"Science of Natural Therapy"

by

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- 1. Humans and nature are synchronized
- 2. Natural therapy and well-being
- 3. Natural therapy and comfort
- 4. Natural therapy and *kansei*
- 5. From *shinrin-yoku* to *shinrin* therapy
- 6. Blueprint for *shinrin* therapy stations
- 7. Physiological effects of relaxation brought about by *shinrin* therapy
- —assessment methods and the importance of individual values in physiological studies
- 8. Physiological effects of relaxation brought about by *shinrin* therapy
 - —validations with physiological studies carried out at 24 places throughout Japan
- 9. Physiological effects of relaxation brought about by natural therapy
 - —implications from indoor olfactory stimulation studies using phytoncides
- 10. Physiological effects of relaxation brought about by natural therapy
 - —indoor visual, auditory, and tactile stimulation studies
- 11. How to enjoy natural therapy
 - —individual values as the top priority
- 12. Special edition on *shinrin* therapy news worldwide
 - —involvement of the International Union of Forest Research Organizations (IUFRO) in *shinrin* therapies

1. Humans and nature are synchronized

The significance of natural environment for human living will be outlined in the following web pages. This is then followed by a conceptual primer on comfort, *kansei* (a Japanese word for emotional makeup, or sensibility), and health. Using data obtained mainly from indoor studies on relaxation effects induced by natural and environmental factors, our "blueprint for *shinrin* (forest) therapy stations" (http://forest-therapy.jp/) that has been actively promoted by the Forestry and Forest Products Research Institute (FFPRI) and Forestry Agency since 2005 will then be introduced. Finally, the question of how best to enjoy natural therapy, with individual values as the top priority, will be discussed.

Harmonization of humans and nature

We feel comfortable when we get in touch with nature, but this sensation is hard to describe in words and science has not yet presented us with adequate explanations for this process. However, thanks to the recent development of assessment methods which can measure the physiological effects of relaxation, much scientific data has now been accumulated. Shinrin-yoku or natural bathing is now changing from an intuitive to an evidence-based natural therapy, based on physiological data.

Five million years have passed since humans became humans. The men and women living in modern times have therefore spent more than 99.99% of their evolutionary history in natural environments. We have become the humans we are today, living in a modern civilization, through a process of evolution in a natural environment. Human bodies are thus made to adapt to nature. However, as expressed by terms such as "techno-stress", artificialization is taking place so rapidly that we now find ourselves in stressful situations and are forced to deal with the resultant pressures.

If, under such circumstances, we receive a stimulus rooted in nature itself through such as natural therapy, we become aware of what we humans really are, relax, and perceive this feeling to be very comfortable. This is accomplished without logical thought. Instead, we perceive it through *kansei* in an intuitive and illogical manner. Because this process cannot be described in words, the use of physiological indicators should play an important role.

A great deal of attention is now being paid to the use of "natural therapy" to

uncover synchronized conditions between humans and nature, addressing this in a scientific manner using data on the physiological effects of relaxation.

2. Natural therapy and well-being

How to achieve a sense of well-being

People have a growing interest in health which perhaps reflects the stressful nature of modern society. How should we achieve a sense of well-being? Obviously, being healthy does not simply mean freedom from disease.

Various definitions of well-being can be found nowadays, but my understanding of "being healthy" is that it is "the state in which an individual fully displays the abilities he or she has or is born with." Because this state differs from one individual to another, a healthy state can be maintained even when you have a physical disability. This involves placing a relative value on well-being rather than an absolute one. Even more important is the conviction that being healthy is not just an ideal "picture" in itself but rather a way or a process through which to live a positive and constructive life. In other words, health should never be a "goal." It should be a "means."

Nonspecific effects of natural therapy

Living in these modern times, in what sort of state do we see our bodies? Five million years have passed since humans became humans. Because we have already spent more than 99.99% of our evolutionary history in natural environments, it is believed that we are essentially nature adaptive. However, we are living in a society characterized by urbanization and artificialization, whereas our physiological functions are still adapted to nature. Because of this, stress levels are always too high and our sympathetic nervous system is also in an overly stimulated state. Bringing such elevated stress levels down to the approximate level our bodies are "expected" to cope with should therefore be an immediate necessity. This is exactly where "natural therapy" fits in. As our bodies get closer to the "expected" state of our natural well-being, our immune functions become enhanced so that our bodies become more disease resistant. For example, although we treat ourselves with antibiotics when we contract pneumonia, we are not expecting the natural therapy to produce such a "specific effect." Instead, we expect a "nonspecific effect" whereby our bodies will become resistant to pneumonia as a result of increased immune function induced by the relaxation of bodily stress.

In a collaborative study with the Nippon Medical School, involving Doctor Li as Principal Investigator, it was demonstrated that immune functions are enhanced by shinrin (forest) therapy. Middle-aged employees working for major corporations in Tokyo volunteered to participate in our study. To begin with, we examined the natural killer cell activity (NK activity) as an indicator of immune function (particularly as an indicator of anti-cancer activity) in 30 volunteers. Furthermore, our study of shinrin therapy was initiated with a study of 12 "hard workers" who had no subjective symptoms but complained of having little energy with decreased immune function. On Friday morning, they took the Shinkansen (bullet train) to the shinrin therapy station located in Iiyama City, Nagano Prefecture, and walked in the forest for 2 hours on the first day, and 4 hours on the second day, for a total of 6 hours. To our surprise, NK activity was enhanced by 56% on the second day, returning to normal levels. A statistically significant increase of 23% was maintained for 1 month even after these volunteers had returned to urban life, clearly illustrating the "nonspecific effect" of natural therapy.

We expect that more attention will be paid to the role of "natural therapy" in preventive medicine in the future.

3. Natural therapy and comfort

How to achieve a sense of comfort

It is common to use words like "comfort" in daily life, yet no set definition is available in the academic community. My understanding of comfort is that it is the "harmonization of rhythm between human beings and the environment." During everyday life, we can, in certain environments, experience a feeling of comfort if we find that our rhythms are synchronized with those of the environment. This is sometimes expressed by such phrases as "We hit it off immediately," "We get on well with each other," or "I like the atmosphere." When you feel that the audience is listening to your lecture, for example, it is easy to talk some more. But, once you have spotted someone looking around or dozing off, you do not want to continue with your lecture.

Masao Inui categorized what is meant by being comfortable using the terms "passive comfort" and "active comfort." I wish to address the question of *comfort* in accordance with this scheme. "Passive comfort" is rooted in the desire for safety and the elimination of discomfort. When assessing this category of comfort, it should not be difficult to reach consensus because individual preferences are not involved. In contrast, "active comfort" is rooted in the desire for personal growth and the urge to achieve something extra. So, even within the same individual, personal aims can change and it can be hard to reach consensus, even within oneself.

What is needed most in today's society is the active comfort. Although the passive comfort is such a basic desire that must be met, in future research on comfort, it is the area "active comfort" that will be the subject of most study, and its assessment methods are already attracting the interest of many researchers.

Nature and comfort

We often have the experience of being attracted to naturally occurring flowers and trees, without much conscious thought. As I am writing this web page at this exact moment, I am looking at a butterfly orchid placed on the shelf beside me and I can see buds that will soon develop into flowers. I can feel myself relaxing simply by glancing at these flowers. This experience must be linked to the fact that we have been living in a natural environment since humans first started evolving five million years ago. As already mentioned in the first part of this web page, the men and women now living in modern times have spent more than 99.99% of their evolutionary history in such natural surroundings (assuming that urbanization can be defined as a post-industrial revolution development). Humans have the ability to gain peace from natural objects like forests. Experiences such as this allow humans to enjoy comfort as a result of synchronization between ourselves and Mother Nature. Individual values are created through the process of genetic information being modified by culture, by the environment, and by individual experiences. Nevertheless, because humans and nature are inherently synchronized at a genetic level that forms the foundation of our values, coming closer to Mother Nature will bring us nearer to realizing our full potential as human beings, and help us relax. In this series of web pages, we are going to further explore the physiological assessment of our relaxed states.

4. Natural therapy and kansei

What is meant by kansei?

Kansei is a Japanese word meaning emotional makeup or sensibility, but while it is used frequently in everyday settings, its academic definition has not yet been agreed upon. In general, kansei can be broadly categorized in two ways, either using the term kansei as "a short form for kanjusei (sensibility)" or using kansei to mean "intuitive power," and I support the latter interpretation. The Critique of Pure Reason (German: Kritik der reinen Vernunft) written by Immanuel Kant has been very influential here. Kant used the term Sinnlichkeit in the Critique of Pure Reason, first published in 1781, and the Japanese translation compiled by Teiyuu Amano (a philosophy professor at Kyoto University, and Minister of Education) in 1921, 140 years after the publication of

the original, translated this term as *kansei*. Kant argued in the text that *Sinnlichkeit* corresponds to "intuition." *Kansei*, in the lexicographical sense, was originally referred to as a "short form for *kanjusei*" (*Dai-Nippon Kokugojiten*, "The Great Japanese Dictionary," 1915). But the use of "intuitive power" as a translation for *Sinnlichkeit* was included after the translated version of *Kritik der reinen Vernunft* came out. By and large, the term *kansei* can be summed up as "intuition" and *kanjusei* (sensibility) but what is really needed now, in terms of the current use of *kansei*, is for more emphasis to be placed on "intuition."

I define the term kansei as "the aspect of one's potential that is illogical and intuitive, so that its process of execution can never be represented in words or phrases."

Achieving a synchronized state through the use of natural therapy and human kansei

Even when discussing well-known natural therapies like gardening therapy and forest therapy, *kansei* is usually only used in the sense defined above. According to our definition, *kansei* is incapable of being represented in words due to its illogical and intuitive nature. For this reason, *kansei* can be directly applied to those situations in which a bond between ourselves and nature is being considered. Because the process of execution through *kansei* is intuitive, no logical thinking and judgment is involved and this process and result cannot, therefore, be reinterpreted or represented in words or phrases. Nevertheless, despite being illogical and intuitive, the fact that relaxation can be attained by gardening or *shinrin* (forest) therapies is a manifestation of its inherent power.

Humans and nature can maintain a synchronized state through our *kansei*. However, only when a physiological assessment system, based on indicators such as cerebral activity, autonomic nerve activity, stress hormone levels, and natural killer (NK) activity, is adopted, can the resulting state of relaxation and the enhancement effect on immune function be truly understood. I have been involved in studies to explore the synchronized state using a physiological assessment system, and I will upload the relevant data from time to time onto these web pages.

Although we are not readily aware of *kansei*, it fills several important roles. Even in our everyday lives, we make numerous illogical and intuitive decisions without indulging in critical thinking. This brings us to an important point in determining the connection between natural therapy and humans. My current interest related to the "nature-human" relationship is to provide an explanation for this kind of *kansei* within the framework of science.

5. From *shinrin-yoku* to *shinrin* therapy What is *shinrin-yoku*?

The term *shinrin-yoku* (forest bathing) was created by a Mr. Akiyama the former head of the Forestry Agency, when this term appeared in the article on the "blueprint for the *shinrin-yoku*," the *Asahi Shimbun*, July 29, 1982. Attention was initially paid to the plant-derived substances called "phytoncides" freely around in the forest, but the physiological data taking on *shinrin-yoku* was almost none at that time unfortunately.

The major reason why no substantial data was accumulated at that time was because the methodology of physiological assessment for enhancement effect of comfort level in the field was not established. In 1990, we collaborated with NHK to conduct a *shinrin-yoku* study in Yakushima Island, and showed the physiological effects of relaxation with the decreased stress hormone level in saliva. When we think about it now, however, the study in Yakushima was carried out without any established measurement methods or experimental design, and should be regarded as a study in our infant stage of research.

We hardly recognize the fact that we are always under stress because we are living in artificial environment despite the fact that we possess the bodies adapted to nature. The "blueprint for the *shinrin-yoku* (forest bathing)" that asserts the relaxation effects against stress by getting nearer to the state of "what humans should be at" through interaction with natural surrounding in forest was really meeting the needs of the modern techno-stress society, but only the physiological grounds were not sufficiently provided.

What is the shinrin (forest) therapy

Japan's Forestry Agency announced its "blueprint for *shinrin* (forest) therapy stations" in 2005. This blueprint will be explained further in the forthcoming (6th) web page of this series. The term "*shinrin* (forest) therapy" was coined during the development process for the blueprint, and the underlying idea was really borrowed from the term "aromatherapy."

This blueprint was prepared as a result of the rapid advances made over the last 6 years or so in the field of physiological techniques able to assess the effects of relaxation. During 2005-2008, the team organized for the study (primarily comprising Chiba University and the Forestry and Forest Products Research Institute [FFPRI]) conducted experiments over a period of about one week at 38 different forests at widely separated locations throughout Japan, ranging from the large northern island of

Hokkaido to Okinawa. Stress hormone (cortisol) levels in saliva, autonomic nerve activity (sympathetic and parasympathetic) monitored by heart-rate fluctuation, blood pressure, and heart rate were adopted as measured variables (endpoints). In addition, for the first time anywhere in the world, we developed a method to monitor the prefrontal cortex activity of the brain using near-infrared spectroscopy in the field. We also carried out measurements of forest phytoncides, urban exhaust fumes, temperature and humidity, illuminance, wind velocity, and negative (minus) and positive (plus) ions. By conducting these studies with human volunteers at 35 different sites (candidate forests for *shinrin* therapy stations) throughout Japan, we were able to confirm the physiological effects of relaxation.

We can now say that "shinrin (forest) therapy" are "shinrin-yoku (forest bathing) fully supported by scientific evidence."

6. Blueprint for *shinrin* therapy stations

What is the blueprint for shinrin therapy stations?

The blueprint for *shinrin* therapy stations is based on an approval system. Prefectures, cities, towns, villages, and corporations can submit approval requests on candidate forests. The final approval will be made after reviewing (1) the actual validation study carried out on the physiological effects of relaxation, (2) intangibles such as board and lodging fees, and (3) tangibles such as the forest environment and facilities. This blueprint is being promoted by Japan's Forestry Agency, and has already been approved as the "Total Project for *Shinrin* Therapy."

This approval system represents a major goal in terms of generating economic benefits for prefectures, cities, towns, villages, and corporations and for reviving community forests in Japan. As of today, 38 sites have been approved over the last 4 years. The present plan envisages approvals for 50 *shinrin* therapy stations within the next 5 years, and a total of 100 sites within 10 years. We hope that creating 50 to 100 *shinrin* therapy stations throughout Japan will contribute to better forest management and help revive forests all over Japan. Since urban residents living in stressful environments find such therapies an effective means of relaxation, from a preventive medicine perspective we can also expect a reduction in national health care expenditure. Furthermore, as a pioneer in this kind of therapy, we will be accumulating a vast amount of physiological data and scientific information.

The criteria used to approve *shinrin* therapy stations

The approval process for *shinrin* therapy stations is based on 3 major criteria.

The most important criterion is the result of the physiological study. The physiological effects of relaxation that occur while walking or sitting in a forest with a view of trees must be confirmed in comparative studies with urban areas. The parameters to be measured (endpoints) include stress hormone (cortisol) levels in saliva, amylase levels, heart-rate fluctuation (activities of the sympathetic and parasympathetic nerves), blood pressure, and pulse rate. The relaxation effects must be confirmed by 2 or more statistically significant endpoints. The second criterion is concerned with intangible aspects. The following factors in each candidate community will be reviewed: (1) the board and lodging fees, along with any local hot springs, food, history and culture in the area near the site being used for *shinrin* therapy, (2) a detailed future plan including the prospects for development, and (3) the management system for the project and the approval of community residents. The third criterion has to do with the fulfillment of tangible aspects such as (1) a good forest environment, obviously, and (2) boarding facilities and hospitals.

Approvals will be given in accordance with the 3 criteria, above, and we would like to see 100 therapy stations, each with their own distinctive features, throughout Japan. In order to make this blueprint a reality, it is essential that it can respond to various individual values.

What lies ahead after the approval of *shinrin* therapy stations

The goals of the blueprint for *shinrin* therapy stations are as follows: (1) economic development of prefectures, cities, towns, villages, and corporations, (2) the revival of all forests in Japan, starting with community forests, and (3) a reduction in national health care expenditure from a preventive medicine perspective which results from improvement of chronic stress condition. We believe that these 3 goals will definitely be accomplished when the number of approved sites reaches 100.

7. Physiological effects of relaxation brought about by *shinrin* therapy

—assessment methods and the importance of individual values in physiological studies

The Importance of Values used in the physiological assessment of relaxation effects

We have been conducting physiological studies in nearly 50 forests including 38 different candidate sites all over Japan as part of the blueprint for *shinrin* therapy stations. As a result, the importance of the physiological studies is now becoming much clearer, and details will be presented in the forthcoming web page.

As explained in the 4th web page, entitled "Natural therapy and *kansei*," I define the term *kansei* as "the aspect of one's potential that is illogical and intuitive, so that its process of execution can never be represented in words or phrases." Because the process of execution through *kansei* is intuitive, no logical thinking and judgment is involved and this process and result cannot, therefore, be reinterpreted or represented in words or phrases. Nevertheless, despite being illogical and intuitive, the fact that relaxation can be attained by gardening or *shinrin* (forest) therapies is a manifestation of its inherent power. Thus, a synchronized state between humans and nature can be achieved through our *kansei*.

I repeatedly insist that the relaxation effects that nature can provide can never be fully revealed in any subjective assessment based on words and phrases, such as a questionnaire. However, if the associated physiological changes that occur without our awareness can be objectively assessed, then these relaxation effects will be revealed for the first time.

Physiological assessment method for *shinrin* therapy

To provide assessment endpoints, we are simultaneously measuring stress hormone (cortisol) levels in saliva, amylase activity in saliva, autonomic nerve activities (sympathetic and parasympathetic), as monitored by heart-rate fluctuation, blood pressure, and heart rate. In addition, we have, for the first time anywhere in the world, pioneered the necessary technology to monitor the prefrontal cortex activity of the brain using near-infrared spectroscopy in the field. With Doctor Li (from the Nippon Medical School) as the principal investigator, we are carrying out measurements of natural killer (NK) activity as a marker of immune function, and studying anti-cancer proteins. We have also carried out measurements of the levels of forest phytoncides, urban exhaust fumes, temperature and humidity, illuminance, wind velocity, and negative (minus) and positive (plus) ions. As a result, we can confirm the physiological effects of relaxation on 420 volunteers at various kinds of *shinrin* therapy stations situated at 35 different locations throughout Japan.

Using amylase activity in saliva as a measure of stress (with each on-the-spot measurement being completed in about one minute), we have recently been developing a system by which bus tourists, at their own request, can directly experience the relaxation effects of natural therapy.

8. Physiological effects of relaxation brought about by *shinrin* therapy

-validations with physiological studies carried out at 24 places throughout

Japan

Validations with physiological studies carried out at 24 places throughout Japan

During 2005 and 2006, we conducted studies (lasting about a week) in forests at 24 different sites throughout Japan, ranging from the Yanbaru Kuina forest in Okinawa to the Kushiro Swamp in the large northern island of Hokkaido. Stress hormone (cortisol) levels in saliva, sympathetic and parasympathetic nerve activity (as monitored by heart-rate fluctuation), blood pressure, and heart rate were adopted as measured variables (endpoints). It is known that cortisol levels, sympathetic nerve activity, blood pressure and heart rate become elevated when exposed to stress, and that parasympathetic nerve activity is enhanced in relaxing situations. When parasympathetic nerve activity is enhanced we become hungry because our digestive systems are activated. This explains why we find that our lunch tastes better when we eat it outdoors, in a natural setting.

As a result of studies involving 288 volunteers at 24 different sites, the group of volunteers looking at natural surroundings while sitting down showed the following endpoint decreases compared to the urban control group: a 13% decrease in cortisol level, an 18% decrease in sympathetic nerve activity, a 2% decrease in blood pressure, and a 6% decrease in heart rate. This proves that stressful states can be relieved by *shinrin* therapy. It should also be pointed out that parasympathetic nerve activity was enhanced by 56%, indicating a relaxed biological system.

Study of brain activity and stress hormone levels in volunteers in the Forest for the Residents of Seiwa in Chiba Prefecture

Using a time-resolved near-infrared spectrometer, we carried out a study using prefrontal cortex brain activity and cortisol levels as physiological markers in volunteers in the Forest for the Residents of Seiwa in Chiba Prefecture. As expected, these two physiological markers both showed a decrease when the volunteers were walking or sitting in the forest compared to the urban control group, indicating a larger relaxation in volunteers in the forest group. Interestingly, in the measurements taken before breakfast, subjective assessments of "somewhat comfortable" were obtained from both the control (in urban areas) and treatment (in the forest) groups, but prefrontal cortex activity and cortisol levels were reduced in the forest group, indicating a more relaxed state in this treatment group. This result shows how illogical and intuitive "kansei" responses can be, and illustrates that accurate results cannot always be obtained by means of subjective assessment using questionnaires alone.

Study of amylase levels in the saliva of bus tourists in Agematsu town in Nagano Prefecture

We carried out a study of 47 bus tourists in the town of Agematsu in Nagano Prefecture. The volunteers, with average age of 64, walked in the forest for about 2 hours. The amylase activity in their saliva was measured before and after the walk. As a result of the walk, a 39% reduction in amylase activity (which is known to go up under stress conditions) was observed. The on-the-spot measurement technique requires about one minute to complete, and the measuring instrument used is no larger than the palm of your hand. Because of the simplicity of this measurement, we expect more use to be made of this instrument when studying relaxed states brought about by nature therapy.

9. Physiological effects of relaxation brought about by natural therapy —implications from indoor olfactory stimulation studies using phytoncides What are phytoncides?

The term *phytoncide* is derived from "phyto" meaning plant, and "cide" meaning killing, and this term was first used by B. P. Tokin in the Soviet Union around 1930. Later, in 1942, Tokin wrote an article in a booklet published by the national medical publishing house in Moscow. In 1946, the term *phytoncide* appeared in the first issue of the *Journal of Clinical and Experimental Medicine (Igaku No Ayumi)* published in Japan. As stated in these articles, Tokin originally considered that phytoncides were volatile ingredients of plant oils. However, in his later publication "A Mysterious Phytoncide in Plants" issued in 1980, he defined phytoncides as the "substances produced by all kinds of plants, which may or may not be volatile, and which have an influence on other organisms." The major substances given off by forests and lumber, such as α -pinene and limonene, are good examples of phytoncides. Similarly, the strong smell of onion or garlic can stimulate our lacrimal (tear) glands when cooking because these smells also contain a phytoncide.

Relaxation effects of phytoncides

When the air in a forest is analyzed, more than 100 different kinds of phytoncide can be detected but, in many cases, α -pinene and limonene are the major components. In order to clarify any physiological effects of relaxation uniquely induced by phytoncides, we carried out an inhalation study using α -pinene and limonene in an indoor artificial climate room. Test subjects were exposed to a low concentration of

each "smell" and blood pressure readings were taken every second during an inhalation period of 90 seconds. As a result, statistically significant reductions in systolic blood pressure of 5% and 4% were noted after inhaling α -pinene and limonene, respectively.

We also carried out an inhalation study using fragrances given off by the wood chips of sugi (Cryptomeria japonica) and hiba or asunaro (Thujopsis dolabrata). This study simulated entering a newly built house, constructed using wood products, and encountering a "wood fragrance." As a result, we found that systolic blood pressure decreased significantly after the inhalation of these fragrances. Brain activity was also significantly subdued, and subjective assessments carried out using a questionnaire indicated a state of natural comfort. We can therefore interpret these data as showing that the inhalation of the fragrances of wood chips of sugi and hiba has a relaxation effect on humans. Interestingly, even in those volunteers who reported finding the fragrances of sugi and hiba unpleasant, systolic blood pressure did not increase and no stressful conditions were observed. As we have been demonstrating throughout this series of web page articles, it is appropriate to say that human biological functions are evolutionarily adapted to nature in terms of nature-human synchronization. We can therefore explain why, even when the volunteers experienced an unpleasant experience with fragrances such as those given off by sugi, they still did not reach a state of stress because of the inherent natural adaptation of the human biological system. The same phenomena have been observed in our studies involving tactile and visual stimulation.

10. Physiological effects of relaxation brought about by natural therapy —indoor visual and auditory stimulation studies Field and indoor studies

To clarify the relaxation effects of natural therapy, both field and indoor studies are needed. A field study is very valuable as it can reveal the natural therapy effects induced by the forest environment via the 5 senses, but reproducibility cannot be assured due to the ever-changing conditions in a field environment. On the other hand, reproducibility can be assured in indoor studies, where a single-stimulation study with different stimuli can be carried out and the relaxation effects induced by each stimulus can be examined. Another advantage of indoor studies is that, as more detailed measurements can be taken, we can expect to focus in on the physiological mechanism leading to a relaxed state.

In the second to last web page, we described field studies conducted with 288 volunteers at 24 different sites throughout Japan. In the previous web page, we gave examples of indoor phytoncide studies on olfactory stimulation. Here, we will now

present the results of our indoor studies involving visual and auditory stimulation.

Indoor visual stimulation study

Using the indoor artificial climate room, we have measured the physiological responses of volunteers looking at all kinds of views as they walked in the forest or took part in *shinrin* (forest) therapy. As a result, we found that the induced changes due to the relaxed conditions elicited by nature-derived visual stimulation were very similar among all the volunteers. This was reflected in the subdued activity of the cerebral prefrontal cortex and the autonomic nervous system (including the reduced blood pressure). Even in the case of single sensory stimulation, the human body showed the ability to find its natural state, leading to a relaxed condition.

The only exception to this was when viewing *sakura* (Japanese cherry trees). When the volunteers saw cherry trees in full bloom, elevated activity of the cerebral prefrontal cortex and increased heart rate were observed, implying bodily excitement. The poetess Akiko Yosano wrote, "One day I saw *sakura* at night, walking from Gion to Kiyomizu temple, all the people I met there looked so spirited." I regard this example as a case where the fascinating natural beauty of *sakura* was actually able to change the physiological states of the volunteers.

Indoor auditory stimulation study

Volunteers, with their eyes closed, were asked to listen to various different kinds of the sound from a forest, ranging from the noise of a forest stream to the singing of nightingales and cuckoos (taped earlier in Kiyosato) in order to monitor their physiological responses. As with the visual stimulation study, we observed subdued activity in the prefrontal cortex of the brain and the sympathetic nervous system. This result illustrates the induced physiological effects of relaxation.

However, it is interesting to note that some volunteers who apparently imagined being in the forest showed a greater relaxation while those who did not have much interest in the sound, or who associated the sound of the forest stream with the flushing sound of a toilet did not exhibit any objective relaxation effects. The same sound may be interpreted in different ways by different volunteers, and its effects may therefore differ. This result highlights an important aspect of individual values.

11. How to enjoy natural therapy—individual values as the top priorityWhat is the correct natural therapy?

I often get questions from TV or magazine journalists who ask "What are the three principles of correct natural therapy?" My answer is always "There are no such principles of correct natural therapy."

This answer reflects the results of the many studies we have conducted. For example, when volunteers were asked to listen to the sound of the forest stream, some of them showed relaxation with subdued cerebral prefrontal cortex activity and decreased blood pressure, while others showed no such effects at all. In the interviews conducted after the completion of study, we found that the relaxed volunteers had images and feelings of actually being in the forest with river water flowing in front of their eyes whereas the volunteers who experienced images of toilets flushing inside a house did not exhibit any such relaxation effects. We can therefore conclude that, due to differences in individual values, the same auditory stimulation does not necessarily always lead to relaxation.

Also, I am often asked to answer the question of which type of forest is better — conifer or broad-leaved. Based on the results of our indoor studies, I can only say that the relaxation effects may differ due to the individual tastes and values of the volunteers.

Advantages of nature-derived stimuli

One advantage of nature-derived stimuli is that, based on the experimental data, they do not seem to bring about a physiologically stressful condition, even if one experiences unpleasant feelings. For example, in the group of volunteers who were asked to inhale the fragrance of *sugi*, those feeling good about the fragrance became physiologically relaxed. On the other hand, there were volunteers who did not like the fragrance they inhaled, but still did not exhibit any signs of physiologically stressful conditions such as elevated blood pressure and pulse rate. We consider that this finding is related to the fact that since humans became human about five million years ago, we have therefore spent more than 99.99% of our evolutionary history in natural environments, and have thereby become nature adaptive.

Natural therapy is not a form of "passive comfort" directed at the elimination of unpleasant feelings but is, instead, oriented towards "active comfort" seeking to get something extra. For this reason, individual values must clearly be given top priority when making use of this form of therapy.

The present status of the shinrin therapy stations/roads

In September, with a great deal of help from 456 volunteers, we completed a 4-year physiological study (from 2005 to 2008) conducted at 38 different "shinrin

therapy stations" throughout Japan, ranging from the Yanbaru Kuina forest in Okinawa to the Kushiro Swamp in the large northern island of Hokkaido. Coming years will see the approval of more *shinrin* therapy stations—50 stations within 5 years, and 100 stations within 10 years. Placing emphasis on the healing effect of forests, all the *shinrin* therapy stations will provide accommodation plan, making the best use of local culture, history, foods, hot springs, and any other special qualities that are specific to each community forest. We hope you will enjoy the *shinrin* therapy that best fits your tastes and needs (http://www.forest-therapy.jp/).

12. Special edition of shinrin therapy news worldwide

—involvement of the International Union of Forest Research Organizations (IUFRO) in *shinrin* therapies

I attended the kick-off meeting of the Forests and Human Health Task Force (referred to hereinafter as the ForHealth TF) held as part of the 6th IUFRO Symposium (on forest recreation, environmental policy, and sustainable forest management) in Finland from August 14 to 20, 2007. The head of Finnish Forest Research Institute, Professor Hannu Raitio, coordinated the ForHealth TF. According to his report, there has recently been increasing interest in Europe (especially in England) on the topic of "Forests and Human health" and, since 2004, a project entitled "Forests, Trees, and Human Health and Well-being" has been conducted as part of a program called COST, with 22 countries participating. However, this project will have finished by 2008. The professor mentioned that one reason he held the meeting was because he wants to continue this project so that the existing movement in Europe can spread worldwide, by means of this ForHealth TF.

The current situation in Japan and Korea, and future activities

Japan's Forestry Agency announced a blueprint for *shinrin-yoku* (forest bathing) in 1982. We are now accumulating scientific data on "Forests and Human Health," mainly through cooperation between the Forestry and Forest Products Research Institute (FFPRI) and Chiba University, based on the "blueprint for *shinrin* (forest) therapy stations." This kind of movement, which started in Japan, is now spreading to Korea where a forum on "mountain forest healing" has now been established. The current chair of the IUFRO is Professor Li of Seoul University and, during the invited lectures at the previous forum, I asked him to establish a new working group on *shinrin* therapy within the IUFRO. This has led to the current collaboration with European countries.

At the ForHealth TF, we presented a lecture entitled "Forests and Human

Health—Introduction of Practice in Japan" in order to explain the approval system for *shinrin* therapy stations in accordance with the "blueprint for *shinrin* (forest) therapy stations" in which Japan's Forestry Agency plays a central role. We also described the methods involved in the physiological studies required in order to gain approval, along with the results. Our data indicating that the forest group, as compared to the urban control group, exhibited enhanced parasympathetic nerve activity (which is known to become elevated when relaxed) and suppressed sympathetic nerve activity (which is known to become elevated in response to stress), while other endpoints such as stress hormone level, pulse rate and blood pressure were all reduced, attracted a great deal of attention. Because no real physiological studies on the effect of forests on human health have been carried out, other than those in Japan, our physiological data must have had quite an impact on the audience.

The Steering Committee of the ForHealth TF (with 11 members) was established the next day, with Miyazaki from Japan in attendance. It was, at first, surprising that so many countries shared such a common interest. On second thoughts, however, most of the participating countries are experiencing many of the same problems of a so-called "stressful society," and are striving to find a way to solve these problems through the use of forests and nature. As we continue our collaborative studies with other countries, we will actively distribute further information from Japan.