

## Achievement and future challenges of Japan Geopark Committee

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The Japan Geopark Committee was established on May, 2008 to promote geopark activity in Japan. Since then the JGC authorized twenty-five areas as Japan Geopark and six areas as candidates for member of the Global Geoparks Network (GGN). Through these evaluation process, JGC basically adopt the guideline of the GGN but JGC also adding some ideas and criteria to make Geopark system more comfortably accepted in Japanese society. As a result of the evaluation criteria of JGC, Japanese geoparks have some distinct characters comparing to the European geoparks and Chinese Geoparks. The distinct character includes; management of the geoparks with less bottom-up style than European ones and more bottom-up style than Chinese ones, more emphasis on relationship between man, biosphere, hydrosphre and geosphere.

Keywords: Geopark, Japan Geopark Committee, Japanese Geoparks Network, Global Geoparks Network, Sustainable Development, Sustainable society

## Bottom-up Management of Muroto Global Geopark

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One of the responsibilities for GGN and JGN members is to use local resources in order to construct a sustainable society, and it is absolutely necessary local people's independent activities in order to make this happen. We can find a word 'local' many times in the GGN guideline. The section titled 'Management and local involvement' in the Guideline says that 'The establishment of a Geopark should be based on strong community support and local involvement, developed through a 'bottom-up' process. It should demonstrate strong support from local political and community leaders, including in relation to the provision of necessary financial resources. The Geopark should have effective and professional management structures, deliver policy and action for sustainable regional socio-economic and cultural development across the territory where it is located. Success can only be achieved through strong local involvement. The initiative to create a Geopark must therefore come from local communities/authorities with a strong commitment to developing and implementing a management plan that meets the community and economic needs of the local population whilst protecting the landscape in which they live.' The 3rd JGN Conference, held in Muroto Global Geopark in November 2012, also discussed on local involvement into geopark project. It is contained on the Muroto Declaration.

However there is no definite way how local people relate to Geopark. All of geoparks in the world has problems to promote local involvement into geopark project. There are slight differences between Geoparks in Europe and Japan. In Europe, geopark is mainly managed by NPOs and local groups; in Japan it is mainly controlled by local government.

In Muroto Global Geopark, new projects based on bottom-up management by local people have been introduced; 1) Preparation project of Geopark off-site center, 2) Developing a new action plan for next three years (2013~2015 fiscal year) of Muroto Geopark Promotion Committee (MGPC, hereafter).

1) Muroto Geopark off-site center will be established by using a closed school in the city. MGPC has held workshops discusses about effective and ideal image of off-site center with local people. In the workshop, participants have shared aim that Geopark off-site center is not only for tourists/ travelers but also for local people. Among the participants, following ideas were shared that Geopark off-site center should be the place where makes visitors actually visit to geo-sites around Muroto city, local people can study, and many people can communicate with each other. An idea of geo-tour which off-site center plays an effective role was also emerged.

2) MGPC introduced workshop style for developing a new action plan. Participants talk about strong and weak points of Muroto Global Geopark. In the workshop, participants are not just discussing. They read the GGN guideline and consider on 'assignment' for Muroto Global Geopark from GGN judges. MGPC try to share such problems with local people through the workshop.

Workshop style has some sort of influences on involved groups in MGPC. For example, a guide group, managed in top-down system so far, has started to develop a program for the year, plan a schedule of guide training program, discover a new geo-sites, and make a new geo-tour program independently.

This presentation/ poster will show you bottom-up management of Muroto Geopark with examples of workshop-style introduced into preparation project of Geopark off-site center and developing a new action plan.

Keywords: Muroto Global Geopark, management, action plan, guideline, bottom up

## Economic effect and its temporal change that the GGN authorization brought -the example of Unzen Volcanic Area Geopark

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Local promotion using geo-heritages is one of the main purposes of geoparks. Though the Unzen Volcanic Area was authorized as a Global Geopark in 2008, local residents have not felt actual economic effects yet. Are there actually tourists with the purpose of visit of the geopark? In order to estimate the proportion of the tourists to see the geopark, we carried out the questionnaire to tourists visited at the Shimabara Peninsula in summer of 2011 and 2012.

The results show the proportion of tourists with the purpose of the visit of the geopark was 13.2 % (day-trippers) and 16.0% (overnight visitors) respectively. From the total amount of visitors, averaged consumption per a person ( 5921 JPY of a day-tripper and 28964 JPY of an overnight visitor) and average number of purposes of tourists ( 2.5 of a day-tripper and 3.4 of an overnight visitor), the economic effect brought by GGN authorization was estimated to about  $2.5 \times 10^9$  JPY in 2011.

On the other hand, in 2012, the proportion of tourists with the purpose of the visit of the geopark was systematically decreased; 10.0 % (day-trippers) and 12.4% (overnight visitors) respectively. Preliminary estimates of economic effect in 2012 is only about  $1.9 \times 10^9$  JPY. Judging from the decrease of tourists, this value must decrease more.

The decrease of the economic effect was due to the decrease of the proportion of tourists for the purpose of the visit of the geopark. The main factor is drastic decrease of the number of collection of the questionnaire at the core and satellite facilities in the geopark; i.e. Mt. Unzen Disaster Memorial Hall, the Heisei Shinzan Nature Center, the Onokoba Sabo Mirai Hall and so on. On the other hand, in 2012, the number of the questionnaires of day-trippers increased more than 200 cases in comparison with 2011. We consider that the results of 2012 are almost the actual situation of the tourists visiting our geopark. We must utilize the information and promote the maintenance of the geo-guide and the development of the local geotour, the development of the original souvenir more to treat the tourist for the purpose of the visit of the geopark.

Keywords: Unzen Volcanic Area Global Geopark, Economic effect, Questionnaire, Day-trippers, Overnight visitors, Local promotion

## How to bring up the ability of geo-guide

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<sup>1</sup>Promotional meeting for Happo-Shirakami Geopark

### 1, Introduction

One of the most important things of managing the geo-park is the ability of geo-guide. In our Promotional Meeting for Happo Shirakami Geopark, we have been operating the activities of the geo-guide.

I would like to introduce our active methods and practical geo-guide.

### 2, Beginning

Hachimori town was one of the typical depopulation town before the annexation of towns and we had been searching the way of promote the economical activities. In that period, Seisyu-wood land load has been proposed that was to construct the wood land load border of Aomori and Akita prefecture.

The wood land load was started at Hachimori town. The load was named Seisyu Wood land load.

We were afraid that this load would destroy 130,000ha virgin forest of beech trees. Some conservation of nature began the movement to prevent this load construction. After that the load construction was stopped. But this Low was afraid to be canceled someday, thereby the idea of registering Shirakami Sanchi was planned and, in 1993 this new idea was realized. That is way to be registered Shirakami Sanchi as the world Heritage.

Hachimori town was nominated as the model area of the Environmental Education. Further more some new activities were started such as To live together with Forest. Promotional Interchange Activities in Shirakami Nature Watching.

To realize these activities, many talented nature guides are necessary.

### 3, Establishment Happo-Shirakami Guide Association

#### (1) To open Guide Training Course

To carry out the following guide training seminar, the participants are required to have taken lectures of Nature Conservation Soc. of Japan

#### (2) The contents of lecture

To learn about the nature phenomenon in Shirakami Sanchi, the participants are required to learn about wild plants in Hachimori area.

Those lectures are held 5 times a year, and required to take lectures and to visit the other local spot to learn the guide methods in those areas.

#### (3) The activities contents

The participants are required to learn about plants, animals, germs in Shirakami Sanchi area, and the next steps, they have to learn about geographical features, varieties of rocks and geological structures. In addition they must training first aid.

### 4, The outcomes

In Happo-Shirakami Geopark area, there are 5 geo-model courses as follow.

a: related Hachimori sand fish with Shirakami mountain course.

b: People lived in sand blowing course.

c: Feeling by observing many terrace land forms course.

d: Interesting process to grow up Mt. Futatsumori course.

e: Protected forest Tomeyama course.

Keywords: Seisyu-wood land load, World Natural Heritage Site, Sand fish, Blown sands, Protected woods, germs

## Representation, Understanding and Application of Scientific Knowledge in the Fforest Fawr Geopark (Wales) and the Muroto

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The opportunity to be involved in scientific activities must be provided to a wide variety of people to improve public awareness of science. Geoparks, which are promoted with the assistance of UNESCO, have great potential to appeal to and involve a variety of people and are expected to make a positive impact on society. Geoparks are sites with geological heritages and they aim to conserve these heritages and use them for education, research and local sustainable development.

Geopark activities including conservation, education and tourism are grounded in the communication of the values and characteristics of Geoparks. This study explores how scientific knowledge is represented, understood and applied through information material by focusing on the process of this communication and associated influential factors, and offers constructionism. To emphasize the characteristics of the communication, a comparative study into Fforest Fawr Geopark in Wales and Muroto Geopark in Japan was conducted.

An analysis of information material, qualitative interviews and self-completion questionnaires for visitors was conducted to investigate how scientific knowledge was represented in the material, what the Geopark personnel intended to achieve through the material, how the scientific knowledge was received by visitors and what role it played in the visitors' experience in the Geoparks.

The study revealed the relationships between the information material, the Geoparks' expectation and visitors' experience of the communication of scientific subjects. Between the Geoparks there were differences in visitors' interests, experience of, awareness and understanding of the Geoparks. The intention of the material, the characteristics of the Geoparks, nationalities, gender and age could be considered as influential factors on the results.

The study concludes that Geoparks have great potential to involve a wide variety of people and that communication in Geoparks is diverse depending on the situation of the Geoparks and their visitors.

Keywords: geopark, science communication, interpretation

## Let's make Shikaribetsu lake by yourself: geopark lecture in Shikaoi elementary school

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The lecture of the name "Let us make the Shikaribetsu lake by yourself" was performed to a total of 183 children of the Shikaoi elementary school and other schools in the Shikaoi-cho geopark concept area.

<The outline of the lecture>

the central resources of the Shikaoi geopark concept is the Shikaribetsu lake which is dammed up by lava domes.

Therefore, the main aims of the lesson were set at the point "understanding the formation process of the Shikaribetsu lake with feelings."

Geographical feature of the valley system before the domes was made from papier-mache. Lava domes was made from the dentistry impression material. Then water is poured into the depression by valley and the domes.

The composition of a lesson is as follows.

The lecturer first outlines the magma and the volcano.

Next, formation process of the Shikaribetsu lake is explained briefly, and then an experiment is started.

<Questionnaire>

About 5 minutes were used to fill up the questionnaire sheet.

The three questions were set up in order to obtain degree of comprehension about the contents of the lecture.

The next three questions are for knowing intelligibility, pleasure of the lecture, and the intelligibility of the formation Process of the Shikaribetsu lake, respectively. And the last question is a comment. Questionnaires were collected from all the students who participated in the lecture.

<The result of a questionnaire>

Question, Do you understand the lecture?: over 90 percent of children answered "I understand the lecture" or "I understand the lecture very well"

Question, Was the lecture pleasant?: 80 percent or more of the child has answered that It was very pleasant.

Question, Do you understand how the Shikaribetsu lake was formed ? : 45% for the fourth grade children answered that they understood the lecture very well. For the 5th and 6th grade children, it was about 70 percent.

Keywords: geopark, Shikaoi geopark, Experiment, Lava dome

## Geohistory of Lake Ogawazawa broken by the eruption of Izu Tobu Volcano Group and the mysterious "Red bull" legend

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Geological and historical studies revealed the geographical evolution of the Ogawazawa area, near Ito, northeast Izu Peninsula, and the geohistorical implication of a mysterious legend, which tells about a monster living in a crater lake of Izu Tobu Volcano Group. This gives us a new theme of the Ito geosite, Izu Peninsula Geopark, Japan.

We found lake sediments, which are distributed along the Ogawazawa valley and are directly overlain by the fallout scoria from the Babanotaira-Hachigakubo scoria cones, Izu Tobu Volcano Group. The tephrochronological age of the scoria cones is estimated to be 23,000 years ago. The facies of the fallout scoria show that the depositional environment is subaerial. This means that a fossil lake had suddenly been broken by the eruption of the scoria cones. This geological history strangely coincides with a local legend, which tells us that the "Red Bull", who lives in Lake Ippokiko, one of maars of Izu Tobu Volcano Group, once lived in a lake at Ogawazawa valley, where no lake exists now.

Keywords: Izu Peninsula Geopark, Izu Tobu Volcano Group, eruption, landslide, ponded lake, historical legend

## Concept for Geopark of Southern Sanriku Coast with the disaster experience

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In this report civilian response for the proposal of geopark of Minami Sanriku coast with the great disaster experience were analyzed.

June, 2011: Start internal meeting

September, 2011: Start external meeting

January, 2012: First report by news paper

March, 2012: Scientific event for civilian

May, 2012: First Symposium (with Media)

July, 2012: Second Symposium (with Academic Society)

November, 2012: Third Symposium (with government)

A needs of civilian after the Great East Japan Earthquake is the life. Many proposals for the life has brought in this Area. Doubts beget doubts. Nevertheless, it is necessary to make proposals for the life.

Keywords: geopark, Minami Sanriku Coast, education for natural disaster



## Geo-Tetsu Project: the History of Dissemination Activities of Geoscience for Four Years (2009-2012)

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Geo-Tetsu is the name of the activity that shows everyone ways to enjoy and learn about geology and related sciences, using railways (Kato et, al., 2009a; Kato et, al.,2009b) [1][2]. The word "Geo" comes from geosciences, and the word "Tetsu" is an abbreviation of railway in Japanese, and common name for railway fans. Following four year's Geo-Tetsu, promotion activities of Geo-Tetsu tours are continued by geological engineers who love railways, organized with the corporation of the Fukada Geological Institute. Fukada Geological Institute. Fukada Geological Institute has the trademark No. 5378786 of the name of "Geo-Tetsu" since December, 2010[3].

Geo-Tetsu offers the chance to get acquainted with geological features, not only through train windows but also along paths accessible from the stopovers alongside the railway routes. We selected enjoyable Geo-Tetsu courses and "Geo-points" which means important geological sites visible, through the train windows from stops alongside the route. In Geo-Tetsu, geological features of the landscape are explained scientifically in a guide-book provided by a group of specialists. As much information is obtainable and can be gathered from various perspectives; the railway itself, geology, geography, cultural heritage and sight-seeing as well. We hope that the general public will enjoy a new style of train trips provided by the Geo-Tetsu.

We have been planned following five routes of Geo-Tetsu since 2009. There are many "Geo-Points" along them, we hope, they make people's eyes direct to geosciences, or eventually toward natural sciences.

1. JR Dosan Line in Shikoku [1][2][4]
2. Gomen-Nahari Line [4][5]
3. JR Yodo Line in Shikoku [6]
4. JR Oito Line [7]
5. JR Furano Line in Hokkaido [8]

We report the Geo-Tetsu activities from May, 2009 to December, 2012; conference presentations, Geo-Tetsu Map productions, book writing, lecture meetings, the guide training courses and tours, the registration of trademark, the logo mark production, media publishing, and collaboration activities with Geo Park (Itoigawa City and Muroto City). Our Geo-Tetsu project will start new stage in 2013.

[1] Kato, H., Fujita, M. and Yokoyama, S.(2009a). Let us enjoy Geo-Tetsu - a proposal of Geo-tours through Train Windows (First proposal of its course, JR Dosan Line in Shikoku). Abstract of Japan Geoscience Union (JpGU) Meeting 2009, A004-P012.

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[3] Fujita, M.(2012). Geo-Tetsu project: dissemination activities of geoscience for four years (2009-2012). Annual Report of Fukada Geological Institute.No.13, pp.13-20.

[4] Yokoyama, S., Fujita, M. and Kato, H.(2012). Let us enjoy Geo-Tetsu (R) in Kochi. In Suzuki, T. and Yoshikura, S. (Eds.) *Daichi ga Ugoku Monogatari* [The Story of the Moving Earth]. Kochi, Japan, Minaminokaze Press, pp.124-146.

[5] Fujita, M., Kato, H. and Yokoyama, S. and Ueta, S.(2010) . Let us enjoy Geo-Tetsu - Second proposal of Geo-tours through Train Windows, Gomen-Nahari Line. Abstract of Japan Geoscience Union (JpGU) Meeting 2010, OES005-P02.

[6] Fujita, M., Kato, H. and Yokoyama, S. (2011). Let us enjoy Geo-Tetsu - the Third proposal of Geo-tours through Train Windows, JR Yodo Line in Shikoku. Abstract of Japan Geoscience Union (JpGU) Meeting 2011, O002-P29.

[7] Ueno, S., Fujita, M. and Yokoyama, S. (2012). Let's enjoy Geo-Tetsu through Train Windows -the Fourth Geo-Tetsu Line, JR Oito Line. Abstract of Japan Geoscience Union (JpGU) Meeting 2012, MIS32-P12.

[8] Yasuda, T. and Fujita, M.(2012). Let us Enjoy Geo-Tetsu - the Fifth Geo-tour through Train Windows, JR Furano Line in Hokkaido. Abstract of Japan Geoscience Union (JpGU) Meeting 2012, MIS32-P13.

Keywords: Geo-Tetsu, dissemination activities, Geo-Point, Geo-Tetsu Map, train trips, trademark No. 5378786 "Geo-Tetsu"

## Usage of the term of "geo" in Japanese geopark activity

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Some people in geopark community is called "geo" about inclusive geological, geographical and geophysical phenomena. This usage is ambiguous and grammatical mistake. Some scientist is aware of problem. This case is an example of the problems of science communication.

Keywords: concept of Geopark, science communication, scientist, community

## Framework for implementing ESD in Geopark

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I developed the theme of education of Geopark in relation to sustainability. In Geoparks many educational implementations seems widely separated from one to one. However some commonality and tendency are found among them in their contents and means like science communication and local area study. After revised Guidelines for the Course of Study, school education is recently shifting towards learning sustainability: ESD. Learning local social sustainability through area study provide students attachment and awareness to their local area. Such understandings support teachers and educators to consider the way how to implement ESD-based Geopark activities. This paper shows a framework for ESD in Geopark after analyzing of GGN Guidelines, MEXT's framework for ESD and some learning examples.

Keywords: Education in Geopark, ESD, Framework, Local area study, Networking

## Let's making the only my rock specimens -Promoting in SCIENCEAGORA-

Tomohiko Sekiya<sup>1\*</sup>

<sup>1</sup>sekiya tomohiko

### Intro

It's reported that Unzen Volcanic Area Global Geopark and Shimonita Geopark promoted each area in SCIENCEAGORA 2012, November, 2012 at National Museum of Emerging Science and Innovation. In this report, I announce the SCIENCEAGORA and promotion activities in that days and proposed that the event is more flourishing more Geopark Area promote in SCIENCEAGORA 2013.

Why then, I am deeply grateful to Dr. Ohno (Unzen Volcanic Area Global Geopark), Mr. Tokunaga (Mt. Unzen Disaster Memorial Hall), Mr. Tagami who plan and arrange this promoting activities, and gives Shimonita Geopark to promoting chance.

### SCIENCEAGORA 2012-Let's find the relationships with science-

SCIENCEAGORA is composite event practicing field for science communication held by Japan Science and Technology Agency. The SCIENCEAGORA 2012 was held in the following purposes. (1) Convey understanding and pleasure to science and contribute to the making of rich society (2) Interchange promotion of the scientific communication practitioner and Birth of new cooperation. This event was held National Museum of Emerging Science and Innovation and Neighboring facilities on November 10 and 11, 2012. 191 science communication

### Geopark promotion activities in SCIENCEAGORA 2012

This promotion activities is titled 'Let's making the only my rock specimens-let's enjoy the Geopark-. We Planed to stick 2cm square rock specimen gathered in each area on an original rock sheet, and to present to a training participant. First day, the visitor can make rock specimens of Shimabara area.

The visitor was able to choose to make that of Shimabara area or Shimonita area the next day. It took approximately 30 minutes for one rock seat making. While making it, the visitor receives using slide explanation about the rock to stick on a seat from each local representative. The guests assumed it approximately five people per once and assumed it a pre-order system. However the reservation was made up by a favorable reception unexpectedly at the beginning of the afternoon.

While we made a rock sheet, audience gathered and distributed a pamphlet. we sold goods of Unzen Volcanic Area Global Geopark in the sale booths. We greatly publicized a Geopark through these activity. Furthermore, We were able to win the SCIENCEAGORA Prize

### Let's join SCIENCEAGORA 2013

According to the count result of the questionnaire of the guest 50% of respondents answer with follow; 'I want to participate in an event again', 'I am interested in natural science and technology'. People having high will gather for this event than the above-mentioned result. It has a big pulling in customers effect to target parent and child that do not usually touch it naturally of the inner city.

It made a repeater that it wanted to make both rock specimens that 2 areas participated. As above, Geopark promotion activities in SCIENCEAGORA is very effective. Besides, the entrance fee is free. We are going to participate in SCIENCEAGORA 2013 each other. Because We have had a SCIENCEAGORA prize, the plan making the rock specimen does not intend to change it. An event will become flourishing if other Geoparks participate.

Keywords: geopark, science communication, education of Earth Science

## Educational activities at Shirataki Geopark: Practice of Shirataki Obsidian Class Learning Obsidian and Volcano

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The main theme of the Shirataki Geopark, northern Hokkaido, is a harmony of earth science and history of people, and we can deeply imagine unique volcanic activity that formed obsidian and prehistoric people that survived the last glacial maximum at the deep forest in the Shirataki Geopark area. The Shirataki Geopark is characterized by the nation's largest obsidian origin, some complete exposures of the compact obsidian layers. The Shirataki obsidian was formed by quenching of aphyric rhyolite magmas at least 10 lava units at about 2.2 Ma.

Shirataki Geopark has been practicing various activities to elementary schools and visitors Geopark for understanding of the unique volcanic activity that formed this obsidian. Volcanic Petrology Laboratory, Hokkaido University of Education at Asahikawa, has developed a learning program of Shirataki obsidian. In this program we have performed vesiculation experiments of obsidian using a portable charcoal stove in addition to general talk of volcano, sample observation of volcanic products, analog experiment of volcanic eruption using a water tank. This foaming experiment is suitable to understand that the role in H<sub>2</sub>O in magma is large during eruption. In this experiment, we can imagine how the magma from glowing charcoal stove at high temperature inside. When heated at a high temperature, H<sub>2</sub>O remaining in the glass structure continues to foam, dense obsidian bulge as bread. This changes to the substance that is completely different in appearance, must feel the *mystery of science* to school students.

Shirataki elementary school has been consistently integrated learning through *stone education* utilizing the geological heritage of the region. The children are confident in this thing for obsidian. Shirataki Geopark has helped human resource development in the region, to take advantage of the education of children.

Keywords: Shirataki Geopark, obsidian, education, vesiculation experiment

## Preliminary geo-tour within the area of the Mikasa Coalfield Geopark Plan, and its questionnaire survey

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Preliminary geo-tour had taken place seven times (total participants are 77 people) within the area of the Mikasa Coalfield Geopark Plan from September to October, 2012. The tour is divided into five course: (1) the Katsurazawa Dam Course, (2) the Open-Air Museum Course, (3) the Pombetsu-Ikushumbetsu Town Course, (4) the Horonai Railway Course, and (5) the Tappu Hill Course.

Moreover, we had carried out a questionnaire survey about the tour. In the presentation, we first (1) introduce the above geo-tour, and (2) report the result of survey. Finally (3) we would like to discuss how the problem could be solved for consulting the better geo-tour.

Keywords: Mikasa Coalfield Geopark Plan, preliminary geo-tour, questionnaire survey

## Simplification of geological information for sightseeing and academic support activity on North Ibaraki Geopark

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Recently, sightseeing like greentourism and ecotourism in local areas draws attention. Geopark can provide new-type sightseeing of geotourism. It is difficult for ordinary people to understand scientific information of geology. In order to resolve this problem, we have simplified geological information for geosite of geopark. In 2012, our project team could build relationships with local governments and a company, and support working groups of North Ibaraki Geopark. In 2013, we are active in making explanation board and map of a new geosite and in supporting working groups of North Ibaraki Geopark.

Keywords: geopark, North Ibaraki Geopark

## The effects of experience-based geological education on Byobugaura geosite in Choshi Geopark

Takao Ando<sup>1\*</sup>

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Choshi, located at the east end of the Boso peninsula, 100km east of Tokyo, Chiba prefecture, Japan, has many geological heritages that should be preserved and passed on to future generations. Representative geological features in Choshi are as follows.

First, the Bioubugaura coastal cliff, comprising Pliocene and Pleistocene sedimentary rocks, is approximately 9 km in length and 30?50 m in height and faces the Pacific Ocean. This topography, which is also called "Dover in the East", consists of sharp cliffs formed by land erosion resulting from sea waves. According to a previous report, the speed of erosion is 5?6 m per year. To prevent erosion, seawall was constructed in 1966. The seawall was a necessity for the residents' safety even though it negatively affected the geo-heritage. Second, the Cretaceous shallow sea sediments, designated as a government national monument, are exposed in the Inubouzaki coastal area at the east end of the Choshi peninsula. Third, the "Inuiwa" and "Sengaiwa" rocks, carried on the tradition of the "Yoshitune legend" which is a legend concerning a samurai warrior in the medieval period of Japan, are composed of Jurassic greywacke, mud stones, and conglomerates that includes calcareous coarse fragments with fusulina fossils.

The geological and geographical characteristics of Choshi peninsula have brought honor to the region as Japan's best spring-cabbage-producing area as well as one of the most important fishery bases in the country, and have attracted many of wind turbines, which are considered as leading renewable energy. Choshi geopark project will provide people with understanding of not only the geological formation process of Choshi peninsula but also of the environmental impacts resulting from this land utilization process. That will convince the people of importance of the local environment and prompt their concrete activities toward conservation of the local environment in the future. We define the concept that divides the local environment into three stages - the passed formation process, the present utilization process and the future conservation process - as the "local life cycle thinking". By utilizing this concept, we are providing education for sustainable development, or ESD, at elementary, junior-high and high schools in the region.

Keywords: Geopark, Choshi, Life cycle thinking, ESD, Science education



## Itoigawa Hisui (jade rock), Japan -Candidate of Global Heritage Stone Resource designation

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Global Heritage Stone Resource (GHSR) designation, that is new international designation of natural stone resources, has been progressing by the International Union of Geological Sciences (IUGS) and the International Association for Engineering Geology and the Environment (IAEG) after the approval at the 34th International Geological Congress (IGC) held in Australia, 2012.

GHSR designation aims to promote the recognition for importance of natural stone resources that have occupied a vital position in their utilization or been highly evaluated in cultural history. This designation is expected to raise public and statesman's concern about the stone resources, promote utilization of natural stone, and keep materials of the resources for maintaining stone heritages as well as constructing new buildings of high quality. This designation can validate the importance of the natural stone resources in the area.

Itoigawa Global Geopark includes a lot of evidence that shows the world's oldest Hisui (jade rock) culture. They are jade localities in mountainous area, jade pebbles on the riverbeds and the beach, ornaments made from jade that have been excavated from historic sites dating from the Jomon Period to the Yayoi Period (6000 to 2000 years ago), etc. Museums and educational programs are provided for students and general public to learn about this jade culture. Research activity has clarified the genesis and exhumation process of jade rock, the history of utilization, and the discovery of jade from the Jomon Period to the modern age.

Abbreviated checklist for GHSR designation is as follows.

**Formal Name for this proposed GHSR designation:** Itoigawa Hisui (Jade rock) **Stratigraphic (or Geological) Name:** Occurred as tectonic blocks in serpentinite melange. **Other Names:** Nothing. **Commercial Designations:** Itoigawa Hisui (Itoigawa Jade). **Principal Location of Quarry or Quarries:** No quarries in operation. **Geological Age and Geological Setting:** Hisui is a metamorphic rock that was formed in the deep part of the plate convergent zone in front of the Gondwana continent about 500 million years ago. Hisui is included in serpentinite bodies as a tectonic block in Paleozoic and Mesozoic systems. **Petrographic Name:** Jadeitite, omphacite-jadeite rock and omphacite rock. **Primary Colour(s) and Aesthetics of Stone:** Chemically pure jadeitite has a white color, omphacite rock shows green, Titan-bearing jadeitite shows purple, Titan-bearing omphacite rock shows blue and graphite bearing jadeitite shows black respectively. **Natural Variability:** None. **Composition (optional):** NaAlSi<sub>2</sub>O<sub>6</sub> (jadeite), (Na, Ca)(Al, Mg, Fe) Si<sub>2</sub>O<sub>6</sub> (omphacite). **Geotechnical Properties:** Hisui has a high toughness because it consists of clusters of jadeite and omphacite microcrystals, however minor fractures and faults are common in the rock. Density (kg/m<sup>3</sup>) 3.0-3.4 **Suitability:** Hammer stone, ornament, sculpture, jewelry. **Vulnerability and Maintenance of Supply:** Its conservation is obligatory because natural Hisui stone shows minor production from the river and seashore. The Kotakigawa Hisuikyo and Omigawa Hisuikyo are protected as natural monument of the nation. Use of Hisui should be permitted only in sustainable collecting. **Historic Use and Geographic Area of Utilization:** Hisui was first used for hammer stone in the early Jomon Period (7000 years ago). In the middle Jomon Period (6000 years ago) it had been used for stone ornaments such as Taishu(Hisui pendant) and then from the late Jomon Period through Yayoi Period to Kofun Period (4000 to 1700 years ago) for Magatama(drop-shaped Hisui bead), respectively. They have been excavated from archeological sites in Japan (Hokkaido, Honshu, Shikoku, Kyushu and Okinawa islands). In addition, golden crown with Magatama made in 6th century was found in the Korean Peninsula. In the modern age it is used for sculpture and jewelry.

Keywords: Global Heritage Stone Resource, Jade rock, Itoigawa, subduction zone, world's oldest jade culture

## Some boundaries in the Itoigawa Global Geopark, Central Japan

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<sup>1</sup>Fossa Magna Museum

### **The feature of Itoigawa global geopark**

The Itoigawa Global Geopark (IGGP) located in most western park of Niigata Prefecture is one of the first global Geopark authorized by GGN in 2009.

The feature of IGGP is rich in diversity.

Even if compared not only with domestic but with a foreign geopark as a feature of the Itoigawa global geopark (IGGP) located in western Niigata which is one of the first global geopark authorization places in Japan, it is mentioned that it is rich in diversity.

It is as follows when the main thing is listed.

(1) Vertical drop: it has a 2766 m big vertical drop from the seashore in the Sea of Japan to Mt. Korenge-san of the Hida mountain range.

If Toyama bay submarine channel of the seabed off Itoigawa is included, a still more geographic vertical interval will become large.

(2) Geological boundary: it is roughly divided into two part by Itoigawa-Shizuoka Tectonic Line at the Hida outer edge belt of an east Fossa Magna area and Nishi.

(3) The difference of age of rocks: it has a difference as long as 500 million years to the Mt. Yake-yama volcano which started activity at Cenozoic era Quaternary (about 3000 years before) from jadeitite generated to the Paleozoic Cambrian period (about 500 million years before).

(4) Various geographical features: coastal plain, sea cliff, sand hill, hill, river terrace and lava flow geographical feature, lava dome and erosional feature (a landslide and large-scale collapse), an asymmetrical mountain ridge, twin ridges (line depression contour), curl, etc.

(5) Various rocks: various rocks such as a sedimentary rock, an igneous rock (plutonic rock, hypabyssal rock, and volcanic rock), and a metamorphic rock, are distributed.

(6) Various minerals: six species of new minerals and 13 species of minerals from new [ Japanese ] are discovered.

(7) Various fossils: new four genera and a new 26 species of fossils are described.

(8) Biodiversity: various creatures are distributed over an area with various altitude, geology, and geographical features.

### **Some boundaries in the IGGP**

Dialect, Food, Electric frequency, Electricity of a railroad, Classification of JR, Seasoning of instant noodles

### **boundary mechanism of production**

It is thought that the cause of the "boundary" of the dialect accepted in Itoigawa and its neighborhood or manners and customs has the large existence of steep geographical feature (the Hida mountain range, the cliff of Oyashirazu) and steep streams (Himekawa, Kurobe river) which restricts the traffic of a physiographic factor, i.e., a human being.

Keywords: Itoigawa, boundary, language, manners and customs, distribution of creatures, tectonic line

## Sound water cycle with a focus on agricultural water -In the case of Hakusan Tedorigawa Geopark-

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<sup>1</sup>Ishikawa Prefectural University

Originates in Mt.Hakusan, flowing north to join the River dozens of Tedor River leads to Tsurugi in Hakusan City, Ishikawa Prefecture. Turn to the west, where it flows down the plains Kanazawa City, Tedor River is the largest river poured into the Sea of Japan in Mikawa Hakusan City,Ishikawa Prefecture is a first-class river basin area of 809 km<sup>2</sup>, the flow path line 27km . In addition, the mountainous area accounts for about 90 percent of the basin, the average slope of the river to the mouth is one of the most rapid in Japan about 1/27 from the source. Tedor River typical alluvial fan is formed in the downstream river channel is committed to the Sea of Japan and the southern part of this fan. Hakusan Tedorigawa Geopark, this basin has been certified to Japan Geopark. In addition, the fan is paddy field has developed through the ages, is responsible for the leading role of the food supply of Ishikawa prefecture. Backbone canal extends 240 km, the water is over Tedor River go to every corner of the alluvial fan. In addition, because it is composed of a relatively steep gravel quality, fan is also active in the basement of use groundwater aquifers develop well.

In addition, the precipitation in the region has a peculiar distribution of the Japan Sea side and the Pacific Ocean side is different. Compared to the area of the Pacific Ocean, precipitation from April to October does not change significantly, the amount of precipitation from November to March the overwhelming majority. Most of this is snow in the mountainous area, snow melt water has been used as irrigation water.

Ishikawa Prefectural University is located in the central fan, such as a watershed area of Hakusan Tedorigawa Geopark is an important research university. To conduct research to address regional issues for the university community, rooted in the development of the region, is also important in terms of contributing to the region and to originate the results is one of the important role of the university community. In addition, because it is one of the purposes of science popularization, as well as a place of research results originating in the Geopark .University can work with Geopark.

At the university, in cooperation Ishikawa prefecture, Hakusan city, and local stakeholders, and other carried out over six years, "A Study on Sound water cycle with a focus on agricultural water" as the theme of the water cycle is a keyword of the Hakusan Tedorigawa Geopark .

Focus on environmental changes and natural (such as urbanization, aging and depopulation) (such as climate change caused by global warming) social environment, research project, the current situation in the region for the blessing of the water cycle a variety of this area It is intended to make predictions for the future from that, get closer recognize the impact of global warming on local residents, were studied from various angles.

We have done research on the subject of roughly 10. 1)Changes in precipitation and snowfall from the progress of global warming prediction ,investigation of changes in sea level rise predictions 2)studies on changes in social conditions, such as urbanization and aging 3) the amount of sediment runoff from the mountains Investigation of forecast changes in river flow 4)the elucidation of the mechanism of hydrological cycle of paddy 5)the elucidation of the structure underground fan 6)the elucidation of the mechanism of groundwater flow 7)survey of forecast impact of rice due to global warming 8)damage prediction due to the increase in wildlife due to the decrease of snow cover 9) increase research impact on biodiversity 10) feasibility study of water use as a natural energy .We investigated the changes of the environment and the current situation surrounding water.

Keywords: Mt.Hakusan, Tedor River, Geopark, Water cycle, Agrecultural water

## Selecting potential geosites in the eastern Kii peninsula, Southwest Japan

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<sup>1</sup>Waseda University

The aim of this presentation is to describe the geotouristic potential of the study area based on the presence of the Median Tectonic Line (MTL) in the region and set the basis for establishing geosites in the future.

Geologically important geosites has been picked up together with the sites of unique history and culture. The valorization of selected objects is ground on field studies and detailed petrographic analyses by using samples from rock exposures on the surface and boring cores.

The petrographic researches provides information about more precise surface trace of the MTL in the eastern Kii peninsula, which can be used as the most attractive point of geological trips in this region, including Ise Grand Shrine (Geku).

This work also focuses on the lack of geotouristic infrastructure that could make available all their advantages for educational purposes. Protecting and using geosites offers various important opportunities for communities including local economy development and providing employment.

In addition, establishing a tentative geotouristic course in the region could increase public awareness of geoscience education, protection and conservation important landscapes for future generations and help tourists to understand particular processes that shape our Earth.

Keywords: geosite, geopark, MTL, Kii Peninsula

## Review of the history of lagoons and iron production in San'in Kaigan Geopark

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Geoparks should introduce sacred spot (e.g.,waterfall, spring, megalith, tree), archaeological sites (e.g., ancient tomb, ancient port), legend of minerals (e.g., gold, silver, iron) and traditions of disaster (e.g., earthquake, tsunami, flood, debris flow) for people with the background of "Geo", because people visiting a geopark are interested in not only geology and geography but also ecology, history and culture related to them. In this presentation, the relationship between lagoons and ancient iron productions in Kyotango City, San'in Kaigan Geopark is mainly reviewed from historical and archeological viewpoints.

In the coastal area of the Sea of Japan, Lake Koyama, Kumihama Bay, Asamogawa-gata and Takeno-gata Lagoon had been used as ports for domestic and foreign trade (with China and Korea) in ancient times. Sinmeiyama-kofun Tumulus and the Aminochousiyama-Kofun Tumulus in the area the largest Zenpoko-enfun (large keyhole-shaped tomb) in the coastal area of the Sea of Japan, suggesting society and culture in the area probably played an important role in ancient Japan. These lagoons were utilized as trading ports under the geographical features. The establishment and extinguishment of these ports must be deeply linked the transition of natural environments with the history of the area.

The archeological site of Enjo Site, located the center of the largest iron production area along the Takeno River, might be related to the largest tumulus and the ancient lagoon ports. The iron production in this area probably played an important part in ancient Japanese society in the age of the beginning of the domestic iron production. Iron sands from Miyazu Granite are widely deposited in the coastal area and the ground surface of the mountainous area. The investigation of the mining history of the iron sand in the granites distribution area is important for understanding the relationship of the ancient iron-making culture between Japan and Korea. San'in Kaigan Geopark can introduce geology especially the granites in the area with introduction of the ancient iron production.

In ancient map in 1603, Takeno-gata Lagoon had already disappeared, although that probably had been utilized as port until the 8th century, suggesting the lagoon was buried between the 8th and 16th centuries. According to the legend of the shrine nearby the lagoon, the lagoon was disappeared instantly at a certain time. Considering the location of the shrine and geology of the area, the disappearance was possibly caused by debris flow. After the scientific inspection, this transition will be able to be used as disaster educational material.

As described above, historical and archeological viewpoints will help people to have interest in geology in geoparks. Introduction from different viewpoints about geoparks with scientific inspections enhance its attraction for more people.

Keywords: Geopark, Tango Area, Iron sand, Lagoon, ruins, ancient iron

## Reexamination of "ancient ripple mark" designated as a Hyogo prefectural natural monument, based on facies analysis.

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Sedimentary originated lineament considered to be "an ancient ripple mark", which is designated as a Hyogo Prefectural Natural Monument, has been preserved in the base of the Miocene gravel bed of the Hokudan Group in Shimonohama, Kamicho, Hyogo Prefecture. The result of the sedimentary facies analysis shows that the most of the Miocene deposits in the Shimonohama area are mainly due to fluvial, flood plane, debris flow, and pyroclastic flow. As a result of the shaped analysis, the lineament can be considered as a gutter cast, a kind of flute cast formed on the bottom of chanel of gravelly river. It is also clarified that it is not a ripple mark formed by wave movements as assumed previously. This result also contributes to educational activities in that it provides correct information scientifically.

Keywords: San' in Kaigan Global Geopark, flute cast, ripple mark, facies analysis, miocene

## Regional revitalization utilized geo-resource in the Hyogo Prefecture

Tohru Sakiyama<sup>1\*</sup>

<sup>1</sup>Museum of Nature and Human Activities

Hyogo Prefecture faces the Pacific, the Seto Inland Sea and the Sea of Japan, and most of the geological bodies in the inner zone of the Southwest Japan can be seen. Recently, regional development utilized those geological features is pushed forward in each place.

### (1) Rokko Mountains

Rokko Mountains was formed by active movement of faults after 1Ma. Active faults caused earthquake, and steep slope and weathered granite often caused debris-avalanche. On the other hands, such geological and topographical features develop the port and urban at the foot of mountains. Many NPO and private organizations develop their activities which are learning on the nature of the Rokko Mountain and guide for the tourists.

### (2) Tatsuyama-Ishi

Late Cretaceous pyroclastic rocks are widely distributed in the southwestern part of the Hyogo Prefecture. Pyroclastic rocks quarried from the Takasago City area are called Tatsuyama-Ishi. These quarries are historical heritages continued from Burial Mound age to the present. Exhaustive survey on the use of the Tatsuyama-Ishi and developing the new products are carried out.

### (3) Ikuno Mine and Gin No Bashamichi(road of carriage transporting silver ore)

Ikuno Mine is a historical mine closed in 1973. Road for exclusive use of the carriage of extension 49km was build from Ikuno Mine to Himiji Port. It is called Gin no Bashamichi and tours and events to follow the building indicating the trace at the time of the going are developed.

### (4) regional development related to excavation of dinosaur

Many dinosaur, mammals, reptiles, amphibians fossils are found from the Early Cretaceous Sasayama Group in Tanba City and Sasayama City. After the excavation, the group which promotes local development utilizing the dinosaur was established. They coordinate with the Museum of Nature and Human Activities, Hyogo,

As mentioned previously, there are much activities that is going to connect geo-heritages with community development. The museum takes a role to let the understanding on the geological heritages.

Keywords: Geopark, regional revitalization, geo-resource, San-in Kaigan, Hyogo prefecture

## Summer school 2012 in Muroto Geopark - we are rolling stones -

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We held a summer school for elementary, junior high school and high school students at Muroto Geopark on 15th and 16th of July, 2012. Aim of the summer school is to feel and understand dynamic cycles on the Earth.

Keywords: event, education, overnight



## Aso Caldera- Influence of huge eruptions and relation with living of people

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<sup>1</sup>Aso Geopark Promotion Council

Aso volcano was born approximately 270,000 years ago and repeated four times of huge eruption afterward. The large-scale caldera which we can see was formed by the huge eruption approximately 90,000 years ago.

The theme of Aso geopark is mainly the topography around the caldera,

volcanic activity of Mt. Naka-dake, the living of people coexisting with a volcano. Above all, even if the caldera looks world-wide scale, and the huge eruption with the caldera formation brings big environment change in the whole not only the Japanese Islands but also earth, and affected the big thing that imagined to the then animals and plants. The times 90,000 years ago are the Old Stone Age worldwide, and the existence of the human after 40,000 years ago is almost confirmed in Japan, but is uncertain before it. Therefore it is not sure whether Aso-4 eruption affected the human being living in then Japan. However, various matters including the influence on animals and plants by sunlight being cut off as for the drop of the temperature on the earth scale from the start are thought about when the influence of the eruption watches examples such as the Toba eruption approximately 74,000 years ago, the Krakatou eruption of 536, the Tambora eruption of 1815. On the other hand, approximately 70,000 people live around the caldera formed by Aso-4 eruption that I had an influence on worldwide and the outskirts. The association with the people and the caldera, the flowing wind connected by the wind to come from the unique collapse feature bringing about a large quantity of precipitation and cause rich springs. However, it's related to natural disaster such as the steep slope collapse of the caldera wall, the flooding of the river in the flatland in the caldera. In this way, global remarkable influence with the formation of the Aso caldera is thought about in the Aso Geopark, and the existence of the caldera brings the relation that is strong in the present generation unconsciously with it. This is one of the big characteristics as the Aso Geopark and thinks that you should strongly appeal. We think that it is necessary for us to carry a central role enlightening for the huge eruption that will happen somewhere of the Earth.

Keywords: Geopark, Aso, Caldera

## Conservation strategies for ecosystem and strata outcrops in Amakusa Goshoura Geopark

Yoshitaka Hase<sup>1\*</sup>, Hiroaki Ugai<sup>1</sup>, Koji Hirose<sup>1</sup>

<sup>1</sup>Goshoura Cretaceous Museum, Amakusa-City

A variety of flora and fauna fossils including those of several species of dinosaur are contained within strata in the Goshoura area of Amakusa, Kumamoto Prefecture. Goshoura town constructed a fossil-hunting place, a fossil park and "Ammonite House"(a structure built to protect and preserve a rare ammonite fossil) among others creating a field museum according to the "Whole Goshoura Museum Plan". There are more than 30 geosites in Amakusa Goshoura Geopark which are maintained in thriving conditions. We would like to show some examples for conservation of strata and ecosystems from these geosites.

"The Sphenoceras Wall" is an example of one geosite conservation strategy for strata and fossils. There are many bivalve fossils of Sphenoceras accompanied by many trace fossils on a bedding plane of shale stratum of the Himenoura Group of the upper Cretaceous period in Makishima. The outcrop was initially covered by wire netting to prevent erosion of this outcrop, but the netting eventually corroded and deteriorated leaving the outcrop and its fossil content exposed and immediately visible. Safe, public access to the site is made possible by a series of steps descending to the outcrop where ongoing scientific research can be observed. It is proposed that this site should be categorized as a geosite once research has finished in order to conserve its present condition and promote public interest.

Another example of conservation strategy of a geosite in Goshoura Geopark is the Ammonite House, which is a structure built at the request of local citizens to protect the largest ammonite fossil found in Kyushu (approx. 60cm in diameter) from being destroyed during the construction of a new road along the coast.

Around the Ammonite House, black shale of the upper Cretaceous Himenoura Group crops out and is visible. *Tsumerenge* (*Orostachya japonica*); a near threatened species (NT) grows naturally on debris sediments from the outcrop walls under sunny and less humid conditions. *Kurotsubame-shijimi* (*Tongeia fischeri shojii*); a near threatened species (NT) of butterfly, thrives on the *tsumerenge* leaves as a food source.

Ammonite House and its surrounding area are general geosites belonging to the Makishima course of Goshoura Geopark. Conservation and protection of many geo-significant aspects of the area including outcrops, flora and fauna is undertaken by the museum staffs and Goshoura tourism guides. These steps include the removal of grass and shrubs that naturally grow in the outcrop areas as well as the observation spots for *Tsumerenge* and *Kurotsubame-shijimi*.

Without careful implementation of conservation strategies at Amakusa Goshoura Geopark, the richness found within the surrounding ecosystem would be lost to future generations.

Keywords: Amakusa Goshoura Geopark, conservation strategies for ecosystem and strata outcrops