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OUTER SPACE LAW: A PROBLEM OF ASTRONAUTICS

Vladimir Mandl

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16. Abstract

This paper discusses the theory of space law, primarily from the point of view of similarities and differences between hypothetical space law and current (1932) aviation law; international legal aspects are also discussed.

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TABLE OF CONTENTS

OUTER SPACE LAW:
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Vladimir Mandl
Doctor of Laws, Attorney in Pilsen

Part One--The Present

I. Introduction

To have thought about an enterprise does not mean simply 1*
to have prepared it, but it means rather to have carried it out. This is because whatever exists in the world of my mind is equally part of my experience, it has a reality, whether it is only and simply a mental picture, or also has a counterpart in the outside world; this equality of all perceptions which reach Earth, whether or not they are caused by any external stimulus, whether they arise because of visual, auditory capacity or touch, is reflected in the expression of psychic life, in the language. For the latter has no special forms for abstract versus concrete, while on the other hand it differentiates for example, the material from the concepts, the substantive from its conditions, the predicate. Through thinking, man acquires thus a mastery over any object just as by touching it, entering it or by the extenal possession. To have thought is, to some extent, to have done; both represent two types of conquest of the world of nature, only a quantatitive difference exists between them. If something has been well thought out, then more than the first step has been taken for the accomplishment.

Now when so many eminent minds are concerned with the problem of space travel, when in countless publications the possibilities of space travel have been discussed, and exact calculations have been carried out of the travel routes and times, this problem is

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*Numbers in the margin indicate pagination in the foreign text.

partly already solved, partly overcome, men will really travel through outer space; the only thing left is to raise the already existing solution quantitatively to a stage with which usually the representation of the actual existence, the narrower reality, is connected. Thus, if space missions already exist in the sense that /2 all possibilities for overcoming enormous differences between the heavenly bodies have been subject to careful consideration and have thus been experienced, no one can consider it premature for us to wish to study in this article the legal questions of astronautics.

But astronautics has moreover another reality: associations have already been established: "Verein für Raumschiffahrt" (Association for Astronautics) in Breslau, "Wissenschaftliche Gesellschaft für Höhenforschung" (Scientific Association for Cosmic Research) in Vienna, the money has already been collected for astronautical experiments and other types of contributions made towards promoting space travel; for a long time a special journal has been published, "Die Rakete", and extensive literature in this sector, both scientific publications and novels already are available; today's astronautical activity has culminated in the fact that we have gone from theoretical discussions to the preparations for a practical implementation, and finally from these preparations to experiments with space equipment. All this activity, which represents reality in the strictist sense of the word, promotes the construction of a new means of transport along with a new field of action and a new procedure, and since new purposes arise here, the activites must be defined teleogically according to their purpose for legal consideration, so that already even before the first space mission has been accomplished, several doubtful legal questions have arisen which concern astronautics.

The words "outer space" represent as a whole all parts of space, which are at all accessible to our imagination, while mostly our world, the narrower scene of our existence, is not included; the world represents all imaginable and at the same time "inhabited" space, on the other hand, outer space represents

the space which up to now could be entered into only in men's imaginations. For all problems of astronautics, the qualities of this outer space must be defined, whose dimensions, contents, temperature and suchlike are distinguished in the same way as the properties of sea or maritime navigation, and those of the air for aeronautics. Therefore, we consider it necessary to establish, besides maritime and air law, a law for outer space.

Just as maritime or air law contain the special provisions /3
which were required within the different branches of the law of the land taken as basis, when man ventured beyond the limits of terra firma, his natural habitat, we define the regulation of those legal questions that have arisen or will arise in future through the conquest of the universe, starting from the first attempts and experiments in this connection until the total conquest of the newly encompassed space areas, under the above indicated name of the law of outer space. We preferred this expression to the simple "space law" (droit de l'espace) and also to "etherized law" (droit éthéré, Laude in Revue jur. intern. de la loc. aér., 1910, p. 18), since this last designation seems to be less applicable because of the doubtful essence of ether, and the former because of its ambiguity. For want of such special provisions, today the legal problems of astronautics must be solved using the general existing regulations. Only later, when a special legal regulation is established, the norms of the law of outer space will be grouped according to history of legislation (specifically arising later), legislation technology (since they are established by special laws, as may be expected), and also logically (insofar as it concerns special problems) into a unit, a special branch of law and a special legal discipline; like maritime law, air law, commercial law among others, then the laws of outer space will also be established by sections from the ordinary branches of law, from public and private law, and for its part subdivided once again for example, in legal relationships of space (property, sovereignty), space travellers, spacecraft as well as auxiliary devices, space missions (traffic order).

The technology of astronautics is totally specialized as compared with aeronautics because of its special means and special purposes. Space travel begins, where aeronautics ends; the air, basis of aeronautics is an injurious, inhibiting element, at most a takeoff or landing place for space travel. As we know there is no lack of projects, of propelling a spacecraft before its own propulsion, by any auxiliary equipment, for example, airships, auxiliary rockets and suchlike, conveying them as high as possible, therefore in the most rarefied possible air layers, and beginning free space travel only outside the Earth's atmosphere; such projects exercise clearly the opposition between airspace and outer space and therefore the opposition between aeronautics and astronautics. Accordingly, the goals of astronautics are outside the range of aeronautics. With regard to these special travels of astronautics, the independence of the law of outer space even with regard to air law must be stated (also at present one must start to a certain extent from the provisions of the air law).

II. Terminology, Guidelines for Legal Judgement

We have already attempted to define outer space, the decisive element of all astronautic problems, as the space which is determined outwardly by the limits of all human ideas about space in general and inwardly by the limits above what man believes is accessible with the present means of transport. In the technical expressions "spacecraft", "space (craft) travel", "space traveler" and suchlike, namely the term "space" has been adopted in a sense which was previously not assigned to it "outer space", "cosmos", so that these expressions are now understood generally in their correct sense. In designating the corresponding branch of law, on the other hand, we wish to maintain the more exact term "outer space", to define clearly the object, travels in outer space, as compared with other legal space problems, for example those of aeronautics, radio, or any other "laws on space", etc. For example, it may be recalled, that even at the time when the words "airship", "aeronautics" etc. seemed to be unambiguous to everyone,

the term "air law" referred to the legal relationships of air as matter, its ownership, possession and suchlike (for example Jurisch, Basic Characteristics of Air Law* in 1897).

We will call space vehicle, spacecraft or spaceship any instrument which is obviously meant according to its design for space travel, that is, travel through outer space. This instrument must therefore incorporate the will of the inventor to penetrate through outer space, and obviously, that is, the will must be made apparent by the type and manner of vehicle. If anyone were to build an ordinary aircraft and entertain in this context the devout wish for the machine to rise up into the world of the planets, then this wish would not convert the instrument into a /5
spaceship in the legal sense, since the wish for space travel is not embodied in the design of the instrument. The recognizable purpose therefore constitutes the content of any legal concept. Legally, for example any object may be considered as a weapon, which is used for attack or for defense, even though this object could also be considered harmless from the scientific point of view, such as a stone, a piece of wood, etc.; as much as a rock, a wooden log or suchlike is intended for attack or defense, then we have immediately a weapon in the legal sense (for example, in the sense of §§123. 243, Nos. 5, 250, No. 1 of the Penal Code), assuming that the qualities of the object, the hardness, the size, etc. permit it to be considered as a weapon. To a technician, a rocket spacecraft, a rocket aircraft, a rocket ship, a rocket automobile, a congreve military rocket seem to be closely related; to the jurist, these are objects which differ essentially, they would rather associate a rocket spaceship and a projectile from Verne's moon gun because of their similar purpose of use as spacecraft. The main question of the technician, as to whether the vehicle is actually capable of space travel is not decisive for the legal considerations; even if the object does not rise one centimeter away from the Earth, it represents still a legal spaceship, insofar as its facilities indicate the objective, that is, generally conceivable purpose of space travel. It makes no difference

*Grundzuege des Luftrechts.

actually whether the instrument is to be manned or unmanned.

In a so-called stage rocket, a spacecraft, which consists of several rockets such that only one is meant for the space flight (the core), only this main rocket is considered an independent spacecraft, the other, auxiliary or take-off rocket (for example Tsiolkovskiy's launching rocket, the alcohol and auxiliary rocket of Oberth's model B) are only separate components, like ejected balloon ballast. On the other hand motorized airships, by means of which Professor Oberth also wants to bring his rocket to an altitude of 5500 meters before takeoff, are independent of the rocket inasmuch as they are guided, manned and can also be used for other purposes, so that they must be judged as independent aircraft.

For the legal terminology, the terms "space vehicle" and "space aircraft" should be preferred to "spaceship". This is because "ship" always indicates very large dimensions (compare ocean-going ship, airship), so that this name would not be very applicable for example, to a small unmanned space rocket. Such a relationship to size is far from the expressions "vehicle" or "aircraft". In this context it may also be mentioned that "travel" and also "flight" apply very well to designate the movement in outer space, since "travel" expresses in general any movement (insofar as no special expression has been adopted exclusively for any type of movement, such as in the case, for example, for "walk") and "fly" although it designates originally the movement with wings (ancient German root pleugh, plugh, Lat. pluma = feather) but at present expresses any fast or sudden movement (see Grimm, German Dictionary;* Kluge, Etymological Dictionary of the German Language;** Paul, German Dictionary*** among others

Special legislation on outer space, that is, possible regulations whose object would be exclusively legal relationships of space travel, does not exist at present. Therefore, to be able to solve the legal questions already arising for space travel

*Deutsches Wörterbuch; ** Etymologisches Wörterbuch des deutschen Sprache; *** Deutsches Wörterbuch.

according to the present status of the legislation, one should first survey whether there is possibly any area of law, which could apply directly here, that is without the help of analogy, whether therefore the existing legal texts could not be applied to situations of space travel. Of the regulations for different means of transport, this is indeed a new type of transport, obviously neither the motor vehicle nor maritime law can be considered, there remains only air law. There is something attractive about the idea of transferring the regulation of aeronautics as a whole directly to space travel.

There could be no doubt about the fact that the only instruments subject to the existing regulations of air law are only those which are meant and designed suitably, exclusively and only for movement in the air in the Earth's atmosphere. Thus the German law of August 1, 1922 speaks of air traffic, of air travelers and in particular, of aircraft, which according to the legal definition of §1 section 2 are "instruments meant for movement in the air space". The French air traffic law of May 31, 1924 defines "aéronefs" (aircraft) as "instruments capable of rising or circulating in the air", but here too the decisive elements must be considered the purpose, not the capacity, for moving in the air (already under the etymological aspects: aer in Greek = the air, nef in Old French = the ship). In the sense of the Italian regulations of January 11, 1925 "aeromobile" is a device which "using the static or dynamic buoyancy of the air, is capable of carrying things and persons" (article 1, section 1). And the American Air Commerce Act of 1926 defines under section 9: "The term aircraft means any contrivance etc. used, or designed for navigation of or flight in the air...". Actually the lists of certain types of aircraft, which are usually given here and there in the air laws (for example, the German air traffic law §1 section 2 "airships, aircraft, balloons, kites") are only given as an example, not as complete lists, so that if the instrument concerned were not indicated in the list it would not prevent the application of the law: also, for example rocket aircraft or recording rockets for upper

/7

layers of the Earth's atmosphere (project of Hoefft RH-1) should be judged according to the legislation of the air law. But the regulations of air law always apply directly only to those aircraft whose area of operation is limited by its purpose to air layers.

And if the air law applies to space travel only according to the text of the law, then it is immediately obvious that the legal problems of space travel as a whole cannot be included in any existing area of the law and that, at present, there is no law to regulate legal problems of space travel. The most extensive analysis of the existing legal principles would never lead to the desired purpose, to a legal regulation of space travel, so that we must take refuge in analogy.

Our problem would be simplified considerably, if among the objects of the present legal regulations we could find an object similar to some extent to a spacecraft so that it could be stated immediately that what applies to this object should apply in general also to space travel per analogiam; unfortunately space travel is a special type of activity and deviates from the previously known ones to such an extent that among the situations subject to laws so far, none can be found which is sufficiently similar to /8 the space travel situation so that all vehicle provisions which concern that regulated situation could be extended as a whole to space travel by virtue of general clarity. All the guidelines of aeronautic legislation do not apply to space travel, since the latter requires in some respects a special treatment, and in spite of their undisputed relationship aeronautics and astronautics deviate from each other in such a way that the intentions of the legislator would hardly be satisfied, if in the law text, using a general similarity we were to replace everywhere the term airship by spaceship.

If there is no general analogy, then we are finally compelled to solve each and every juro-legal problem which is

brought to us for decision in connection with a space travel situation separately and in itself, by seeking some similar situation in the existing legal situations, and using the legal regulation of this situation "per argumentum a simili sive a contratio"; only the special similarity, the similarity of individual regulations and not entire legal areas of laws may apply occasionally. And since in the accomplishment of air travel, situations occur relatively frequently which have their counterpart in space travel, it seems obvious now to take with the use of special analogy some principles of the air law in the first instance, although we have declared a priori that the direct application as well as the general transfer by similarity of air law to space travel to be inadmissible, and we will start from these principles of air law to come to individual conclusions by analogy; but our analogy must often be based on other branches of the law, also outside the air law.

III. Private Law

Can a landowner forbid flying or landing aircraft from using the airspace above his plot of land or does the right of free flight, which was granted by §1 section 1 of the air traffic law to aircraft, apply in the same way to spacecraft? The question must be answered in the sense that a space traveler can only call upon /9 §905 section 2 BGB ("but the owner cannot forbid actions, which are carried out at such height or depth, that he is not concerned in the exclusion"), but in establishing this item of the law, the generally valid basic principle of misuse of law must be taken into consideration: anybody is only justified to exercise a right insofar as there is a reasonable ground for this purpose, not simply to cause difficulties to someone else. This basic law applies already with regard to air space property in the following §906 BGB, to which we can also compare §12 of the telegraph route law of December 18, 1899. An interest in the exclusion from the use of the air space in the sense of §905 section 2 BGB does not apply if, for example there is only a

remote danger that any part might be detached from the spacecraft and damage the landowner, if the pollution from smoke, smell or noise is very slight or suchlike. Only in those regions where there is lively air traffic could a scale be applied regarding the extent to which the landowner must be influenced by the space travel, and consider the extent of the effect which is already caused by approved flight of aircraft over the landowner, the dangers of this flight or any other disturbance connected with it; since wherever a plot of land is already threatened and disturbed by air travel by virtue of §1 section 1 of the air traffic law, the owner has no longer any interest in forbidding the space travel, insofar as the local disturbance by space travel is not increased very much. If on the other hand, the plot of land is away from the air travel route, then the owner would under certain circumstances be justified to forbid such effects which do not exceed the extent of a permissible aircraft overflight; since, as already mentioned, §1 section 1 of the air traffic law does not apply in favor of space travel.

Just as for §905 BGB, the powers of disposal of the landowner above his land by assuming his interest are also limited, for example by article 667 of the Swiss Civil Code, article 2288 of the Portugese Civil Code. On the other hand there are still codes of law where, at least according to the text, the Roman principles "Qui dominus est soli, dominus est coeli et inferorum"* has retained it full strength, such as for example, in article 552 of /10
the French "Code civil" or in article 440 of the Italian "Codice civile". But even here the predominant opinion (even without taking into consideration the provision of article 19 of the French air traffic law of May 31, 1924) is that the effective rights of the landowner do not exceed his interests (compare Colin-Capitant, Cours élémentaire de droit civil francais (Elementary course of French civil law), 4th edition, vol. 1, p. 722), so that the landowner could not be entitled to forbid a harmless overflight by a space traveler over his air layers. The greater the distance of the air space from the Earth's surface, the less possibility there

*"He who rules the earth rules heaven and hell.

is for the landowner to make any use of this space, and the lower the effect of the production of smoke, smell, noise from that altitude on the plot of land, and thus, even before leaving the Earth's atmosphere, a zone is reached which is free from the interest of the owners of the land lying under it and therefore by private law is open to any use by anybody.

Damage is inflicted by a spacecraft (its crash, explosion or suchlike) on third parties (that is, those who are not involved with the space mission) either bodily or on their property; under what conditions will this damage be compensated and who is responsible? If this damage arises within the framework of any contract conditions (the victim suffers the damage during the exercise of his duty according to contract with the spacecraft, the damage affects persons or things which are involved in the mission by virtue of a promotion contract or suchlike) then there is a regular contractual liability for damages. If we are dealing with an extracontractual damage (persons not involved with the mission present at the takeoff or landing site were wounded or objects not involved in the space mission located in that area were damaged) then the question arises whether the liability extends only according to the principle of liability for direct responsibility (§832 BGB) or moreover, also for damages for which they are not at fault. The opinion is often put forward that the liability for damages which are not caused by fault should have a special provision, which concerns always only that legally listed cases and does not permit possible extension by similarity; the liability for fault should be the rule (for example, see Tuhr, general section of German civil law, vol. 1 p. 43). /11 Since a damage liability without guilt is not imposed by any law on the space traveler, his position would be very pleasant as compared with the automobile or aircraft owner or railroad operator; he could wait quietly until the victim proves some fault on his part, which in view of the novelty of the area (that is, space travel) and the lack of familiarity by the public and courts with it as well as in most cases because of the suddenness of the event causing

the damage would truly be a "probatio diabolica."

But since that time when Ihering was able to declare with some justification: "No damage compensation without guilt (in 1867 the guilt factor in Roman private law, p. 50) so many holes have been punched into the guilt principle in the damage compensation laws by so many legal provisions, that the liability without guilt is no longer the exception and we can now state that this type of liability is the dominant one in the area of transport law; in land, maritime or air traffic in particular where automotive drive power is used, the liability for damage compensation is mostly burdened without regard to the guilt. The spacecraft is a means of transport, and the capacity which is required from it makes it necessary to propel the spacecraft with motor power (mechanical force in the sense of §1 section 2 automobile law); here we understand by motorpower drive a means of movement in which actual forces are used but actually not directly, as in the case of human or animal traction, or sailboats, but by means of special devices which allow the release of suitable action of natural forces. A reaction engine (a rocket motor) is such a type of machine, and there is no project for space travel without machines, if we omit the product of an author's fantasy, which we own to Godwin (1638) or a Grimmelshausen (1659). It is most probable that each spacecraft will be designed as a mechanical vehicle.

Accordingly we must consider that the space traveler should provide compensation for all damages caused to third parties through the operation of the space vehicle, that is through the legal astronautical disposal of the vehicle, without regard to his guilt, and /12 that at most he may argue the guilt of the victim (similarly to §§1 liability law, 7 automobile law, 20 air traffic law). By "space traveler" we refer not only to the pilot of the spacecraft, but to any natural or legal person, who holds the spacecraft (in the sense of the legal definition, that is for preparation, for implementing or accomplishing a space mission, and specifically pursuing his own purposes), or undertaking space missions (even if it is not

personally, but only with unmanned equipment). The minimum of the liability for space traffic must reach individually the validity of the air traffic liability, since both types of transport are extremely closely related with regard to the type and manner of damage.

According to article 1384, French civil code ("one is responsible not only for the damage caused by one's own action but also for that which is caused by the action of persons for whom one is responsible, or things which are under one's responsibility") or according to article 153 of the Italian civil code with similar context, the guilt-free liability of the space traveler is even more clearly apparent, and even the English doctrine is in favor of compensation of the damage even in the absence of any guilt (absolute liability) under hypotheses which apply undoubtedly in space travel or in astronautical experiments (compare Pollock, The Law of Torts, 13th edition, p. 500 ff., Salmond, The Law of Torts, 7th edition, p. 12 ff.).

If a spacecraft causes damage, when landing, to the property of a plot of land, here the exercise of a lien which amounts according to §273 section 2 BGB to the damage compensation claim does not stand in the way of a similar prior right, which applies to the aircraft save by virtue of §12 section 2 of the air traffic law, since a similar application of this special paragraph would be quite out of place.

Perhaps one should not refrain from mentioning that a franchised company, whose legal purpose is only air travel, cannot on its own extend its radius of action to space travel (see §43 last section of BGB).

IV. Public Law

We have stated above that it would often be very difficult for the victim to prove the guilt of the space traveler by civil law,

because with regard to the novelty of space travel, there has been little experience, let alone regulations on the precautionary measures to be applied. This does not mean that we have said that there would be no guidelines by which one could judge whether the behavior of the space traveler was appropriate or not under the given circumstances, and whether he had been criminally negligent or not. The only question is whether we could find law standards necessary for prosecution (nulla poena sine lege)?* /13

For the moment there are no special protective standards for space travel (in the sense of §823 section 2 of the BGB) in which for the purpose of avoiding dangers and where prescribed, it is stated how a traveler should proceed to satisfy his obligation of care; this defect in the standards is easily comprehensible in view of the present situation with regard to the problem of space travel. The thorough regulation of air travel (in the German State by the law of August 1, 1922 along with the decree of July 19, 1930) does not apply directly to space travel, as was already indicated, and it would therefore be premature to wish to prove guilt vehicularly simply with the circumstance that the space traveler has not followed some air traffic regulation; the penal provisions of §§31, 32 of the above indicated air traffic law of August 1, 1922 do not apply to it.

However the space traveler is committed to every general obligation to take precautions, whose nonfulfillment could result in punishable consequences by virtue of a penal code (§§230, 309, 314, 316--318a, 326, 360 ff.) along with secondary laws, since everyone must fulfill their duty of not endangering general safety and preventing damages. The contents of this general obligation to take precautions, that is, the definite type and manner in which one should proceed in any case, depend on the specific circumstances; certainly anyone producing explosives must take different precautions from a person preparing foodstuffs. For the space traveler the required measures of security will arise from situations which occur possibly in space travel, from the condition of

*No punishment without law.

the means used by him.

Before takeoff, the material (the spacecraft and the ground devices) and personnel must be checked to make sure that both satisfy the required qualifications, while the regulations regarding testing and approval of aircraft as well as pilot or aeronautical personnel do not come into question; each astronautic company must judge at its own risk whether the instruments and the crew have the necessary qualifications so that their use would not justify the claim of negligence and in case of need it could claim immunity from criminal prosecution. For rocket equipment, if necessary, one should satisfy in sequence all the legal regulations on the preparation, storage and treatment of explosives (compare §367 No. 4--6 penal code); since these regulations apply wherever explosives are used, and moreover, one should do whatever seems appropriate under the circumstances, according to experience. It may be noted by the way, that the rocket experiments certainly represent a "permissible purpose" in defense of §8 of the explosives law of June 9, 1884. Insofar as work is carried out with fuels, the regulations of the firefighting police apply, and a solenoid gun or Ulinski's electronic rocket would make it necessary to take precautions with regard to high intensity electric current. The design of the airport must also correspond to the propulsion force used each time. /14

Let us consider the takeoff of the spacecraft. Before starting the actual space mission, the latter has to pass through the lower layers of air, where is seems possible to encounter aircraft. The space traveler must either make sure that by announcing his space experiment, blocking the takeoff site, organizing a warning service or suchlike, the collision with an aircraft is prevented, or during the flight through the layers of air he must follow the regulations of air traffic. It may be emphasized once again that the space traveler is not formally bound by the regulations on evasion, by the regulations on atmospheric layers and suchlike according to air traffic ordinances, but he is bound by the contents,

that is, materially he must expect that the aircraft pilots must fly according to these rules, and therefore that a collision or other damage could best be avoided by following these rules. Following the traffic rules of air law represents the content of the general obligation for taking precautions, and it is not the judge, but the expert who will be called upon to decide whether the space traveler should proceed according to that /15
regulation or not. The judge should state that the rule would not apply to the space traveler; the specialist judges whether, for example, the space traveler in case of his craft encountering an aircraft should proceed according to §72 section 1 of the air traffic ordinance or 26, 27D annex of PLA,* or whether a different procedure would be preferable. Here in case of deviation the question remains open as to whether a spacecraft should be given preference with regard to its small maneuverability in the priority sequence of §73 of the air traffic ordinance or 21 D annex of PLA, or whether the same must apply to all aircraft in view of the suddenness of the appearance. Similarly perhaps, an aircraft pilot if he were to find himself in road traffic at the time of takeoff or landing, should observe certain road traffic regulations, to avoid accidents, also he is not formally bound in any way by such regulations (the technical obstacles which would stand in the way of the actual occurrence of the situation given as an example may be omitted from consideration). On the water, the aircraft pilot is directly bound by the regulations of the river and ship navigation police according to §77 of the air traffic ordinance.

The fact that villages, construction works, centers of population should be overflown only at a proper altitude, that one should not fly under bridges or high tension lines and antennas, is not imposed on the space traveler by virtue of §§78--80 of the ordinance on air traffic, but also by virtue of his general obligation for taking precautions. He should certainly also not throw out any object (the permissible ejection of ballast is not relevant here!), since such a procedure obviously implies public

*PLA = Paris air traffic agreement.

danger, and the space traveler must take care that the solid parts which are detached from the spacecraft according to prior calculation (used auxiliary rockets) should reach the ground in a safe manner (see §366, No. 8 penal law). For safety reasons the landing bans of aeronautics should be observed; for the rest, space travel, like any other action subject to the government, is subject to police inspection, and since obedience to the police is one of the duties of any citizen, a spacecraft has to land "in the next suitable place", as long as the official landing call /16
takes place by virtue of §84 of the air traffic ordinance or in any other comprehensible manner.

By fixing an air blockade zone, this space is blocked for military or any other public reason to all traffic, including spacecraft; a similarly absolute nature (that is, applying to everybody) applies to the bans on carrying photographic or radio equipment (here moreover, the provisions of radio law, in particular the law of January 14, 1928, apply), weapons and firing requirements and suchlike, consequently they also apply to the space traveler. Moreover, by penetrating into a military air blockade zone and by taking photographs, one is exposed to the same danger of becoming guilty of a criminal act according to the general law against the betrayal of military secrets of June 3,1914. Neither can the space traveler disregard a customs border, without incurring a penalty; the union custom law of July 1, 1869 makes no distinction in its penalty provisions as to how the goods were brought over the border.

The civil and penal responsibility of the space traveler is regulated by the present legislation with such completeness that for the moment it leaves hardly anything to be desired; on the other hand, the so-called simple ordinance regulations are totally absent, and the specialty of such proscriptions, which are indeed always connected very closely with the objects regulated in them and only apply to them, makes it impossible to obtain help by similarity with other sectors of the law, primarily air law. A

spacecraft does not need to be classified in the role of an aircraft or to carry either altitude or classification symbols, nor even license or aircraft pilot certificates, to carry logbooks, etc. No special type of illumination is prescribed for the case of darkness and it is sufficient that a space rocket should be rendered visible at night through its fiery wake. For the pilot of a spacecraft the personal limitation of §4 of the air traffic law does not apply, the training of the personnel is free to anyone, likewise space companies and organizations. The airports and ground organizations must be erected only under the aspect of general safety (perhaps observing the regulations for explosives and fuel), not according to any special regulations of aeronatutics. /17 The liability does not require any compulsory insurance.

On the other hand, a space travel device does not enjoy the special immunity from prosecution which was granted to the railroads by virtue of §§315--316, to the telegraph stations by virtue of §§317--318, to the pneumatic post and telephone equipment by virtue of §318a of the penal code, the aircraft by virtue of §33 of the air traffic law, and since the principle of "nullum crimen sine lege"* prevails in the penal law, a similar extension of the already mentioned regulations to space equipment would not be permissible. Even less does space travel enjoy a preferred law of expropriation; one cannot by similar use of §15 of the air traffic law for purposes of space travel remove or limit property or other rights to a plot of land. Such a conclusion by analogy would be falsified here in particular because the property is protected from the condition (article 153) and its expropriation could only be carried out on a legal basis and only for public good.

Will the future legislation with regard to space travel be subject to the state or are the districts competent in this area? According to article 7 No. 19 of the Constitution of the State, the latter provides generally the legislation regarding auto vehicles on the land, the water and air, that is all traffic involving

*No crime without law.

motor vehicles. Accordingly the state is also responsible for legislation on the traffic for spacecraft, since the latter are designed in every case as (auto) vehicles, as already mentioned above. Moreover, the above indicated concept standard talks of "traffic in the air", not "traffic with aircraft", and since each spacecraft must travel necessarily in the air, even though perhaps only in passing, it is subject to the legislation of the state, the range of action of the state's traffic ministry.

In foreign countries the same legal prerequisites exist preliminarily for space travel as we have found them in the German state: in the absence of any special regulations there the space traveler is bound by general national duties of taking precautions and obedience, space travel is not included in the special air travel regulations.

V. International Law

In the Paris air traffic agreement of October 13, 1919, the contracting states recognized each other's territorial sovereignty in the air space (article 1: "The above contracting parties acknowledge that each power has total and exclusive sovereignty over the atmospheric space above its territory") and thus the question as to whether the air space is free from state authority or on the contrary, subject to it, a question which has been much disputed since the end of the 19th century, has been answered in favor of the air space sovereignty theory rather than the theory of the freedom of the air. The above mentioned article 1 of the PLA (Paris air traffic agreement) expresses the result arrived at by the military practice during the World War, while in the theory of the pre-war period, the idea about freedom of the air dominated, and was put forward even after the war (see, for example, the resolutions of the Institute of International Law at the meetings in Madrid in 1911 and in Brussels in 1927). Just like the Paris agreement, two other group contracts, specifically the Spanish American air agreement of November 1, 1926 and the Pan American

one of Havana, February 1928 approve the viewpoint of national air sovereignty and approved the sovereignty clause as article 1. At present the principle of air sovereignty constitutes the principle of the international common law, which is not mentioned explicitly in most contracts between countries, but is assumed implicitly.

The range of principle of national territorial sovereignty in the air space extends far beyond the limits of air travel; this principle reserves rather to any country the right to exercise sovereign rights over the use of the air space lying over it, whether this use is implemented by air travel or otherwise, including for the purpose of space. As soon as a spacecraft enters the air sovereignty zone, it is under the authority of the state.

In article 2 of the PLA, the contracting countries have engaged mutually to assure during peacetime the right to safe air travel over a territory to the aircraft of the other contracting countries. This approval of free traffic applies exclusively for aircraft, and no contracting country is obligated through its adhesion to the PLA to accept the passage of spacecraft from other signatory countries over its territory, even if /19 the spacecraft has satisfied all the requirements of the agreement (which could hardly be possible, since the provisions of the PLA were adjusted only to aircraft). Certainly it was the intention of the contracting parties in the PLA to approve only the air transport means available at that time and this will was reproduced totally in the text; a similar application for new, untested and very dangerous instruments, as the present space rockets are, would not be consistent with the objective clarification of the intention of the contract. We would like to explain very generally that no international agreement on the regulation of air traffic concerns traffic of spacecraft between countries, so that a spacecraft which would fall in the air space of a foreign country could not call upon such an air agreement with its own country, that is, the country from which it came. Personally the space traveler would be entitled to the proceedings which the foreign

country assures for its citizens, and the fate of the spacecraft will be that of other mobile objects in foreign countries.

Peaceful international traffic of aircraft is very different from the traffic of spacecraft. On the other hand, if it is desired to use space equipment, whether manned or not, as warfare agents, all the aspects would apply which apply for the international regulation of war by means of aircraft, in particular the characteristic vertical direction of combat, the possibility of attacking cities and villages lying outside the actual combat zone, the speed, any danger which exists for the crew in case of damage to the aircraft, etc. Accordingly, the present air battle law could apply almost literally to spacecraft.

Part Two--The Future /20

I. The National Law

We have already seen that up to now space travel has not reached a point in its development at which the legislature feels obliged to establish precautions (Minima non curat praetor).* Upon judging by the increasing interest in all questions in this area, however, that time is not far away. We would hope that no accident would happen during any astronautic experiment, which would be the last motive for legislative regulation, although in the transport law, catastrophes and the establishment of laws are extremely often related (compare the establishment of new liability laws, the Austrian one of March 5, 1869 and the German one of June 7, 1871, after the serious collision of trains in 1868 in Horschowitz at Pilsen in Bohemia); since where there is no such unfortunate motive, the legislation usually treats all new inventions in a step-motherly manner at the beginning (compare the banning of the Montgolfier balloons in France by virtue of the ordinance of April 23, 1784, the English Locomotives Act of 1865, among others). Possibly some scientists may establish a peculiar theory, that because of the rocket experiments, the topmost layers of the Earth's atmosphere, insofar as they are rich in hydrogen, could be ignited, because of which a general ban on space travel would be proposed, to prevent a devastating worldwide conflagration. But if, in the future, space is to suffer from periods of legislative disfavor, hopefully this development stage of space law will not last long and several promising experiments will soon cause a change in the legislature's distrustful attitude toward problems of space travel.

Even before this legislative encounter takes place, certainly a basic revision of air legislation and probably also automobile /21
legislation must be carried out. This is because the designers of aircraft and automobiles will enjoy the fruits of astronautic research before astronautics itself can enjoy these benefits. For

*The governor does not concern himself with small matters.

their part automobiles were the very first to use the improvement of the gasoline engine, which arose because of aircraft technology, and now once again automobiles and aeronautics will adopt for themselves the means of propulsion of astronautics (the rocket automobile experiments of Fritz v. Opels are known to everybody).

By using the same means, the technology of aeronautics will come very close to that of astronautics: rocket aircraft with the smallest possible bearing surface will convey travelers or mail in the high layers of the air with an undreamt speed, the atmosphere will be investigated up to the highest zones by recording instruments of extraordinary climbing force, during a war remote airborne torpedoes will be used, without leaving in this context the basis of aeronautics. The technical similarity of spacecraft and aircraft will be closer, the smaller the powers furnished by the first spacecraft; at the beginning they will hardly penetrate above the so-called stratosphere and thus, actually travel only over slightly extended aircraft routes without actually losing their intended purpose, that is penetrating into space.

As a result of the adoption of astronautical technology and the corresponding increase in velocity and in climbing power, in the near future, aeronautics will be so different from the present day level, that the present provisions of air legislation will no longer be suitable for the new state of the art. There will be new traffic regulations (safety measures), new directives with regard to licensing and the certification of equipment and personnel, with regard to airports and suchlike. And on this occasion, probably, the legislature will also come out in favor of the technically related spacecraft, by stating: "The term aircraft in the sense of this regulation applies also to all instruments which are meant for traffic above the air layers", or something similar.

Astronautics will not remain stuck in this stage, but will have an improved, more powerful aeronautics. Its range of action will

gradually increase by hundreds of kilometers of altitude, the /22
achievable velocities will accordingly increase by several kilometers per second, so that finally it will be possible to carry out shorter space trips, not more than a round trip to the Moon. But these space missions can only be carried out with those means presently available only with extreme increase of the power, and with enormous capital expenditures; the required payload will be relatively small and consist mostly only of automatic steering and observation instruments, until finally, toward the end of this period here and there, there will be a couple of dare-devils who will accomplish it, despite great probability of failure.

Such advances will represent one of the greatest successes which were accomplished in technology, although the final purpose of astronautics, the exploration of remote outer space with relatively safe and economic transport of considerable payloads, will take a long time; in any case these advances will be sufficient to reveal clearly the peculiar characteristic by which a space mission can be characterized as compared with any other type of transport, and astronautics will be free from being equated to aeronautics by legislation. Voices will be raised loudly demanding a special astronautics regulation, according to proper laws on outer space, that is, legislation which would be adjusted to all the characteristics of space travel detected at this state of the development.

The fact that there would be a sufficient number of such peculiarities cannot be denied by anybody. The scientifically studied projects of today give us already an idea as to the grandiose nature of the lifting off of a spacecraft. It will have to be an enterprise of colossal expense, since, for example, in jet engine drive the initial weight of the space rocket will be at least a hundred times the final weight (= the payload) (the exhaust gas velocity may still be possibly very small). Professor Robert H. Goddard calculates, for example, that 602 kg of fuel will be needed to bring 1 kg above the gravity limit of the Earth;

it is indisputable (see calculations of V. Hoefft, Oberth, Hohmann among others) that the takeoff weight of a space rocket even for a payload less than 100 kg will come to several thousand kg. And /23
what could one include in 200 kg of payload, when for example the weight of the cabin, in which Professor Piccard and Engineer Kipfer were able to close themselves for 17 hours in case of need during their balloon flight on May 27, 1931 amounted, with a crew, to 800 kg? Different types of launching device, with which regard to size and power can hardly be compared in any way to the prodigies of modern technology, will have to be achieved, before even just an unmanned recording rocket may be carried some distance into outer space, and indeed only when a spacecraft with a crew of 1--2 persons will be considered!

The legislature must take into consideration the above indicated extraordinary extent of the astronautic enterprise. He will transfer competency with regard to all problems of astronautics, the manifold approvals, the inspection, the administrative jurisdiction, etc., to a higher authority, perhaps the central authorities, ministries, to secure a qualified and uniform official position with maximum certainty. With regard to the intense influence on the environment of the takeoff site (we are thinking of devastating effects, which could be caused by the burning of the Hohmann powder tower of 27 meters height, which would cause the firing of a Moon gun or finally the takeoff of a giant rocket!) the approval of an astronautic experiment, a launch site, etc., would have to be preceded by a thorough establishment of all the decisive circumstances. First the projects will have to be tested by specialists, who would evaluate in a knowledgeable manner its designs with the cooperation of the planner. The takeoff site and the launch time must perhaps be arranged by the central authorities themselves, to reduce as far as possible the disturbance of public order. Naturally, the official approval of place and time must take into account the position of the heavenly bodies, which would be a prerequisite for a smoothly planned mission. This theoretical checking of the space projects will perhaps call upon a special

body, a space council, in which all interested groups are represented; experimental institutions will be established, as well as a "cosmic weather service", a constant observation of the position of the stars, the radiation and flows in outer space.

If the plans withstand the preliminary theoretical procedures, then if necessary preliminary experiments with regard to the launch /24 site, including on-site investigations by commissions will be carried out while the objections of nearby residents will be heard and an equitable decision made with regard to damage claims. Naturally the corresponding compensation amounts must be insured by the contractor, before an airport is approved or a launch approval granted. Each authorization document must contain all the safety regulations to be adopted and the takeoff approval, in particular also the takeoff time, which is to be announced in a suitable manner, to control unnecessary attention. During the takeoff, a government commissioner will be present to monitor the adoption of all safety measures, if necessary, also a fire brigade guard When the launch is from the high seas, the approval procedure is simplified, but still required; just like the launching site the presumable landing site, for the spacecraft and for all the parts which are detached during the flight, takeoff rockets and suchlike, must be checked officially, insofar as these objects do not reach the ground in a harmless form, totally disintegrated.

It is easy to see that by handling the required amounts of explosives or fuel during the preliminary work, through the explosion at the time of takeoff or the work with intense electrical current among other things, the environment will not only be affected adversely to an extraordinary extent, but also endangered. An attempt will be made to limit to the maximum possible extent these hazards by setting up suitable procedural measures, while the degree of the "permissible" hazard must surely be kept rather high, because a safe space enterprise can hardly exist. All parts of the spacecraft, the craft walls, the walls of the propellant tank, the rocket furnaces and nozzles must have a certain safety

coefficient, care must be taken of the respiratory air, foodstuffs, and a sure landing of the crew, a certain pressure level, the minimum and maximum temperature inside the cabin as well as certain fluctuations of the internal pressure which must not be exceeded, some onboard instruments, orientation and rescue instruments, protective means against the possibly detected "cosmic" radiation will be required unconditionally. Not only the pilot of the spacecraft, but also the leader of the enterprise must be suitably /25
trained and the crew of the spacecraft must have a medical certificate of physical fitness, especially resistance to pressure. The ground organization must also be trained for the required performances.

Detailed regulations can hardly be obtained. Since we will be dealing with isolated missions carried out in different ways under the technical aspect, only general directives can be provided for approving personnel and equipment and this approval itself should be given only under special consideration of each individual case.

It does not need to be mentioned particularly that space mission contractors must be liable to third parties, that is except for the members of the space mission and all members of the enterprise, for all bodily and material damages, without regard to their own guilt, that this liability cannot be limited by maximum amounts and that the liability must be insured by means of compulsory liability insurance, by depositing money or securities and suchlike. As regards the persons carried, the contractor, except for a special agreement, will only be responsible for premeditation and for gross negligence, for example for non-observance of prescribed measures of regulations since these persons have consciously and willingly accepted the dangers of the space mission; provision will be made for employees and their families naturally through accident insurance. The civil liability of the space traveler will be increased considerably through suitable penal provisions with relatively high penal sanctions (this punishment would in most cases concern the characteristic of

public danger); in case a legal person operates a space transport, agencies would be appointed responsible for criminal prosecution, and the agency must be responsible for imposing fines, to prevent an avoidance of criminal liability by the responsible party pleading insolvency. On the other hand, space enterprises will be given a special protection against punishment, for example by extending the regulations of §§315--316 of the penal code to space institutions, spacecraft or other accessories of the latter.

The fact that a space mission can only be carried out with large expenditures in view of the amount and quality of the required material and personnel, apart from the value of the scientific preparations, is obvious. For example, v. Pirquet is /26 hardly exaggerating when he estimates the cost of the Moon rocket, without preliminary experiments and suchlike, as 3.5 million Marks (see Ley, The possibility of space travel,* 1928 p. 233) and altogether 3 million gold Francs would have to be paid for Graffigny's Moon torpedo along with the corresponding launch equipment. The required capital will generally exceed the capacities of an individual and must be provided by the participation of several persons, and specifically in forms where money is collected for common use, since there can be no prospect of restitution; even the contractor can only expect in return for his trouble, for the liability assumed as far as money (since he would certainly also participate financially), a nonmaterial profit, the satisfaction of having implemented a bold plan. A space mission is not at all aimed at profit; since the money must predominantly be procured by voluntary donation, its proper use must be ensured by public accounting, on the responsibility of the director of the company. Because of the requirement an official checking and government inspection, dubious enterprises, exploitation of public interest and therefore the degradation of the idea of space travel will be prevented.

Since there are always people who will wager everything for the prospect of a large profit (see foenus nauticum),** the possibility is not excluded that a space traveler may find a

*Die Möglichkeit der Weltraumfahrt. **Maritime interest (profit).

"creditor of the bottomry type" (§§679 ff. HGB), that is creditors who could hold on because of their loan together with bonus only to the mortgaged object, that is, the spacecraft, possibly its load, and specifically only in the case of a favorable end to the space mission. Undoubtedly the spacecraft which has returned successfully is an object of satisfaction of very high value, whose public auction would be visited by many admirers of rare objects, by museum administrations and suchlike, and the payload, that is, the total yield of the mission, cannot be underestimated. But care must be taken that because of the pledging of the scientific results of the space mission, publication and general evaluation of these data should not be delayed too long, that is, the /27
implementation of the bottomry rights should be bound by a period of exemption and the space traveler must be given free and unsiezable portion, so that on the one hand good traditions are upheld, and on the other hand, the space traveler should not lose all share in the publication of his personal observations, by which once again the common scientific interest would suffer.

And since we are now in the area of bottomry in maritime law, let us propose a protection of the "totally finished" spacecraft against predators of the property according to the example of §482 HGB. In order that the inventor's rights to a spacecraft design should be used properly, as we stated above, this benefit is usually a nonmaterial, nonprofit one, and extension of the patent law protection period could also be recommended; since from the time of the experiments until the first flight of the spacecraft, considerable time will elapse and the inventor must make his intentions public early for the purpose of obtaining financial funds and for the purpose of official approval. Further space missions then will follow probably only at very large intervals, so that the inventor must certainly be allowed a longer time (for example, 30 years according to §195 BGB), so that he may reap the fruits of his work.

As indicated above, an enterprise of the magnitude and cost of a space mission will not take place every day: during the entire stage of its heyday, a rarity. Moreover in any serious astronautic experiment even the launch of unmanned recording instruments will be given general attention as an attractive event and the course will be accompanied by the curiosity of everybody around. Because of the rarity and general knowledge in spacecraft some regulations of the other traffic law are not needed. For example, during the traveler's passage through the atmosphere, it will be possible easily to exempt the space traveler from observing air traffic regulations, that is rules of aviation, the light management or landing regulations, without establishing other space traffic regulations for this purpose: the behavior and equipment of each spacecraft must be planned, calculated and approved officially beforehand, therefore the regions of air bans or landing bans, limitations on the transport of photographic or radio equipment, (should this occur to any inspection official!) need not be considered separately; decisions in this context are readymade in the general approval of the space mission. The special qualifications and characterization of the spacecraft could also be superfluous, also the compulsory logbooks. Since a space launch or landing site will be used extremely rarely, perhaps only once, for this approval, it will be possible to tolerate the effect on the environment, which would be inadmissable in case of repeated occurrences. /28

Possible contracts for carrying persons or even freight would have rather the characteristics of "gambling" contracts without liability than real working contracts; accordingly even in case of dispute, the individual contract points must be explained.

The technical possibilities of this period are not sufficient for a trip to a planet, let alone the round trip to several heavenly bodies. Nevertheless there will certainly be projects for such enterprises, or even experiments, while the time for such missions is far away, possibly years away, in view of the incomplete capacity of the present means of propulsion. An attempt

will be made to overcome the technical deficiencies of the flight equipment, by choosing instead of the shortest and quickest connection by straight line between the Earth and a planet, other longer "synergic curves" which can be traveled with less energy consumption, and include between the journey there and back a long stay on the planet reached, to wait there for favorable stellar constellations, and be able to return to Earth as economically as one traveled from it. The legislator will perhaps consider it his duty to provide in regulating the laws provision for the case when such year-long travel in space could still be carried out in the future. The captain of the spacecraft will be given command and even the right of punishment over his crew. Provisions must be made for prisoners and for the dependents of the space traveler left behind by insurance measures, if the space traveler himself, or his curator absentis has not provided for the needful and if a long absence threatens the repayment of the creditors, the care for the maintenance or education of children. Moreover, a clause for being missing in space according to /29
the questions of §16 BGB should be introduced if as a result of the unknown fate of the vessel §17 BGB is not applicable. And even before death is declared, the dependents of a participant of a space mission, who was insured against accident and is missing along with the spacecraft for a certain time, will be provided for in the claims to accident benefits for those he left behind; according to the example of §§861 ff of HGB the amount of insurance with regard to a spacecraft must be made available under the conditions of abandonment. It is clear here that several shipping traditions will be resurrected.

Finally however the legislator can not escape the view that public interest requires the maximum possible favoring of prosperity of the space mission, so that the latter could maintain the same pace in his country as abroad. Naturally there is fear that neglect of space missions could be disastrous to the country in case of war, since the Earth could be observed favorably and influenced from the maximum altitude, the military aspects would

represent the most obvious and most important motive for the offical promotion of astronautics, as for the rest it is already being implemented by the American and French Defense Ministry sponsoring the rocket experiments of Goddard and Melot. The national economy expects from the exploration of space an economical production of valuable raw materials from space itself or from the regions of the newly explored heavenly bodies. Finally the purely scientific needs of space travel require government support.

Thus space travel is put forward as the preferred legal position of an enterprise for common benefit. Government allocations will be assigned to it, obviously using the offical inspection of the subsidized enterprise. If the share of government funds represents a considerable portion of the total capital investment, then we will be dealing with the mixed, private and at the same government form of economic enterprise, so that the collaboration of both types of economic means should be implemented as smoothly as possible. In each case the procurement of funds for government sponsored space enterprises will facilitate the exemption from the required legal negotiations regarding /30
fees and suchlike. The government administration will moreover make available their observatories, experimental institutions and if necessary also military personnel, training grounds and suchlike, allot a preferred use of the railroad, telegraph and telephone among other things.

As a further privilege, space travel will assume the right of making use for their purposes of foreign plots of land by means of expropriation for takeoff and landing sites, propellant factories and other units while the expropriant has primarily only a right of use limited with regard to time, as required for the limitation of his project and then the right to re-availability of the expropriant is once again removed.

The rights of the owner of the land regarding the region

of air lying above it will undergo a new limitation with regard to §905 section 2 BGB or section 1 of the air traffic law of August 1, 1922, this time of little importance qualitatively since space traffic will be extremely rare, on the other hand quantitatively more impressive, insofar as the effects of a flying spacecraft over the neighborhood becomes probably very serious because of the evolution of gases, heat, the smoke, the noise, air pressure, etc. This pollution must be taken into account already at the time of the official approval for a space mission, moreover the space traveler will be unconditionally liable for any type of damage, and an attempt will be made to avoid as far as possible damages by timely announcement of the direction of the forthcoming takeoff (by public announcement or also individually to the users of the surface concerned) as well as the presumable landing site. In view of these measures then a paragraph should be introduced into the future space traffic law, which would have the following content or something similar: "The owner or user of a plot of land cannot forbid the effect caused by an officially approved space mission, insofar as his plot of land is not permanently withdrawn from use due to this effect, which is usual according to the local conditions for plots of land of this situation, or when this effect is taken into consideration in the legal approval procedure or was not asserted by the owner (user)". This paragraph will be /31
followed by a paragraph on emergency landing in the sense of §12 of the air traffic law, to the effect that specifically the claimant to damage compensation in case of emergency landing cannot prevent the removal of the spacecraft landed after an emergency; a general obligation to provide help and rescue is also imposed if a spacecraft should fall in an emergency, and demanding rescue or assistance.

To adjust as exactly as possible the individual provisions of space law to the situation, care should always be taken and one should differentiate in the legal sense: 1. whether an unmanned or a manned spacecraft is involved; 2. whether

explosive substances or substances representing fire hazard or electrical high voltage current or only harmless propellants are used (for example the centrifugal force of the mass and Drouet giant wheel); 3. whether the spacecraft is equipped with its own engine or is propelled by means of guns or projectile machines; 4. whether remote trajectories to other heavenly bodies or only nearer travel routes (internal navigation!) will be covered.

II. The Intrastate Law

With the progress of space travel the question as to how far upward the area of sovereignty of a country extends, a question which had been thought to be already banned from the doctrine with the final decision made in favor of the lack of limitation of air sovereignty at altitude, is once again facing international legislators. The international law today is made as we know very generally on the fact that each country has territorial sovereignty over the zone lying above the country's territory, without imposing if possible, maximum limit; but the country's sovereignty must have some limit in space, it cannot extent to infinity. But at what distance from the ground would this limit lie?

The approval by international law of the sovereignty concerns only the region of the air, the atmosphere ("atmospheric space", article 1 of the Paris Agreement of October 13, 1919); it was neither approved nor intended to give the countries rights extending far up. Wherever air space ends, then at the same time any territorial sovereignty which had been conceded mutually by the countries over their territory by contract and by continuous exercise ends.

This limitation of space sovereignty has a deeper meaning /32
than the reason alone that up to now it was not practical to regulate legal conditions above the air layer. Every country exercises its sovereignty over the ground and the coastal sea

because the air layers lying over the ground are related to the ground in such a way, are indispensible for life in such a way and satisfy the needs of the citizens of the country in such a way that these air zones can be considered properly as appurtenances of the ground. Here we are not thinking of an appurtenance in the sense of civil law (§97 BGB) and we cannot put forward the suggestion that the air sovereignty, if we take as assumption the accessory property of the air zone, should be considered as a property right, in the same way as a land owner according to §905 BGB considers the air space lying above as an accessory of his plot of land. For the concept of appurtenance in the establishment of air sovereignty is not a civil right concept, not even a concept of general law, it is simply a relationship concept, which manifests an actual relationship between the air zone and the Earth's surface. And actually all theories on the justification of air superiority start in the final analysis from the idea of pertinence: the need for air sovereignty is based simply and solely on the relationship of air space to the ground, for example the absolute need of the atmosphere for life, the possibility of endangering the country's territory from the top and suchlike, the sovereignty of land represents therefore the support for sovereignty of the air. It would not occur to anybody to attribute to one country sovereignty over air zones which lie above another country or a region without sovereignty, and a country would hardly ever claim an air space without the ground lying under it. The airspace is not an independent national region, it can only become an object of sovereignty as an appurtenance of the land lying below it; if you like: the scene of action of sovereignty.

This quality of appurtenance stops with the air zone, since life on the Earth is only related so closely with the space filled with air that that space can be considered as a natural appurtenace of this surface. A division into air layers which are still required for life on Earth and those which are not, is not feasible; because without the upper air zone, the lower one would

have an entirely different density, composition, etc. than the present one, and there is a constant air flow and mixing of air between individual layers; the lower one is renewed continuously from the top. Even zones which are usually designated as stratosphere, indeed the topmost hydrogen zones possible present in the sense of the Wegener theory, take part through their weight and content in the formation of the lower layers so that they are included in the air space and subject to the sovereignty of the country. Only from the "Earth's coast spaces" does a region begin which is not related at all to our Earth and neither therefore to individual parts of the Earth's surface, having no longer any appurtenance to the Earth and therefore free from any earthly territorial power, coelum liberum.* In this region the spacecraft travel is totally free.

It is most improbable that already at the time to which we have just referred, the earthly countries should be able to divide by contract outer space free from sovereignty (or individual heavenly bodies) into so-called spheres of interest, that is, into such regions where one or the other of the countries under contract should be entitled to exclusive occupation; since it becomes apparent according to the situation of astronautic technology that the occupation, a takeover or the effective sovereignty over the reserved portion of outer space, is still unfeasible. Rather a decision should be made under the principles of international law that during the flight through zones free from sovereignty, the events on board a spacecraft should be judged according to the law of the country to which the spacecraft belongs; and regarding the nationality of the spacecraft, probably the nationality of the owner or the majority of co-owners would be decisive (mobilia sequuntur personam domini,** article 6, 7 of the Paris Agreement of October 13, 1919). The requirement of a home port will not be necessary because of the rare nature of spacecraft and with regard to the small number of flights which each spacecraft will accomplish, so that the possibility of determining the nationality by the home port is

*Free sky (or heavens). **Possessions follow the person of the master.

eliminated.

The erection of any station in outer space, an artifical Moon, will also remain reserved for the remote future from technical considerations, so that the international administration /34 of such astronautic means for the purpose of monitoring free use will also not be considered. If in an astronautic project the country of the launch should be different from the country of landing, then the two countries must achieve an agreement with regard to the approval of this project, where the necessary processing of the state custom boundary line will certainly have to be taken into consideration. The reasons favoring an extension of the period of protection of national patent rights in astronomic patents, the need for early announcement of the design for the purpose of obtaining money and the requirement for a long period of use also apply with regard to the international patent law.

For his part Bynkershoek (quaest. jur. publ, V, 1) explains with regard to the means which a war leader can use against his enemies "in hostes, qua hostes, omnia licet",* that is everything is permissible in law; such an international "regulation" will certainly be extended to spacecraft, and the latter will be classified under the usual warfare agents, without anybody seriously thinking of excluding the use of spacecraft in warfare. The spacecraft will be used for some time only as an aid in war conducted on land, sea or in the air, without constituting an independent type of weapon; this is because with the means available, the production of military spacecraft in a very large number will either be not at all feasible or only at such high cost that it would not be justified by the results achieved. The spacecraft can only be controlled to a limited extent, its trajectory can be determined only after long calculations; in this context the accuracy of aim will remain fairly low. Therefore we will not be arriving at a battle between spacecraft, they will rather be used only experimentally and extremely seldom to achieve the strongest strike effect as a result of the fearful

*Against enemies, since (they are) enemies, everthing is allowed.

speed of descent or to threaten the most remote regions (the Antipodes). According to the assignment of spacecraft to support the infantry, the Navy or the Air Force, they will be subject to the regulations of warfare on land, sea or air. It may be mentioned, by the way,that outer space, as free from any national powers, could become a theater of war for anybody.

III. The Technical Prerequisites for Space Exploration /35

As maximum power of space travel is a stage of development which we have just described and whose achievement we consider possible even without considerable improvement of the present technical capabilities, we have designated a round trip to the Earth's Moon, whose average distance from us (according to Hansen) is 384,452 km. Through this achievement, however marvelous it may be, only the tiniest part of the problem of space travel will be solved; there will still remain the examination and if possible the visit to other heavenly bodies in the region.
In this case a solution would be much more difficult. This is because,expressed in billions of kilometers, the shortest distance of the planets from the Earth is as follows: for Mercury 80, Venus 41, Mars 57, Jupiter, 591, Saturn 1199, Uranus 2520, Neptune 4312 (taken from Henseling, Astronomy for all,* 1929 p. 57), the newly discovered Pluto about 6000. To overcome these distances, even if we choose as a travel route the shortest line of connection, an average velocity will be required of approximately 100 km/sec, let us say 100 kilometers per second; at a lower velocity and a correspondingly longer travel time, the load of required air for breathing purposes and food (Valier, Rocket travel** 1930, p. 71 estimates here the total consumption per person per day, 12 kg) would make the implementation of travel impossible, especially if necessarily or as a precaution, one would also carry the air and food required for the planned duration of the stay on the foreign heavenly body. The maximum velocity of the machine will then, with regard to the slower period of acceleration and braking, have to be much more than

*Astronomie für Alle. **Raketenfahrt.

100 km/sec, even during the flight in the gravity region of a planet whose force of attraction exceeds that of the Earth.

It will seem less unreasonable to attempt such high velocities, if it is considered that the density of the mass distributed in the stellar space is less than a thousandth of the density of the space artifically emptied of air, according to Eddington, so that the forward resistance is equal to zero and solid bodies actually move in outer space with similar velocities: the meteors 50--100 km/sec; the eruptive solar protuberances over 300 km/sec (compare the measurements of the protuberance of July 15, 1919). /36 In a comet wake, any weak propulsive force, whether it be light pressure or an electrical repulsion, could impart to solid particles a velocity of over 50 km/sec. The trip will begin with slow acceleration to the speed which we experience by the movement of our Earth at the moment of the launch; during the passage through the air layers, the velocity is not increased too much so that the resistance to the pressure of the crew members should not be overstrained, so that the resistance of the air should not be too unfavorable, and on the other hand one should not lose the favorable effect which arises from the fact that the gases released by the recoil cannot escape really because of the air envelope, but are dammed up behind the rocket and through their pressure support the recoil effect. After leaving the Earth's atmosphere the travel rate will gradually increase to over 100 kilometers per second. And in the return the dense air will slow down the free fall again.

Although we consider it possible to solve the problem of travel to the planets as a basic principle, we are aware of the extreme difficulty of the implementation. The construction of a spacecraft of the power just indicated is far beyond the range of our present capacity. Since the ideal propulsion power of a rocket and the recoil principle seem today to be the only accessible method to solve the problem of space travel, each final velocity which the rocket is imparted by the combustion of

its entire explosive charge is greater, the greater either the ratio of the launch rate of a rocket to its final weight or the exhaust velocity; thus an increase of power will only be achieved by increasing one value or the other. On one hand instruments of enormous initial weight will be built, on the other hand it will be necessary to use propellants of high velocity of combustion. Another means could be found if it were possible to collect totally or partly the waste mass and waste energy during the flight from outer space, because then the necessary supply of propellant would be completely renewed and would not have to be carried along to the full extent. Because the final weight of the rocket must be as small as possible and because the mass which is consumed or released simply during the mission is not wasted, /37 this final weight (or dead load) of the rocket (even though only until the time of consumption or release) would be increased, the spacecraft in spite of the size and its great demand must be built extremely light, moreover of a material which would withstand besides the stress the considerable explosive heat and at the same time the cold of outer space. The present level of machine building technology could not satisfy the structural requirements of planetary travel and neither is the present chemical industry able to supply suitable construction materials as well as explosives for achieving the required exhaust velocity.

Here we will mention for the sake of comparison how at the turn of the 18th century all the basic principles of modern aeronautics were known: in 1783 Charles had achieved an ascent with a hydrogen balloon, in 1784 Meusnier has proposed a guided balloon in the shape of a cigar with an air propeller and already in 1680 Huygens had designed an explosion powder engine; but only after the machinery building during the 19th century had risen to an unexpected height was it possible to use any of the previous inventions to establish a feasible flight in the air. We consider that the most important basic principles of space travel have already been discovered, but it will still take fairly long until machine technology can implement the existing astronautical

projects, assuming that meanwhile the chemical industry has provided the necessary construction and explosive materials for this purpose. The principles and the direction of effects of the Earth's gravity must also be further studied: if gravitation emanates from the center of the Earth, its effect must be reduced by the quick travel in the direction of continuation of gravity, and the most enormous acceleration of the travel would be desirable; otherwise the gravity in the sense of von Sahulkas' opinion would fall back to Earth like a gravity rain. If gravity is of electromagnetic origin, it might be paralyzed by electrical means, etc. Moreover the production of the energy from existing material must be improved to a considerable extent, to achieve on one hand the fastest and most complete combustion possible of the propellant in the rocket, to obtain the high exhaust speed, on the other hand to allow the renewal of the propellant stocks from outer space during the flight, finally to be able to satisfy the enormous energy consumption in space missions in an economical manner, by destruction of cheap raw materials; this is because astronautics can only reach full bloom as an economical means of transport.

It is apparent from these considerations what little progress there has been in our natural sciences to be used as bases for space travel, the greatest problem of all. Therefore before we can travel freely and economically through outer space, we must also experience an era of surprising progress in physics and chemistry as well as accordingly machine building technology, which would be equivalent to that of the 19th century.

IV. Effect on Economy and Culture

By our previous statement, that the present world has not yet reached the degree of maturity of implementing a trip to the planets, we wish to recall that a very advanced level of economy and culture must be assumed, if we wish to represent correctly the general effects of the exploration of outer space. The period

lying between today and the day of the first trip to the planet and which must imply with it the full development of machine technology and all related branches of science, will result everywhere in such an overmechanization, that is such an abundance of machines, whether they be necessary or not, that it may be feared that the machines will choke out the life of all living creatures, and the whole world will lay claim to all the available supplies of organic and inorganic raw materials for themselves alone, the meadows and fields, groves and forests, air and water will have to be sacrificed to the iron idols, to satisfy their requirements in construction and operating materials. On the Earth a similar situation would arise, as would be the case if today an industrial region were closed off from the rest of the world and left to itself. Indeed individual thinkers who become aware of the threatening danger of self-annhilation by machines call for the "return to nature", but no one listens to their voices, which is always the case: world history knows no return, no one will /39 decide to flee from machines to a mutilated nature, to earn with difficulty his daily bread as a shepherd or farmer. Even the very promising development of the human soul will suffer a sudden break because by solving all the existing problems in a world "full of patents", a need can hardly be felt for further invention, and the spiritual forces will be crippled by compulsory leisure time. Also the educational art will be lacking in incentives for further creativity.

The exploration of outer space will come precisely at the right time like a refreshing breeze to cause a release from this stifling state, to offer new sources of raw material to the economy, to provide new possibilities of application of machines and make them reasonable, to arouse the mental forces lying fallow by raising new problems. Space travel will achieve a conversion, a mutation of a type which will represent in the sense of H. de Vries (the mutation theory) milestones in world history; it will save not only highly civilized mankind from ruin, but moreover allow a new rise to even higher stages of development.

Primary production will find in the regions of the explored heavenly bodies new areas of activity through which then the industry can receive new natural material, convert them or refine them. At the same time a great requirement will arise for all types of devices, since a planetary traffic would be unthinkable without an extraordinary number of mobile and fixed items, not to mention the fact that further instruments, buildings and suchlike would be needed to make the economic and scientific achievements of astronautics generally useful; this requirement will control the crises which would arise on the world market by the sudden increase of the introduction and production of goods. Since moreover, there would be travel into the universe, a certain lack of workers would be perceived, which would have a favorable effect on the position of the working class.

All branches of science (not astronomy alone) will be busy processing the newly obtained findings, and some of them will consider it necessary to assert a special "cosmic" subdivision in their existing specifications. A special moon geography, moon /40
geology, moon plant science would be established, if the observations of W.H. Pickering were confirmed and suchlike, and also with regard to the other heavenly bodies. It can hardly be imagined how much scientific work will be required until all space disciplines will have investigated even halfway the abundance of observation material brought back. In this context however, certain earthly problems, for example the course of development in the animal and plant kingdom may have better light shed upon them through new species discovered, and by traveling the almost infinite trajectories, we will be one step closer to grasping infinity and conceiving eternity.

The new landscapes, the new exposures, the new life situations will provide the pictorial arts with an inexhaustible stock of incentives, and besides the clay sculptor, who will try to grasp the harmony of the spheres, the painter will attempt to give his picture, besides space perspective, a time perspective, that is express

that the object represented is not in the present time, but belongs a hundred or thousand light years away, to the remotest past.

Only a mechanical culture which preceded the flight to the planets has allowed a considerable blooming of the mental forces. Through the continuous thinking of astronautical problems, through the flight experiments, man has gradually prepared mentally to leave the Earth's gravity and the protected atmosphere altogether, to pass through the ether with continuous change in temperature, velocity, etc. Therefore it may be hoped that man can withstand the "mental pressure" of a planetary mission as well as the physical stress, and that he will not be driven into mental confusion by the sensation of weightlessness nor by the pain of abandonment in infinite space, although these sensations will certainly be the strongest which have even been experienced by the human spirit. By the experiences of the space mission, the mental strength will be reinforced and the mental capacities increased extremely; the space traveler must be able to react with greatest possible speed to all observations, even if things of unheard of type were to appear before him; his attention is always highly stressed, his human weaknesses, discomfort, fatigue, fear must be suppressed by /41 strong will.

A man who would be hardened by such a deeply moving feeling adapts quickly in all situations of life, he considers the world from a lofty viewpoint since he has seen it in the form of a dot from an enormous distance. He communicates his manner of seeing life to his surroundings and the future philosophy which arises from it reflects correctly the observations of the space mission: the maximum possible indifference to all special interests, all physical suffering of the individual, complete surrender of the "I" to the common purpose: the knowledge that the collaboration of individuals and this collaboration alone will provide the maximum performances, but even then the highest goal of existence does not lie simply in this earthly human society achieving everything, but must be sought much higher in the

occupation of the universe by the most perfect forms of life and the harmonious rise of all living creatures. Since starting from the Earth the remaining heavenly bodies must be sowed with the primary cells of new forms of life, the Earth will once again rise to the center of the universe, a new geocentrism; but once man has traveled through the remote regions of the universe and examined the position of the Earth under other prospects than were accessible to antiquity and the middle ages, he will be led to the view that the Earth was a starting point of the universal society, specifically a hothouse of higher life, but not the final purpose of the universe, that the universe does not exist because of the Earth, and as the ancients believed, but that Tellus was predestined because of living conditions existing there, tc inhabit the universe with a giant species, that therefore its mission remains subordinate to a higher final purpose.

V. Revision of the Concept of State and Law

As soon as man has managed to travel through outer space with relative safety and economy, and as soon as the living conditions on the neighboring stars have been explored to some extent, the mobilization of the Earth's population will be possible, there will be a real emigration from the Earth to the newly explored /42
regions of outer space, and from there back to the Earth. The attraction for adventurers who are tempted by the prospect of enrichment will be the livelier, the more the bands of attachment to the native place have been loosened recently by the frequent change of residence already on the Earth, and since the space nomads will always be attracted by new untouched regions, since moreover space travel will enjoy increasing improvements, the sensation of the attachment to the native countries will keep returning, the decrease of emigration will not be expected. How should the relationships of travelers within the remote world of stars, whether we are dealing with events during the space mission or after landing on any foreign heavenly body, be judged legally?

With the concept of the present state as a legal forced association, it would be incompatible if the citizen who leaves the territory of the country should lose because of this every legal relationship with the country; if the legislation of any country should contain the regulation that the rights and duties of a citizen would only exist as long as the subject in question remains within the territorial limits, then this provision would destroy basically even today a legal consideration of the nature of the country as a legal association and the government order as a legal order; the binding of individual members of the association in question would be considered only as actual, and not as legal, the unity could not be called real, there would be no question of a state in the present sense of the legal state and of a legislation. In each complex of standards which claims illegal basis for the state, statutes must be established that the validity of the standards cannot be removed unilaterally, for example by leaving the country's territory but that a citizen remain legally bound to a country wherever he may go, until a final separation of the bilateral relationship takes place. And the conditions of this separation are established also autonomously by the relevant legal regulations.

In particular it would be contrary to the present legal perception if anyone would be deprived of their nationality simply because of a departure from the country: for each individual is not only a citizen but also a component of the state subjectivity, he shares in the formation of the state (no state can undermine its own power within the international community by the precipitate release of the people) and has for its part, certain rights with regard to the community of states. The individuals have formed countries to be better protected in the matter of life, and this protective association would lose its basic purpose if it would release its members immediately, its founders in the struggle for existence. Basically the loss of citizenship should only be established by being received under the protection of a different country, by changing one's nationality; today there is

no transfer of this status quality, the stay in any country today when there is actually no inhabitable region without the status of a state, is considered as a rational need (Hegel, Legal philosophy, §74: the rational purpose of man is to live in the state), the citizens are neither extradited nor transferred from the country.

Now the members of a country must remain necessarily subject to the law of this country even outside their homeland, onboard a spacecraft they will take their native competency up to the most remote regions of the sky and the state territory, that is the barrier of operation and at the same time, the object of operation, that is the state power will extend up to there. But it is apparent that no earthly country can exert an organized coercion on another heavenly body, to impose its laws there; the legal compulsion is therefore merely an illusion, and specifically not only in the remote regions, but even on the Earth itself, since in the future any uncooperative citizen could escape the exertion of this constraint by escaping to some star. And there is no doubt that the implementation by an organized power today constitutes the concept characteristic of legislation even if it remains undisputed that besides this there are various secondary guarantees of the law of which some, but not all (perhaps the power of tradition, the internal value of the norm, but not the /44
effect of the existing living environment and the awareness of the previous community) will also further influence the refugee; in the sense of the present concepts a regulation ceases therefore to be a legal regulation as soon as it is not supported by a government organized restraint (Feuerbach states the following: "The reality of the legislation depends...on the possibility of coercion...") and a state is no longer a legal state as soon as its norms no longer have the quality of law.

It is very easy to see that it will not be possible to maintain the present concept of legal state and law when the exploration of space offers the Earth dwellers new regions without sovereignty, and that therefore the progress of astronautics will mean at the

same time a new era in the history of these two concepts, state and law. Now we shall see what reorganization the terms of legal state and law will undergo.

After man, the people of the nation in antiquity and middle ages were considered as object of the state power, fully integrated in the state and without any rights with regard to it; lately the citizens have been granted certain rare "freedom rights" with regard to the almighty state and their position has been raised from the object relationship to the object and subject relationship (according to Waldecker, General Theory of Government,* p. 502). But as soon as a previous subject of the state is free to escape from any earthly power by leaving the Earth and establishing himself in areas of outer space without sovereignty with others of his kind to form a new homeland, then not only this new association of people arisen, but also the earlier native country must be judged legally as mere private association, which has certain claims on the individual, while the latter, however, remains totally free. From this point then there can no longer be any talk of an object relationship of the people in the legal sense, even though individual members of society may be bound economically, and actually with the association, just as today it would occur to nobody to say that the members of an open commerical association are in any way "dominated" by the latter, also they are committed to the society and depend totally on it economically.

The dream of the cynic, that the state order may be non- /45
binding for the wise man, that is for anyone who is able to survive alone in the battle for existence, will be fulfilled: there would be no dominion of the new association, the new state with regard to the members; both the state and the citizens would stand mutually in the simple legal relationship of two equivalent legal subjects; there is no legal superior and subordinate, the legal structure of the future country will omit any idea of sovereignty. The new association of states, although perhaps it will be an autarchy (Aristotle), a self sufficiency with regard to the outside, will in

*Allgemeine Staatslehre.

no way be sovereign on the inside, that is it will have no rights to define the legal position of the citizen with regard to itself according to its own community will; it will have legally the same rights and obligations. The individual will achieve a legal recognition of his self-determination.

Just as the stationary nature of man is lost by the exploration of outer space, the new state will be lacking in any relationship to the Earth which would be necessary to be able to speak of a state territory as a basic element of the state. The new state body will consist only of the personal element, will be spaceless in concept, it will only need some theater for its operation, regardless of where they find this refuge; it may be located here today, and somewhere else tomorrow, its citizens may live in the same place as the members of another "country" and thus two countries may interpenetrate each other locally, while their legal position is not affected. Such a mobility in the absence of territory or penetrability would be incompatible with the present legal concepts of nationality, although even today people do not mind stating that the organized groups of nomads of the time of the migration of people were states of a lower stage of development (see Binder, Philosophy of law,* p. 520 f.).

The time of unification of the new country will be represented only by the pursuit of common purposes, and the country will then be different from the other associations formed for a purpose, by the fact that its purposes are somewhat more manifold so that the /46 association acquires a certain closed nature with actually preferred position. For the jurists the state and the popular private association will be equivalent in essence. (As an example of the fact that a private association can really exert the powers of a state, we may refer to the enterprises of the colonists, from the American "conquistadores" to the African Congo Company).

It is highly probable that the process of revision here will not be static, but that in the course of time, among the

*Philosophie des Rechts.

different functions of the modern state, some will be taken over by one private association and some by another of the same (or predominantly the same) individuals (a militia group, a police group, a justice or obligation group and suchlike); if such a "division of powers" comes into being, in future a central organization and consequently a reproduction of the modern state must be totally eliminated (a similar decentralization existed in the middle ages countries, where there were several independent powers of the public type, feudalized royal offices, different independent jurisdictions, immunities, privileged cities and suchlike).

The law in the model sense must necessarily be supported on the basis of validity by some state organization, and its implementation must be adopted by the same organization (compare on the other hand the right of the church as an example of a law without nationality of the older concept); Sauer, Textbook of legal and social philosophy,* p. 196 designates both as parallel concepts. There will be no such relationships between the state and the law of the space travel era.

A legislation of any era will no longer arise by a unilateral sovereign state document, it will rather be agreed upon freely, explicitly or implicitly by exercise between the participants. Consequently the law will be resolved formally under the remaining regulations of social behavior, customs, courtesy and suchlike; but if it is desired to establish a special law within the community regulations, then one must refer to a material characteristic with regard to concept, one must choose among all the private associations a group, which because of its type and the extent of its purposes assumes a preferred position similar to the state, and the regulations of contract conditions between this very arbitrarily /47 chosen group and its members will be declared "law"; the behavior which refers to the contract content concerned (= statute contents) will be called correct, legal and suchlike.

The selection of a "state" or "legal" association assumes

*Lehrbuch der Rechts- und Sozialphilosophie.

moreover that a private group can be given preference because of the range of its effect. If on the other hand, the functions of the modern state are divided nearly equally between several bodies, then there will be no possibility of designating by the word "law" any of the several state successes, and all norms of social behavior must be treated equally; then the modern state and the modern law will search in vain for related phenomena among the new forms of life.

It should not be believed that for lack of an official state power the fulfillment of a duty of the new "law" will only be guaranteed by an unorganized social coercion by the power of tradition, imitation, by the desire not to be conspicuous, by courtesy and suchlike; in any contract relationship guarantees may be provided, while the coercion of power by the competent contract party must take place even by means of self-help (in which the counterpart has already given his consent when signing the agreement), and if there is fear that the powerful group (regardless of whether its behavior is disapproved by public opinion and thus threatened with the consequences of social coercion) will not fulfill its obligations towards the weaker individual, then the individual can defend his interest by joining a special protective group. The groups which will punish the damage or danger to their members will also assume a protective nature, so that modern penal justice and police will also operate for their members towards anybody outside; the penal acts inside, that is in the relationship of each community with its participants and between them, will be judged as a breach of contract with contract penalty, which need not in any way be only of the nature of pecuniary claim; since even today associations usually exert an internal disciplinary power with honorary consequences.

If we should wish to visualize as reasonably as possible the actual appearance of legal relationships in the space travel area, then we can use, for the sake of comparison, international law! The latter is not enforced by a superior organization, but freely

agreed upon between equal subjects. Likewise the companies under international laws are only associations for cooperative purposes (see Liszt-Fleischmann, International law,* p. 8) which do not possess any lack of penetrability in space, since several such associations may be agreed upon for different purposes among the same (or partly the same) subjects, accordingly therefore several associations for special purposes may be established on the same territory, and nevertheless the content of the group contract is subject for each of them to international "law". Such international associations for special purposes are, for example associations for promotion of traffic, with regard to legal assistance, for protection of life and health, animals and plants, spiritual property, humanitarian and religious interests, workers, to fight against slavery and the white slave trade and suchlike, while often courts of arbitration are called upon to settle differences of opinion, but if the international law obligations are not satisfied voluntarily then in the final analysis the injured party has to rely on self-help.

It is customary to say that international law stands at a lower stage in development than national law; but we consider that international law represents a "free law" of the future. Others deny international law any legal quality or call it an "anarchic law" (for example Jellinek, General Theory of Government,** 1929, p. 379); the latter will obviously also deny the qualification as a law to the law of the future, when space travel, by opening infinitely vast regions of space inhabited but without state sovereignty, dissolves any state allegiance or state power. Thus the exploration of space will be characterized as decisive not only for how the law is applied, but also whether it will be applied and the name of space law will characterize not only a system of standards newly added to the previous law, but finally a phenomenon essentially different from the present juridical legislation.

*Das Völkerrecht. **Allgemeine Staatslehre.