, insisting that the status of Antarctica should be settled by agreement between all parties having an interest in the area.[290] The recent Antarctic settlement, though explicitly limited to a term of years and purporting not to affect particular claims, would appear to be in fact a general community rejection of all particular claims and to reflect a growing consensus that areas which cannot be effectively occupied may not be made subject to exclusive appropriation.

The degree of comprehensiveness in occupation required for the exclusive appropriation of islands, as we have seen above, has varied widely in accordance with the differing characteristics of the islands claimed. When an island has been of strategic significance or rich in resources, states have commonly engaged in extensive settlement and colonization to establish their interests; when, on the other hand, the island has been unimportant, desolate, and uninhabited, the accepted practice has been that a state may carry out merely such periodic acts of governmental authority as sufficiently evidence its continuing claim.

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288 For fuller account see CHRISTIE, *op. cit. supra* note 287, at 263-85; Waldock, *supra* note 285, at 331-33; JESSUP & TAUBENFELD 145-53.

289 1 HACKWORTH, DIGEST OF INTERNATIONAL LAW 399 (1940).

290 INTERNATIONAL LAW 192-94 (Kozhevnikov ed. 1961). See also JESSUP & TAUBENFELD 157.

The United States has, for example, been permitted by other states to acquire a large number of islands under its Guano Act, passed in 1856, which provides in part that:

> Whenever any citizen of the United States discovers a deposit of guano on any island, rock, or key, not within the lawful jurisdiction of any other Government, and not occupied by the citizens of any other Government, and takes peaceful possession thereof, and occupies the same, such island, rock, or key may, at the discretion of the President, be considered as appertaining to the United States.[291]

Thus, in 1857, United States citizens discovered guano deposits on the island of Navassa, located approximately 30 miles from Haiti. Haiti claimed that the island was under its sovereignty on the basis of proximity to its territory. In a note to the minister of Haiti, the United States asserted that since Haiti was unable to show an actual possession and use of the island, or an exercise of jurisdiction over it, her claims to sovereignty could not be supported. After a further exchange of notes, the Haiti claim was dropped.[292] A similar dispute developed between the United States and Peru over Lobos Island, in which the United States also insisted that actual possession and use were necessary to maintain title despite the relative proximity of the island to the Peruvian coast. Peru, however, was able to show that it had exercised jurisdiction over the island for a considerable period of time, whereupon the United States withdrew its claim.[293]

The proximity of one land mass to another has seldom alone been made the basis of claim to exclusive appropriation, but has often been regarded as an important factor, affecting the extent and type of activity necessary to constitute effective possession.[294] The bearing of proximity upon general community policy must obviously vary greatly with circumstances: in some instances, claims to vast areas merely upon grounds of proximity by states who have made no efforts, and perhaps do not even have the capabilities, to develop and exploit the areas, would clearly run contrary to the general community policy of promoting maximum utilization of resources; in other instances, states in closest proximity to *terra nullius* may have the greatest capabilities for its efficient exploitation.

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291 1 MOORE, DIGEST OF INTERNATIONAL LAW 556 (1906).

292 *Id.* at 266-67.

293 *Id.* at 265-66, 575.

294 See generally LINDLEY, THE ACQUISITION AND GOVERNMENT OF BACKWARD TERRITORY IN INTERNATIONAL LAW 228-31 (1926); 1 HYDE, *op. cit. supra* note 276, at 343-46; Von der Heydte, *Discovery, Symbolic Annexation and Virtual Effectiveness in International Law*, 29 AM. J. INT'L L. 448, 470-71 (1935); Waldock, *supra* note 285, at 345-49. SMEDAL, *op. cit. supra* note 274, at 42-44, appears to reject even such limited relevance of the factor of contiguity.

It may be recalled that the claim of the United States in the *Island of Palmas Arbitration* discussed above, was in part based upon considerations of "contiguity," the technical term for referring to proximity when a body of water separates two land masses. Certainly, the opinion of the arbitrator in that case contains one of the clearest rejections of the efficacy of proximity alone as basis for exclusive claim. He stated:

> In the last place there remains to be considered title arising out of contiguity. Although states have in certain circumstances maintained that islands relatively close to their shores belonged to them in virtue of their geographical situation, it is impossible to show the existence of a rule of positive international law to the effect that islands situated outside territorial waters should belong to a state from the mere fact that its territory forms the *terra firma* (nearest continent or island of considerable size).[295]

In contrast, the allocation of the islands in the Arctic illustrates the importance that proximity may have among other factors in determining decision. Historically, Canada has claimed all the islands to her north, but she made no intensive effort to extend effective occupation until 1922, since her claim to these islands had never been seriously challenged by any other nation.[296] The Soviet Union has made claims also to the islands to her north, and the only challenge to this claim was in the case of Wrangel Island.[297] Neither Canada nor the Soviet Union has, however, relied upon contiguity alone and both have carried out acts in occupation of their northern islands.

Considerations of proximity have of course played an important role in disputes concerning the boundaries of exclusive use. The question often raised is as to the extent of the area embraced by activities undertaken in assertion of such use. It is obvious that comprehensive activities cannot be conducted upon every small bit of territory claimed. Proximity has on occasion been taken into account in permitting a state to establish exclusive appropriation of areas which form a geographical whole, even though the entire area has not been subjected to activity. This policy serves both to minimize disputes and to promote efficiency in the exploitation of areas which exhibit geographical unity.

The bearing of proximity in this contest is illustrated in the British Guiana and Venezuela Boundary Arbitration of 1899.[298] In this dispute

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295 22 AM. J. INT'L L. 887, 893 (1928).

296 SMEDAL, *op. cit. supra* note 274, at 35-36, 64-67.

297 *Id.* at 9. See also 1 HACKWORTH, *op. cit. supra* note 289, at 464-65.

298 See LINDLEY, *op. cit. supra* note 294, at 228, 273. See also our discussion of other phases of this arbitration, pp. 619-20 *supra*.

Venezuela claimed that it was unnecessary to show acts of occupation and control in every inch of territory and that, where an area formed a geographical unit, acts of occupation in a part would give sovereignty to the geographical whole. Britain did not deny the authority of this argument, but contended that the areas Venezuela was claiming did not form part of a geographical whole with Venezuelan territory. Britain insisted that the line which she claimed to be the boundary was based upon the physical features of the country, and suggested that delimitation should depend, first, upon the extent of effective occupation and political control on each side of an asserted boundary, and second, upon the natural features of the country. The line drawn by the arbitrators, in the main, followed that claimed by the British.

The length of time during which claims to exclusive appropriation have been asserted has, despite the absence of any generally accepted doctrine of prescription in international law, also on occasion been an important factor in the recognition of the lawfulness of claims.[299] The policy relevance of this factor is in its bearing upon the maintenance of stability in expectations, for the promotion of both minimum and optimum order. The clearest example perhaps of a community decision-maker giving effect to this factor is to be found in the *Island of Palmas Arbitration,* discussed above. In this case, as we noted, the Dutch based their claim to sovereignty on "the title of peaceful and continuous display of state authority over the island."[300] The arbitrator identified the basis of this claim as "so-called prescription," and observed:

> If the claim to sovereignty is based on the continuous and peaceful display of state authority, the fact of such display must be shown precisely in relation to the disputed territory . . . what is essential in such a case is the continuous and peaceful display of actual power in the contested region.[301]

He stated further that the display must be "open and public" and found that the Netherlands' title met these requirements since it was based upon a "continuous and peaceful display of state authority during a long period of time going probably back beyond the year 1700" and never previously contested.[302]

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[299] For general discussion see Johnson, *Acquisitive Prescription in International Law,* 27 BRIT. YB. INT'L L. 332 (1950); 1 OPPENHEIM, INTERNATIONAL LAW 575-78 (1955); LINDLEY, *op. cit. supra* note 294, at 178-80; 1 HYDE, *op. cit. supra* note 276, at 386-90; 1 HACKWORTH, *op. cit. supra* note 289, at 432-42.

[300] The Island of Palmas, Arbitral Award (United States v. The Netherlands), 22 AM. J. INT'L L. 867, 908 (1928).

[301] *Id.* at 896.

[302] *Id.* at 909-10.

The sum of all this historic practice of the general community in the allocation of the major land masses of the earth would, thus, appear to confirm that the effective occupation which has in common consensus been regarded as necessary to legitimize exclusive appropriation has been a very comprehensive process, embracing a wide range of activities which have extended through a substantial period of time. This process has most often been considered to include both an expression of intent to appropriate, the *animus occupandi* as exhibited through symbolic ceremonies or other public notification, and an actual occupation, a *corpus occupandi* established by putting people into the area and actually exploiting its resources, with an accelerating integration of the area into the authoritative processes—political, economic, and social—of the claimant state.

The comprehensiveness in occupation and intensity of activity required have observably varied in some measure with the physical characteristics of the area being claimed and other features of the context. Thus, though the introduction of some nationals or other agents of the claimant state into the area claimed has usually been regarded as essential to effective occupation, the most intensive settlement has been required only in temperate zones.[303] The few exceptions which have been made to the requirement that representatives of the claimant state be introduced into the claimed area have related principally to barren areas, largely devoid of resources and publicly claimed over a long period of time without protest by other states. The very recent settlement with respect to Antarctica suggests, further, that in contemporary expectation, when areas are of genuine concern to many states, intensive settlement and development, however difficult or uneconomic, cannot safely be omitted. The most fundamental policy established by the general community with respect to the modalities for acquiring unappropriated resources, when it permits them to be subjected to exclusive appropriation, would appear, accordingly, to be that of encouraging peaceful use and development by protecting priorities only in such use and development, and not in mere egocentric claim.

B. Experience in the Allocation of the Minerals of the Earth

The practice of states in the allocation of the mineral resources found within their boundaries reflects policies comparable to those pursued by the general community in its allocation of the major land masses. For the preservation of internal minimum order, including

[303] For summary discussions see 1 OPPENHEIM, INTERNATIONAL LAW 557-58 (1955); 1 HYDE, *op. cit. supra* note 276, at 330; LINDLEY, *op. cit. supra* note 294, at 140-41; Waldock, *Disputed Sovereignty in the Falkland Islands Dependencies*, 25 BRIT. YB. INT'L L. 311, 324-25 (1948).

both the preclusion of violence and maintenance of stability in expectations, states have commonly prescribed with respect to mineral resources regarded as within the public domain a very definite set of procedures which must be followed by all who seek to establish exclusive acquisition. For the promotion of optimum order, states have also commonly imposed a variety of requirements designed to guarantee the development and use of the resources and to prevent hoarding.

The procedures most often prescribed for establishing exclusive acquisition of mineral resources within a state's public domain bear considerable resemblance to those employed by states in their purported symbolic annexations of major land masses. Thus, an intending claimant, after obtaining appropriate license or other permission, is often required to proceed to actual discovery and location of the minerals before making claim. Once discovery and location are achieved, the next step commonly required is that of staking, by markers or otherwise, the boundaries of the claim. The final required step is that of public notification, usually through some form of registration, of the name of the claimant and of the location and extent of the claim.[304]

The requirements commonly prescribed for the continued maintenance of an exclusive right to take minerals bear a corresponding resemblance to the activities we observed as necessary to establish the effective occupation of major land masses. Such requirements, in the interests of optimum order, often place a limit upon the size and number of claims which any one person can make, and provide that if a minimum degree of exploitation is not accomplished within a specified time, the claim lapses and the area is open to others for acquisition.

The proposed protocol drawn up by the conference at Oslo in 1912 for settling the Spitsbergen controversy may be invoked as an example of the application in an international arena of private law provisions for

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304 See ELY, SUMMARY OF MINING AND PETROLEUM LAWS OF THE WORLD (1961). Professor Colby in *The Freedom of the Miner and Its Influence on Water Law*, in RADIN & KIDD, LEGAL ESSAYS IN TRIBUTE TO ORRIN KIP MCMURRAY 67 (1935), points out that: "The available record of the mining laws of different countries throughout the ages establishes the fact that there is a remarkable uniformity of underlying principle in these usages and customs." He finds the source of these principles in Roman law and traces their influence upon the mining law of Germany of the Middle Ages, and from there, throughout the world. SMIRKE, STANNARIES OF CORNWALL 83 (1843), in describing the medieval mining law of Germany states:

> Upon the discovery of a vein or other mineral deposit, he is entitled, as of right, to a grant of a certain measured space of ground for the purpose of pursuing his discovery; and the ceremony of bounding this areas is announced by three consecutive proclamations. The demand made upon the Bermeister, or other local officer of the sovereign, cannot be refused unless there be conflicting claims, in which case the first finder, and not the first claimant, is entitled to preference. The interest of the concessionary is permanent, assignable, and transmissible; but is subject to the obligation of continual working, or payment of the tenth or other proportion, and of a small fixed quarterly rent.

As quoted in RADIN & KIDD, *op. cit. supra* at 69.

the acquisition of minerals.[305] The islands of Spitsbergen were, during the 19th century, generally considered *terra nullius,* with only an occasional visit being made by whalers, fishermen, or hunters. At the end of the century, however, important coal and iron deposits were discovered, and the staking out of claims by nationals of various countries shortly followed. At the suggestion of Norway a conference was held in 1910, at which time Norway, Sweden, and Russia were authorized to draw up a suggested protocol which was completed by these three powers in 1912.[306] After providing that "nothing more than rights of occupation and exploitation" could be acquired, and setting out the qualifications necessary for filing claims, section IX of the agreement laid down the procedures for establishing rights of exploitation. It required that claims be carefully measured and not be excessive. If no valid objections were alleged, a "provisory certificate" was issued and the claim registered; however, such a certificate was forfeited if the claim was not exploited within six years.[307] A conference called in 1914 to enable the interested powers to consider the protocol never met because of the intervention of World War I. In 1920, a treaty was signed in Paris by the interested countries giving Norway sovereignty over the archipelago of Spitsbergen, but providing that all the contracting parties should have inclusive access and the right to exploit minerals. The issuance of appropriate regulations was, however, left to Norway.[308]

VI. Probable Developments With Respect to Space Resources

The probabilities are, as we have sought to document above, that general community consensus will include only certain stock resources, such as minerals, among the space resources which may be subjected to exclusive appropriation, and that the spatial-extension resources of the celestial bodies will be maintained as sharable resources, open to free access by all. Further, so long as the general community maintains its past requirement of relatively complete effective occupation for the exclusive acquisition of such resources as may be appropriated, this requirement about the modalities of acquisition will, because of the technological difficulties and high costs of establishing effective occupation of space resources, serve to reinforce the more substantive policies affirm-

[305] For a more comprehensive account see Jessup & Taubenfeld 34-39. See also 1 Hackworth, *op. cit. supra* note 289, at 465-68. An historic background to the controversy is offered in Gray, Spitsbergen and Bear Island (1919).

[306] Information about and a summary of the protocol is available in *id.* at 26-40.

[307] *Id.* at 32.

[308] Spitzbergen Treaty, Feb. 9, 1920, 43 Stat. 1892, T.S. No. 686, 18 Am. J. Int'l L. 199 (Supp. 1924).

ing common interest in the greatest possible inclusivity in the enjoyment of space resources.

In the eventuality, however, that the general community should come to tolerate the exclusive acquisition of the surfaces of the celestial bodies, it would still appear in the common interest that the community should impose the most stringent requirements of effective occupation for the establishing of such exclusive acquisition. The technological achievements and expenditures thus made necessary might serve to limit the area which any single state could claim, enabling other states to share in the resources of these bodies. It may be added that the factors which were influential in the honoring, upon relatively unsubstantial occupation, of the claims to the small and unoccupied islands of the Earth will not be likely to prevail with respect to the celestial bodies. Whether or not the celestial bodies are rich in resources, they are—unlike the small islands—already of extraordinary concern to all the peoples of the world. This concern could not be better illustrated than in the race between the Earth's two greatest powers, each indulging in expenditures highly extravagant by all prior standards, to reach the Moon. Even conceding the correctness by standards of contemporary expectation of the decisions in the *Clipperton Island* and *Palmas Island* cases, it is scarcely conceivable that the amount and type of activity which was in these cases held to constitute effective possession could be regarded as sufficient, in contemporary context, to establish exclusive dominion over the Moon or any other major celestial body. As capabilities for space exploration improve and become more widely diffused, the peoples of the world can be expected to become increasingly concerned about the use and enjoyment of the celestial bodies and, hence, increasingly to insist upon their common interests in the widest possible use and enjoyment. Proximity can, of course, have little relevance in the immensity of the void of space, and exclusive claims are not likely to go uncontested for any substantial period of time.

For regulating the exclusive acquisitions of such mineral, or other stock resources as it may make subject to such acquisition, the general community might well adopt policies comparable to those which we observed to be employed by many states in their allocation of internal mineral resources, and which were suggested for the Spitzbergen controversy. The adoption of such a system would include both the establishment of a set of procedures for the assertion of claim and the imposition of certain requirements for insuring reasonable development and use.

In terms of procedures, states discovering mineral or other stock resources would be required to erect some standardized type of markers, carrying the name of the claimant state and indicating the boundaries

of the claim. The staking of claims in this manner could be made a bar to invasion by others for a period of time sufficient to permit the claimant to register its claim with an international agency, established for the purpose. Registration with such an agency could be made to serve as notice to the world of the exact nature and extent of the claim and as evidence of title.

In terms of substantive limitations, any exclusive rights permitted to be acquired should be clearly limited to particular stock resources, and should not include the right arbitrarily to bar the access of others to the same area for other purposes. Limits might also be set upon the amount of stock resources subject to claim in particular contexts, with appropriate measure of taking related to such factors as the type of resource, the uses to which the resource can be put, the amount of capital required for development and use, and the number of other participants capable and willing to develop and use the resource. In situations in which, for example, the resources are needed for the supply of space stations or settlements, the amount appropriated could be made to depend upon the size and location of a claimant station or settlement, and the purpose of its establishment. Limits could also, finally, be imposed upon the time within which exploitation must be undertaken, with claims made to lapse in the absence of appropriate effort.

The outcome most insistently urged by the general community's rich experience in the allocation of Earth resources is, we would emphasize again, that the great bulk of space resources should be held open for inclusive enjoyment by all, and not made subject to exclusive acquisition. If, however, important space resources should come to be regarded as amenable to such acquisition, and especially if the spatial-extension resources of celestial bodies should come to be so regarded, some such procedures and requirements as we have outlined above, including a new international agency for the registration and regulation of claim, would appear indispensable to securing the common interests of all peoples, both those having and those still to achieve space capabilities.