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8. On the Occurrence of Seymourites in Nippon and its Bearing on the Jurassic Palaeogeography.

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(Contribution from the Geological Institute, Imperial University of Tokyo)

[With Pls. VII-VIII]

The Upper Kuzuryu Valley in the Province of Echizen has become famous among Japanese geologists for the occurrence of Jurassic ammonites since KOCHIBE's discovery of some specimens at Shimoyama in 1882. When YOKOYAMA described six species of ammonites in 1904 which had been collected by KOCHIBE as well as by MATSUSHIMA he showed the close affinity of this fauna to the Indian and European faunas as tabulated below:

Specific name	Specific alliance
1. <i>Perisphinctes</i> (<i>Procerites</i>) <i>Matsushimai</i> YOKOYAMA.	<i>Perisphinctes promiscus</i> BUKOWSKI from the Lower Oxford of Poland, France and Portugal.
2. <i>Perisphinctes</i> (<i>Grossouvria</i>) <i>Hikii</i> YOKOYAMA.	<i>Perisphinctes Steinmanni</i> PARONA and BONARELLI from the Kelloway of Italy.
3. <i>Perisphinctes</i> (<i>Biplices</i>) <i>kaizaranus</i> YOKOYAMA.	<i>Perisphinctes subcolubrinus</i> WAAGEN from the Oxfordian of India (Katch), Poland and Portugal.
4. <i>Perisphinctes</i> (<i>Biplices</i> ?) <i>Kochibei</i> YOKOYAMA.	Oxfordian <i>Perisphinctes triplex</i> QUENSTEDT and <i>Perisphinctes polygyratus</i> REINECKE.
5. <i>Perisphinctes</i> (<i>Ataxioceras</i>) sp.	<i>Perisphinctes occultefurcatus</i> WAAGEN from the Katch.
6. <i>Oppelia echizenica</i> YOKOYAMA.	<i>Oppelia nobilis</i> NEUMAYR from the Tithonian of Transylvania and Switzerland.

At that time he concluded that the age of this fauna was probably early Upper Jurassic.

In his revision of the Kachh cephalopods, SPATH (1933) questioned

* This is a result of studies on the Jurassic System of Nippon which I am undertaking with the grant given to me from the Hattori-Hoko-Kai.

the validity of YOKOYAMA's identification of the ammonites. Yet YOKOYAMA's suggestion on the faunal affinity was lately endorsed by the occurrence of Kimmeridgian *Katroliceras* at Kaizara (KOBAYASHI and FUKADA 1947).

Prior to the finding of *Katroliceras* I found a specimen of *Kepplerites* in our institute collection. I took its plaster model and made a comparative study with the specimens of *Seymourites* and its allies from Alaska, British Columbia and Montana with the assistance of Dr. John B. REESIDE, jr., of the U. S. Geological Survey at Washington and Dr. F. H. MCLEARN of the Geological Survey of Canada at Ottawa. For their generosity and kindness during my stay with them I wish to take this opportunity to express my most sincere thanks.

As reported briefly on a previous occasion the discovery of such an arcto-boreal type of ammonite as *Seymourites* in Nippon is of more than ordinary interest and significance. Incidentally it may be mentioned that in 1927 I found a poorly preserved ammonite resembling *Hildoceras* at Yambara in a bed below the *Perisphinctes* beds. With the find of *Seymourites* it became a question whether the Callovian ammonite was collected from the Kaizara beds or from the Yambara beds because the *Hildoceras*-like ammonite might be an oppelid, or even a keeled cardio-ceratid.

To solve this stratigraphic question I sent one of my students, IJIRI, to make a detailed survey of the area. It was found that the Yambara sandstone which yields *Seymourites* and pelecypods lies below the Nagano shale which contains *Perisphinctes*, *Inoceramus* and other pelecypods. Between the two ammonite beds two formations containing land plants are intercalated, the Kawai sandstone above and Kaizara sandstone and shale beds below.

As he collected a specimen of *Seymourites* at Goribashiri, Shimoyama, in the Yambara sandstone during this survey, I suggested that he make a study on this specimen as well as the one which I studied. He called the former *Seymourites perampulus* var. *Kobayashii* (nom. nud.) and the latter *S. tychonis* var. *yokoyamai* (nom. nud.) but could not carry his palaeontological study far enough to publish their description. He found however another specimen of *Seymourites* from Kaizara (?) of Shimo-Anama village in the collection of the Tokyo Science Museum. He simply illustrated these three specimens in an amateur journal and turned over any further study to be made on them to me, donating the plaster model of the third specimen to our institute. For this donation, I wish also to take the opportunity here to thank him.

Last spring when I made a survey of the Jurassic formation of the Mizunuma area in the southern part of the Kitakami Mountainland, I found still another specimen of *Seymourites* in a collection at the Inai National Primary School, and through the courtesy of Messrs. OKAMOTO and Y. IROKAWA it was added to the collection of our institute. With

all of these specimens at hand, I went over my old manuscript and the result is presented here. Three new species are established through this paper. They are:

1. *Kepplerites* (*Seymourites*) *japonicus* KOBAYASHI (nov.)
(in the old collection of our institute),
2. *Kepplerites* (*Seymourites*) *kuzuryuensis* KOBAYASHI (nov.)
(collected by IZIRI and kept in our institute), and
3. *Kepplerites* (*Seymourites*) *acuticostatus* KOBAYASHI (nov.)
(in the collection of the Tokyo Science Museum)

among which the first is most truly typical of the subgenus. The Ishizaki specimen, though strongly deformed, is most closely related to the third, if indeed they do not belong to the same species.

In these specimens the suture line is unpreserved except in the deformed one from Ishizaki in the Mizunuma area in which it is preserved though faintly. Erosion makes it impossible for me to trace the line with confidence, but as illustrated on Plate VIII it can be recognized that the line is strongly indented, and the saddles are large and the lobes narrow as noted by RAVN on *Kepplerites* (*Seymourites*) *tychonis*. The external and lateral lobes are very deep and the external saddle is very broad. The flattening of the venter in the early stage cannot be ascertained in the specimens before hand, but it can clearly be seen that the overlapping of the ultimate on the penultimate whorl is gradually lessened toward the aperture. All of them have numerous primary ribs each of which branches out into two or more secondaries at the point of distinct tuberculation. Through all of these characteristics the conclusion is quite warranted that they belong to the arcto-boreal group of *Kepplerites*, i.e. to *Seymourites*. This conclusion has an extraordinary bearing on the late Jurassic palaeogeography.

In his palaeogeographic study of the Jurassic and Early Cretaceous periods in 1911 UHLIG placed Nippon in the neritic marginal zone of the Mediterranean and Caucasian realm. The alliance of the Upper Jurassic fauna of Nippon, especially of the Torinosu fauna, with the Tethyan faunas is, as I have demonstrated already in 1935, quite marked. But, nevertheless, the discovery of *Kepplerites* in the *Seymourites* group evidently shows that there was a temporary inflow of the northern current into the late-Jurassic sea of Nippon.

Then, the route of its migration becomes a question. The known distribution of the subgenus is summarized below. It occurs in the *Cadoceras* zone in the northwestern side of the North America from Montana to Alaska. A Malm formation with *Cadoceras* zone below and *Cardioceras* zone above appears to fringe the arctic margin of Siberia. The former zone is known to exist in New Siberian islands as well as in Begitschew and Pre-obraschenje islands in the Chatanga gulf, but I have not yet heard of any occurrence in the interior of Siberia, although the presence



of the Upper Bathonian formation containing *Arctocephalites* and *Inoceramus retrosus* in European Russia and northern and northeastern Siberia is reported.

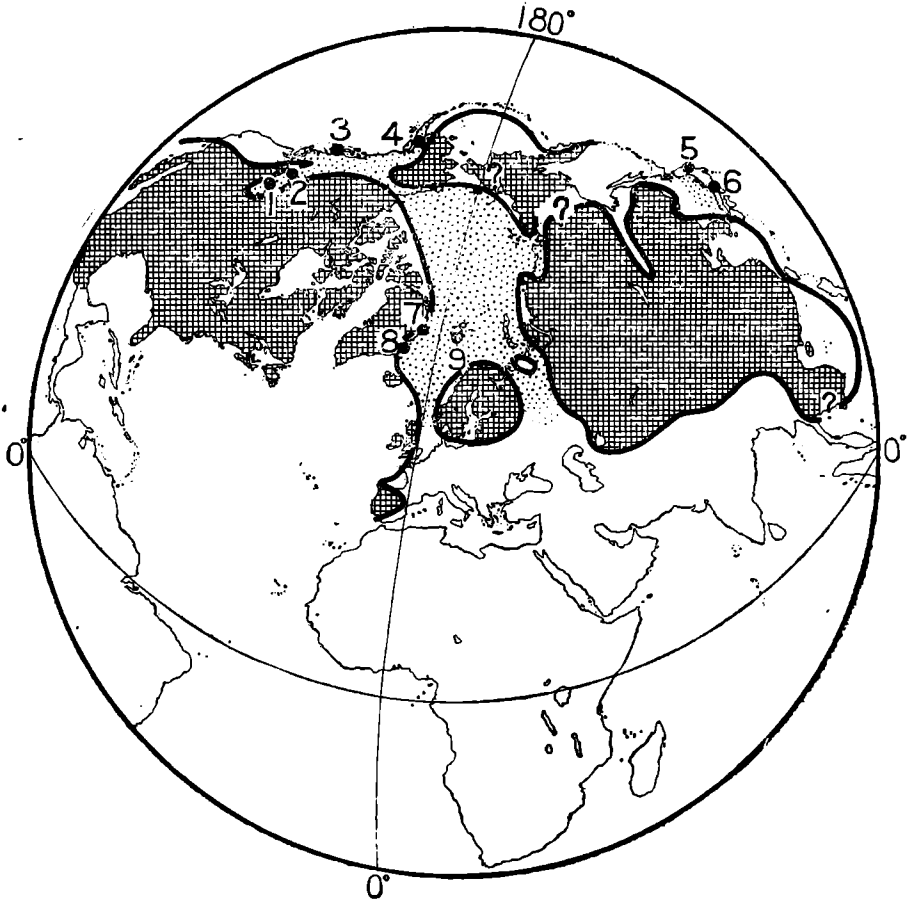
I. retrosus KEYSERLING is closely allied to *Inoceramus utanoensis* which I described from the Utano formation in Nagato in 1926. Furthermore it should be noted that Kimmeridgian *Aucella kirghisensis* occurs both at the mouth of the Byrandscha on the southwestern coast of the Ochotsk sea and on Kotelny Island in the Arctic sea. On the other hand the connection of the Malm fauna on Askold island near Vladivostock with the Tetori fauna is maintained through *Perisphincti* of the *biplex* group. There is a formation of the Bathonian-to-early-Callovian in eastern Transbaikalia, but arctic affinity is not distinctly represented in the fauna contained. Above it there comes a thick conglomerate still Upper Jurassic in age, the stratigraphic relation suggesting a regression in the Callovian or late Callovian epoch.

Although strips and patches of the Upper Jurassic formation is shown on the geological Map of USSR 1937, exposed in Siberia to the east of the Lena River, no fossil evidence has yet been provided to warrant the view that the Ussuri Bay as shown by GRABAU crossed the eastern part of Siberia as far as it reaches the Arctic sea in the late Jurassic period or at least in the Callovian epoch.

On the other hand it is proven that the Arctic sea was connected with the Pacific one through the Yukon-Alaska boundary whence one branch extended toward Montana while the other flooded over the Alaskan peninsula. Further beyond, *Seymourites* was found in the southern Kitakami mountains and the Hida plateau. Whether it migrated into Nippon along the Kamchatka peninsula or along the unknown Lena channel, however, is as yet undetermined. At any rate it is certain that the cold current used to flow into the inner side of West Nippon as well as North Nippon. The circumarctic sea in the *Cadoceras-Seymourites* hemera is shown in the map inserted here.

Finally a brief note must be given on the question of the *Seymourites* bearing beds in Nippon. Except in the case of a specimen from Goribashiri the exact horizon is unknown of the three others. While the Goribashiri specimen is contained in a fine sandstone bed and others in shales, *Kepplerites* (*Seymourites*) *japonicus* as well as *K. (S.) acuticostatus* are contained in black shales resembling the Nagano shale. Whether *Seymourites* continued to live from the Yambara to the Nagano stage or whether the two were procured from some shale member which was overlooked in the Yambara sandstone formation is not known. Of the Ishizaki specimen also the exact locality is unknown, but the deformation of the ammonite and the shale containing it are strongly suggestive of its derivation from somewhere in the Samurahiama formation at Ishizaki (?) in the Minuzuma area. The tendency of loose coiling seen in this specimen might mean that it is a terminal form of *Seymourites* along

-  Arcto-Boreal Callovian Sea
 Continent



1. Montana.
2. Fernie, British Columbia.
3. Skidegate inlet, Queen Charlotte island.
4. Cook inlet, Alaska.
5. Mizunuma, North Nippon.
6. Echizen, West Nippon.
7. Store Koldewey Island, Northeast Greenland.
8. Jameson Land, East Greenland.
9. Ice Fjord, Spitzbergen.

this line of evolution, but at the same time it must be kept in mind that, while *Kepplerites* (*Seymourites*) *kuzuryuensis* from the Yambara sandstone is an aberrant form (*K.*) *S. japonicus* in black shale has diagnostic characteristics of the subgenus. At any rate there is so far no positive evidence showing that *Seymourites* appeared earlier or survived later than the Callovian and all of them so far known from Montana, western Canada, Alaska, Spitzbergen and Greenland are considered to be Callovian in age.

Genus *Kepplerites* NEUMAYR, 1892.

Subgenus *Seymourites* KILIAN and REBOUL, 1909.

Remarks:—In recent years the genus and subgenus have been subjected to discussions by BRINKMANN, SPATH and others. Restricting the use of the generic name, *Kepplerites*, to a very narrow sense, BUCKMAN established out of the left-over species several new genera, such as *Gowericeras*, *Galilaeiceras*, *Galilaeanus*, *Galilaeites* and so forth. In agreement with his restriction MCLEARN established in 1927 two new genera, *Yakounites* and *Yakounoceras* respectively for *Yakounites plenus* and *Yakounoceras gitisni*, both new species. *Yakounites* was, however, synonymized in 1929 with *Seymourites* by MCLEARN on account of priority.

When KILIAN and REBOUL established *Seymourites* as a subgenus of *Kossmaticeras* they said that "*Kossmaticeras Loganianum* WHITEAVES sp. reproduit par ses côtes primaires, régulièrement et nettement trifurquées en branches plus fines, le mode d'ornementation des *Stephanoceras* et *Coeloceras* jurassiques; cette forme constituera le chef de file d'une nouvelle section, celles des *Seymourites*" (p. 26).

The type of the subgenus was *K. (S.) loganianum* (WHITEAVES) from the Queen Charlotte islands which was considered to be Middle Cretaceous, instead of Callovian, in age.

On this occasion they identified an ammonite from the island of Snow Hill, south of Graham Land in West Antarctica, as belonging to this species, but it is evidently different from *Seymourites* or *Kepplerites*, notably in the mode of ornamentation which the two authors emphasized as the distinguishing characteristics of *Seymourites*. Furthermore *Desmoceras*, *Hauericeras* and several other Cretaceous ammonites were procured at the same locality. The Snow Hill series which yielded them and extends into Seymour island, is quite fossiliferous and its age has been determined to range from Cenomanian to Senonian by KILIAN and REBOUL. WILCKENS on the other hand noted the alliance of this fauna to the *Seymourites*, has once misled IZIRI into thinking of bipolarity in its distribution, but in fact its occurrence in Antarctica must be thus excluded.

In his monograph on *Kosmoceras* BRINKMANN considerably simplified the kosmoceratids by putting *Kepplerites* as a subgenus of *Kosmoceras*, including BUCKMAN's *Gowericeras*, *Cerericeras Galilaeiceras*, *Toricelliaceras*, *Galilaeites*, *Sigaloceras* and *Guliemina* in the subgenus. SPATH on

the other hand took the intermediate route between the extremities of lumping and splitting. He reserved *Seymourites* however as a subgenus for the boreal forms of *Kepplerites*, but eliminated *Yakounoceras* as a synonym of the subgenus.

According to SPATH the distinction of *Seymourites* from *Kepplerites* s. str. rests on "the size, the tendency of the peristome to become flared, with a preceding shallow constriction, the loss of runcination at an earlier stage than in the Wurtemberg examples, and especially the finer ribbing in the young, the true *Kepplerites* (including "*Cerericerias*") being coarser in the septal stage than most of the boreal form here grouped in *Seymourites*."

The series of undescribed specimens from Alaska and Montana kept in U. S. National Museum, presents a wide range of variation in size, mode of coiling, and density of ribs. Glancing over them as well as the illustrations of previous workers it may however be generally said that the ribs are more densely distributed in the boreal forms than in the north European ones, but it is a question whether this is a clear cut distinction or not. In a form from Montana the runcination on the venter of the whorl is very distinct up to a certain part in the youthful stage but later becomes obscure. It is probable that *Kepplerites* s. str. and *Seymourites* would be connected by a chain of intermediate links.

Distribution:—According to BRINKMANN, *Kepplerites* as he defines is distributed in middle and south Russia, Poland, the southern Baltic region, north and southern Germany, northern France, England and Scotland in Europe, Franz Josef Land (?) and eastern Greenland in the Arctic regions; Alaska and British Columbia in North America; and the Himalayan region. The last mentioned locality is, however, exceptional and if the species he had in mind were *Kepplerites galilaeii* OPPEL and *Kepplerites neumayri* UHLIG from Caucasus, then both of them have the runcinate whorl up to the adult stage which makes doubtful their generic reference to *Kepplerites* as here restricted. The limit of its distribution in southwest Europe is said by him to be drawn through the northern margins of the Aar massive, Savoyen, Cote d'Or, Poitou and Middle Portugal. The distribution of *Seymourites* in the sense of SPATH which includes *Yakounoceras* is more restricted. So far as I am aware sixteen species and one variety are described as follows:

- 1) *Ammonites loganianus* WHITEAVES, 1876, from the Queen Charlotte islands.
- 2) *Kepplerites tychonis* RAVN, 1911, from East Greenland and Spitzbergen.
- 3) *Yakounites plenus* MCLEARN, 1927, from the Queen Charlotte islands.
- 4) *Yakounoceras gitinsi* MCLEARN, 1927, from the Queen Charlotte islands.

- 5) *Yakounites maevoyi* MCLEARN, 1928, from the Kanaskio River, Alberta.
- 6) *Seymourites multus* MCLEARN, 1929, from the Queen Charlotte islands.
- 7) *Yakounoceras abruptum* MCLEARN, 1929, from the Queen Charlotte islands.
- 8) *Yakounoceras ingrahami* MCLEARN, 1929, from the Queen Charlotte islands.
- 9) *Yakounoceras torrensi* MCLEARN, 1929, from the Queen Charlotte islands.
- 10) *Kepplerites svalbardensis* SOKOLV and BODYLEVSKY, 1930, from East Greenland and Spitzbergen.
- 11) *Kepplerites (Seymourites) tychonis* (RAVN) var. *fasciculata* SPATH, 1932, from East Greenland.
- 12) *Kepplerites (Seymourites) peramplus* SPATH, 1932, from East Greenland.
- 13) *Kepplerites (Seymourites) rosenkrantzi* SPATH, 1932, from East Greenland.
- 14) *Kepplerites (Seymourites) antiquus* SPATH, 1932, from East Greenland.
- 15) *Kepplerites (Seymourites) nobilis* SPATH, 1932, from East Greenland.

Furthermore it is quite probable that EICHWALD's specimens of *Ammonites* aff. *asterianus* d'ORBIGNY which were collected on the Island Chasik in the Kinai Bay and from the Tukusitnu Bay belong to *Seymourites* instead of being Cretaceous ammonites. In MARTIN's paper EICHWALD's *asterianus* is referred to *Stephanoceras* and its occurrence with *Kepplerites* cfr. *loganianus*, several species of *Cadoceras* and other fossils in the Chinitna shale of Cook inlet is cited. This shale formation occurs also in the Matanuska valley and the Shelikof formation of the Alaskan peninsula yields the same species of *Cadoceras* as those of the Chinitna. He mentions that "this fauna has not been found in North America outside of Alaska, but the possible equivalent of the Chinitna horizon may be found in the Bicknell sandstone of the Taylorsville region of California and possibly in the lower part of the Ellis formation of Montana." The occurrence of *Seymourites* however shows that the horizon which yielded the ammonite can safely be correlated with the Yukon sandstone and shale lying on the Yakoun volcanics in the Queen Charlotte islands as well as with the *S. maevoyi* bearing zone of the Fernie formation on the Kanaskis river in Alberta.

MCLEARN mentioned that the *Seymourites* zone of Western Canada represents the Proplanulitan age, and the opinion was upheld by CRICKMAY. In discussing the age of the *Kepplerites-Cadoceras* beds which lie at the top of the Vardekloft formation in Jameson Land SPATH concluded

that it cannot be earlier than Middle Callovian. *Seymourites* is a characteristic group of *Kepplereti* in the Callovian fauna of the arcto-boreal province.

Kepplerites (Seymourites) japonicus KOBAYASHI, new species.

Plate VII, figure 1.

Description.—Spire coils gradually, the diameter of the umbilicus being equal to about a quarter of that of the shell; broad flank of the last whorl flat and inclined more abruptly on the umbilical than on the peripheral side; toward the aperture the whorl tends to evolute to some extent.

Tubercles located on the whorl about one-third the distance across the body from the umbilical margin; primary rib stout, ending at the tubercle and running through the umbilical slope with a backward convexity; the rib bifurcates at the tubercle into two slender secondary ribs which are subangulate and which curve with gentle forward convexity; one or rarely two secondary ribs of the same strength and curvature are intercalated at about the line of nodes between every two bundles of secondary ribs, ten to eleven primaries are counted in a quarter of the whorl.

Dimensions and observations.—As the specimen is incomplete, in place of the diameter, I measured two radii along the anterior and posterior broken edges of the last whorl. They are about 64 mm. and about 50 mm. respectively. The height of the body whorl, and the diameter of the umbilicus measured in the same direction as the larger radius given above, are 43.5 mm. and 32.3 mm. respectively. The thickness is actually not measurable on the specimen, but from the section of the specimen it is presumed that it would be approximately 24 mm. at the same plane where the height is measured. The penultimate whorl is subangulated on the flank, but the angulation appears to be due to secondary deformation, because it dies out not only forwardly but also backwardly. The ribs, especially the secondary ones, are obsolete in the last quarter of the last whorl. Though such a tendency is seen in many species of *Seymourites*, it is certainly accentuated in this case by erosion. In the anterior of this quarter the shell is more or less depressed, notably on the peripheral side, suggesting the presence of a shallow constriction.

Comparison.—The distinguishing specific characters are the fairly compressed section of the last whorl, densely distributed ribs, and small but prominent tuberculation. If we disregard the last characteristic this resembles *Kepplerites (Seymourites) tychonis* RAVN and *K. (S.) peramplus* SPATH. In the variety *fasciculata* of *tychonis* the tubercles are distinct on the last whorl but the ribs are more straight than those of this species. This is more related to *Kepplerites plenus* (MCLEARN), *K. (S.) loganianus* (WHITEAVES) and *K. (S.) multis* (MCLEARN) of western Canada and

some undescribed forms of the genus from Alaska, but these American forms usually have more dense ribs. In *plenus* and in *loganianus* however the primary rib branches into four or three secondaries, and there is one more secondary rib in the interval. The species, *multis*, has either five secondaries rising from each primary rib or four secondaries in addition to one intercalated. The primary ribs are more densely distributed in the Japanese than in the Canadian species. Furthermore, in *japonicus* the whorl is more compressed laterally.

Formation and locality:—This ammonite was found in an old collection of the Geological Institute, Imperial University of Tokyo. It is contained in black shale and on the original label is read "Kaizara in the Province of Echizen."

***Kepplerites (Seymourites) acuticostum* KOBAYASHI, new species.**

Plate VII, figure 2.

This species differs from the preceding in having a larger umbilicus, stronger tendency to release the coiling of the spire in the grown stage, gentle convexity of the lateral side of the whorl and extraordinarily prominent ribs.

The diameter of the shell is, if complete, a little longer than 92 mm. where the umbilicus is 27 mm. across. The flank of the penultimate whorl is gently convex and the umbilical slope steeply inclined, but this inclination becomes very gentle in the latter part or the last whorl, where it tends to lose the coiling until a half of the secondary rib becomes exposed.

The primary ribs which number 40 on the last whorl are narrow, prominently elevated, acutely angulated on the top and separated from one another by deep and broad grooves. They reveal distinct backward convexity on the flank. From the tubercle which is located a little below the middle of the whorl-height, primary rib branches off into two or three secondaries and frequently a rib is interplaced between every two bundles of secondaries. These ribs on the ventral side are broadly arcuate with forward convexity. Though finer than the primaries, they are still very prominent and interspaced by deep grooves, and are slightly broader than the ribs. The prominence of the ornament is maintained through all around the whorl so far as it is preserved. There is no trace of constriction. This species agrees with *Kepplerites (Seymourites) plenus* in plate-like secondary ribs and with *K. (S.) loganianus* in frequent trifurcation of the primary rib, but the primaries are more numerous and the umbilicus broader in this than in the two allied species.

Formation and Locality:—Kaizara (?) in Shimoanama village, Onogun, Province of Echizen (Fukui Prefecture); Holotype in the Tokyo Science Museum and its pleisotype in the Geological Institute, Imperial University of Tokyo.

***Kepplerites* (*Seymourites*) cfr. *acuticostum* KOBAYASHI.**

Plate VIII, figures 1-2.

The Ishizaki specimen is strongly deformed secondarily by a lateral compression, which is a common characteristic among all the specimens from this region. But nevertheless it shows good agreement with the preceding specimen in its broad umbilicus, sharp and crowded ribs as well as in other aspects. Caused by deformation the whorl section is of course more convex than the preceding ones.

One of the notable difference is the diameter of the umbilicus which is about 0.3 of the diameter of the shell whereas it is about 0.35 of the diameter in the preceding specimen. But it must not be overlooked that this ammonite is larger, and the penultimate whorl is almost wholly exposed. Therefore it is easy to understand that the difference in the diameter depends upon the coiling of the spire which becomes evolute in the fullgrown stage.

The major and minor diameters of this shell are roughly 170 mm. and 65 mm. respectively where those of the umbilicus are 65 mm. and 21 mm. Along the umbilical margin about 47 ribs are countable. The primary ribs are mostly trifurcate at the tubercles which lie a little outside of a point one-third of the way up the whorl-height and a rib is frequently intercalated at intervals. All of these ribs are prominent as in the preceding specimen. A broad constriction is seen on the side of the last whorl along the major diameter.

If the great variability of *K. (S.) tychonis* as recognized by SPATH is considered, it is probable that the specimen belongs to the identical species with the preceding, although the deformation and the loss of the inner whorl prohibit this identification. It must also be noted that there is none among the specimens abroad which becomes as much evolute as this species. On the poorly preserved suture line on the inner cast a note was given on a foregoing page.

Formation and locality.—This specimen was donated to the Geological Institute, Imperial University of Tokyo, from the Inai Primary School. From the black shale containing this ammonite, I presumed that this came from the Oginohama series at Ishizaki (?) in the Mizunuma area.

***Kepplerites* (*Seymourites*) *kuzuryuensis* KOBAYASHI, new species.**

Plate VII, figure 3.

This species is based upon an incomplete external mould from Gori-bashiri, which has a very distinct characteristic ornamentation.

The primary ribs which are Δ -shaped in section are very narrow and very widely spaced by shallow intervals. There are only seven or eight

primaries in a quarter of the last whorl. A tubercle is located at a point a little inside of the middle of the flank whence the primary rib generally bifurcates and in addition two riblets are intercalated between them. The riblets thus issued are very fine and separated from one another by flat interspaces of uniform breadth. The course described by the primary rib and the secondary riblet is sigmoidal, convex forward on the outer and backward on the inner side.

The whorls are convex gently on the flank but, abruptly curving on the inner margin, become vertical on the inner slope. Such a sharp bent however becomes weaker through the latter half of the last whorl and at the same time its lapping over the penultimate whorl decreases rather abruptly and the secondary riblets on the penultimate whorl become largely exposed. The radius of the shell is about 50 mm. while that of the umbilicus is 9 mm.

The fine and sparse ribs of this species are such aberrant features among the known species of *Seymourites* that they prevent its confusion with any of these species.

Formation and locality.—IZIRI collected the specimen from the Yambara sandstone formation at Goribashiri of Shimoyama, Shimoanama village, Ono-gun, in the province of Echizen during the field survey for his graduation-thesis presented at the Imperial University of Tokyo.

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Explanation of Plate VII.

Keplerites (Symourites) japonicus KOBAYASHI, new species.

Figure 1. Internal mould of the holotype; an old collection of the Geol. Inst., Imp. Univ. Tokyo, labelled "Kaizara in the Province of Echizen": natural size.

Keplerites (Symourites) acuticostum KOBAYASHI, new species.

Figure 2. Plaster cast from the external mould of the holotype: loc. Kaizara? Province of Echizen; natural size.

Keplerites (Symourites) kuzuryuensis KOBAYASHI, new species.

Figure 3. Plaster cast from the external mould of the holotype; loc. Goribashiri of Shimoyama, Province of Echizen; natural size.



Explanation of Plate VIII.

Keplerites (Seymourites) cf. acuticostum KOBAYASHI.

Figs. 1-2. An internal cast taken from an external mould and an incomplete internal mould of the same individual as the preceding, the latter showing the sutureline; loc. Ishizaki(?) in the Mizunuma area, Province of Rikuzen; natural size.

