

THE SENSORA: A MULTI-SENSORIAL THERAPEUTIC DEVICE

By:

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Abstract:

This article presents the “Sensora”, a new multi-sensorial device having therapeutic applications. The Sensora is a whole environment integrating 3 sensorial sources: a colored light-projection system, a spatialized sound system and a multi-transducer chair for kinesthetic stimulation. These 3 sources are driven by multi-media programs that allow the generation of a rich sensorial experience, with the potential of facilitating various processes such as relaxation and creativity enhancement, as well as more specialized therapeutic techniques. A description of the instruments comprising the system is given, followed by an explanation of the operating principles involved in the programs, and their applications.

1 Introduction

The Sensora is an electronic system belonging to a new class of devices that can be called, for want of a better name, “mind machines”. The purpose of these devices is to use technical means with the intention of having a beneficial influence on the mind, or more precisely on the body-mind, of users. Such beneficial influence can include relaxation, creativity enhancement,... as well as more specialized therapeutic processes.

The Sensora’s distinguishing characteristic is its integration of 3 different sensorial influences; hence it is being described as a “multi-sensorial” system. Many of the concepts involved in the Sensora are quite unique, and the technology it uses is amongst the most advanced in this relatively new field. In this article we will attempt to describe the operating principles of the system, so that a better understanding of how it differs from other mind machines may be obtained.

2 Description of the System Components

Originating from early work on sound spatialization and EEG monitoring, the development of the Sensora has been ongoing for the past 15 years. Relying on experimentation with hundreds of individuals, we gradually evolved a method of combining sensorial stimuli into an integrated whole. Along the way we had to create and refine our own proprietary instruments, which now enable a multi-sensorial

process involving light, sound and kinesthetic sources.

In this section we will briefly describe the different components that together make up the Sensora installation:

2.1 Light Projection

In the Sensora the user is exposed to light projections covering the whole field of vision. This is achieved using three components:

Light Controller:

A dedicated microcomputer, which we call the *SD-1 Sensor Driver*, generates the light patterns in real-time.

Light Projector:

The SD-1 digitally feeds a special light projector, which we call the *LPA-1 Light Projection Array*. This compact projector houses 15 discrete light sources with their associated digital power dimmers; the light sources are merged through fiber optic bundles into 5 groups of 3 primary colors, allowing the creation of any color through additive synthesis. The use of dichroic color filters ensures an excellent chromaticity, essential to the quality of the overall process.

Projection Screen:

The light patterns are projected on a large hemispherical screen, with a diameter of typically 3.5m for an individual installation. The screen has an inclination of about 45°, and the user reclines under it at a distance optimized to cover his/her field of

vision. Its surface is coated with a special silvery compound to enhance the apparent depth of the light projections. When combined with the LPA-1 projector this results in an exceptional light quality, with an intensity and texture reminiscent of the vivid colors sometimes perceived in dreams.

The light patterns used in the Sensora are divided into 5 independent and overlapping zones, distributed horizontally along the width of the projection screen. The center of the screen is fitted with an additional independent point light source, which serves as a focal point around which the user can anchor his/her gaze.

2.2 Spatialized Sound

The Sensora soundtracks are re-mixed with our own *Sound Spatialization Processors*, which have already been used around the world for audio research and design¹. This enables the creation of a sound field surrounding the listener, where each sound can be positioned and delicately moved at will. The Sensora uses a 4-channel audio system to store and playback these spatialized soundtracks.

2.3 Transducer Chair

The kinesthetic stimulus of the Sensora is sound-based, generated using the following two components:

Transducer Controller:

A special microcomputer-driven audio processor, which we call the *TD-1 Transdriver*, extracts low-frequency information from a dedicated audio track. The TD-1 first stabilizes the audio signal through a sharp (48dB per octave) low-pass filter and a 2-stage AGC circuit; it then distributes it in programmable patterns across 8 discrete amplified channels.

Transducer Chair:

The 8 outputs of the TD-1 drive a special reclining chair, which we call the *VIA Transducer Chair*. The VIA chair contains an array of 8 audio transducers which can create a wave of vibration felt along the body as a kinesthetic sensation. The transducers are positioned in 2 rows of 4 across the chair surface, allowing transversal as well as longitudinal wave patterns.

Taken together, the TD-1 and the VIA chair can create a wide variety of vibration-wave patterns (e.g. up-down movements from head to feet, circles, crosses,... at varying speed and direction) which the user will perceive as having relaxing, stimulating or balancing effects.

2.4 Sensora Programs

All the instruments composing the Sensora system are digitally controllable and are designed to be driven by special *multi-sensorial programs*.

These programs contain the following elements:

- A digital track driving all the Sensora instruments
- 4 audio tracks containing the spatialized soundtrack
- A low-frequency audio track driving the Transducer Chair

This information is encoded using a proprietary technique and stored on special CDs, or as encoded audio files on a PC. A Sensora session is played by simply accessing and starting the desired program. The process is then entirely automated, and does not require an operator.

We have already developed a library of Sensora programs that explores a good portion of the system's vast possibilities, and new ones are being created as the research grows.

We are also developing an authoring tool allowing experienced operators to create and record their own Sensora sessions, according to their specific understanding of the functions of color and sound.

2.5 Room Environment

All the components of the Sensora system are installed in a dedicated room, typically with a 15m² area for an individual installation. The appearance of the room is carefully designed to contribute to the overall quality of the process.

The walls, floor and ceiling of the room are all black (either painted or carpeted). This has two functions:

- It enhances the optical quality of the light projections by minimizing reflections.
- On a subjective level, it contributes to the perception of the Sensora as a womb-like space with somewhat diffused, undefined boundaries which can also be felt as limitless; this helps to open the user's mind to an "extra-ordinary", deeper experience.

The large hemispherical screen obviously dominates the environment; with the black room surfaces and a subdued ambient lighting, it actually appears to be floating in a void.

Depending on the application, Sensora installations can be configured with one chair (for individual sessions), two chairs (allowing couples to share a

Sensora session) or multiple chairs (such as for waiting rooms and other public installations).

Session Procedure:

The user sits on the Transducer Chair, under the screen. As the session starts, the chair reclines and the ambient lighting softly fades out. For the duration of the session the user simply rests, letting the light, sound and kinesthetic sources perform their function; he/she maintains an unfocused gaze towards the screen, letting the eyes occasionally close and open at will.

As the session ends, the room is left in quiet darkness for a short while, giving the user an opportunity to feel and savor the state in which the session has brought him/her. The ambient lighting then softly fades in, and the user brings the chair back to an upright position when he/she feels ready.

3 Operating Principles

In this section we examine the operating principles that have guided the design of the Sensora system. The intent behind the Sensora is far-reaching: it is an attempt to blend art and science, using objective, scientific means to create a rich, aesthetic experience. The system's development has drawn on many new fields of research, on the boundaries between technology, medicine, psychotherapy, psychology and art.

It must therefore be emphasized that while some of these operating principles are based on clearly established science data, a number of others are *working hypotheses* that have arisen out of both our own experimentation and of currently available worldwide research. These are presented here as pointers towards further research in this fascinating field.

3.1 Light Modulation

“Light Modulation” is a unique process developed and patented² by Sensortech, which is at the root of the effectiveness of the light projection patterns used in the Sensora.

Essentially, Light Modulation applies to *light* the type of modulation processes that have long been applied to *sound* in audio synthesizers. This is achieved by using structures of Low Frequency Oscillators (LFOs) to control (i.e. to *modulate*) the intensity and color of light projections, in configurations of various complexities.

Programming Light Modulation patterns is somewhat similar to programming sound synthesizers, with a large number of parameters (up to 100 in the Sensora's SD-1 Sensor Driver) defining the exact frequency, waveshape and phase of the many oscillators involved in the modulation structure.

The end result of this technique is the creation of shimmering, ever-changing light patterns that can have a remarkably organic quality of aliveness, or give a fleeting astral-like impression. This imbues them with the ability to exert a visual fascination that is an essential factor in some of the operating principles described below. Also, the oscillatory nature of the modulation patterns naturally leads to the *brainwave entrainment* process described next.

When experimenting with such a powerful light-generating tool, it quickly becomes obvious that the frequencies used in cyclic light patterns can have a deep impact on the brain. A significant portion of the expertise developed over the years of research into the Sensora is related to the selection and combination of frequencies and patterns optimized for different types of sessions, whether for relaxation, stimulation or integration purposes.

In fact, organizing sequences of Light Modulation patterns leading to pleasant and inspiring inner experiences has turned out to become a fascinating new art form in itself.

3.2 Brainwave Entrainment

The human brain generates weak electric signals called EEG (Electro-Encephalographic) waves, covering a frequency range of about 1 to 30 cycles per second (Hz). When the brain is exposed to pulsations of sound or light in the range of EEG wave frequencies, it tends to spontaneously harmonize with the pulsed frequencies. This phenomenon is known as *photic driving* (in the case of light) and has been widely studied. It has been found, for example, that stimulating the senses with pulsations in the Alpha range will help the brain to move toward the relaxed state normally associated with Alpha waves.

The Sensora is ideally suited to make use of this brainwave entrainment. A subset of the frequencies available in the Light Modulation process overlaps the frequency range of EEG waves, and the Sensora light projections can perform excellent photic driving. Sound entrainment can also easily be integrated in the Sensora soundtracks by embedding appropriate audio binaural beat frequencies.

While the research linking EEG waves and their associated mental states is complex and ongoing,

their basic properties are by now well known and established³ (see the Table below). Their use in the programming of Sensora sessions is therefore one of its most systematic and objective operating principle.

EEG Phase	Frequency Range	Associated Properties
Beta	14 to 30 Hz	Brain waves in this range indicate the normal waking state. This is a state of mental activity and attention turned out towards the world. Most of us spend the majority of our waking hours in this state.
Alpha	8 to 13 Hz	Alpha waves accompany relaxation. This state indicates attention turned inward, as in meditation and deep unwinding, let-go.
Theta	4 to 7 Hz	The hypnagogic state just before falling asleep. This state plays an important role in visualization, creativity and learning.
Delta	1 to 4 Hz	Delta waves appear during the deepest portions of sleep. They are also associated with states such as trance mediumship.

EEG Phases and their associated mental states

The complex nature of the Sensora light projections enable unique refinements in photic driving, not found in other simpler devices:

Modulation Depth Control:

Our experience has shown that some individuals find the use of raw light pulsations (such as with common brainwave entrainment light goggles) rather unpleasant or too intense; the Light Modulation parameters of the Sensora provide a fine proportional control over the modulation depth of light pulsations, allowing the generation of gentler pulsations which are more universally appreciated. This lower intensity does not detract from the overall experience, since brainwave entrainment is not the primary purpose of Sensora sessions but is only used as a support for the multi-sensorial process.

Enhanced Laterality Control:

It is well known that laterality is critical in brainwave activity, since each of the brain’s hemispheres is linked to different psychophysical functions. In implementing effective brainwave entrainment, it is therefore important to be able to act on each hemisphere separately.

The optical nerve linking the retina of each eye to the brain is divided in two separate bundles channeling each eye’s left and right field of vision. The left and right bundles from each eye are then merged and

crossed before reaching the brain’s visual centers. Therefore the combined left field of vision from both eyes reaches the right-brain hemisphere, while the combined right field of vision reaches the left-brain hemisphere.

Simple goggles with pulsing lights for each eye cannot completely resolve each brain hemisphere even when separately pulsing each eye, since each eye is partially linked to both hemispheres.

By contrast, the Sensora light projections are viewed on a large external screen and simultaneously reach both of the user’s eyes with the appropriate laterality: for example a pulsation projected on the left side of the screen will reach the same side of both eyes’ retina, and will be relayed through both left optical nerve bundles to the right-brain hemisphere only.

Peripheral Vision Temporal Sensitivity:

The retina’s central region (the *fovea*) has an enhanced spatial resolution, while the lateral regions have a higher temporal resolution⁴: they can detect faster movements, but with less spatial details. In a proposed explanation for this phenomenon, it is seen as an evolutionary adaptation to the need of quickly detecting predator movements at the vision’s peripheral edge.

We have found that brainwave entrainment seems less obtrusive – while still remaining effective – when primarily performed on the peripheral lateral vision field, and de-emphasized on the central vision field. This makes sense since it optimally uses each vision field’s specialization: the spatially sensitive fovea is less distracted by reduced central pulsations, while the peripheral vision is most tuned to the fast temporal variations of brainwave frequency pulsations.

As illustrated by the preceding three examples, the Sensora may be the only current instrument permitting such fine-tunings on brainwave entrainment light patterns.

3.3 Color Therapy

The use of colors for therapeutic purposes is as old as civilization, and many traditional color systems have been developed over the ages. Modern science has both broadened and more clearly defined the use and the effects of color. Extensive psychological research allows us to specify the arousing, relaxing, awareness sharpening, or pacifying effects of various colors. Fields of medicine such as *Syntonics Optometry*⁵ have been deepening our understanding of the therapeutic use of light and color.

While the Sensora does not espouse any specific color system, it can be used as a sophisticated delivery instrument for many such approaches since it is fully programmable. Its LPA-1 light projector is optimized to generate saturated colors across the rainbow spectrum and has the capability to create color patterns covering the user's field of vision. This gives the perceiver the sensation of being inside an encompassing field of light, thereby greatly enhancing the psychological impact of colors.

Physiological effects of color:

In addition to their subjective perceptual effects, colors appear to have more direct physiological effects on the body. Ongoing research provides intriguing glimpses into possible mechanisms for such effects.

One operational vector is indicated by studies which have demonstrated the existence of an "energy section" of the optic nerve⁶ connecting the retina of the eye directly to the pineal and pituitary glands. This nerve fiber network operates in parallel to the normal "optical section" of the visual system, and transmits the effects of light directly to the hormonal system, which is an essential mediator and modifier of metabolism and mood.

Another biochemical avenue is indicated by the fact that the transparent capillary vessels in the retina directly expose the blood to light coming into the eyes. The blood flow through this channel is surprisingly large: it has been established that the body's entire blood supply runs through it every 2 hours. This provides ample exposure to any potential catalytic effects of specific light frequencies on the blood's chemistry.

Red, Orange	Energizing, invigorating colors; activate the sympathetic nervous system
Yellow	Considered to be an excellent facilitator for intellectual work; anti-depressive
Green	The color of nature, associated with heightening the emotional qualities of the heart
Blue	Contributes to the creation of ordered thought and harmonious mood; activates the parasympathetic nervous system
Pink	Has a calming and soothing effect on the disposition
Violet	Associated with feelings of being uplifted; accessing higher spheres of consciousness
Ultraviolet	Stimulates concentration and the ability to learn

Known properties of the main colors

Color properties:

While the exact properties of specific colors are open to debate, certain broad tendencies are pretty much universally accepted; some of these have been extensively applied in the creation of the current generation of Sensora programs.

3.4 Open Environment

All along the Sensora's development, we have considered important to design it as a whole environment surrounding the user. Obviously this approach is costly, since it requires rather large-scale multi-sensorial equipment and the dedicated use of a Sensora room; but we consider that it brings significant advantages that cannot be obtained with other approaches.

- The quality of the Sensora light projections would be impossible to duplicate on smaller display systems (whether of video-screen or LED goggle type), and its spatialized sound environment could not be effectively reproduced through headphones.
- We have found that an open environment is more readily accepted by the population at large than smaller enclosing devices. Being wrapped-up in light goggles or being enclosed in a small space such as a flotation-tank sometimes brings up claustrophobia-like feelings in people, and it requires a certain dedication to persevere in using them; whereas an open space often feels less threatening, more welcoming, for people uninitiated to mind-machines.
- For most people, the striking impression felt when walking into the Sensora space and being fully immersed in its multi-sensorial field results in a psychological readiness to be touched more deeply by the experience.

To summarize this principle, we like saying that comparing the Sensora environment with smaller mind-machines is somewhat like comparing the experiences of cinema and TV: the film being watched may be the same in both cases, but the immersive cinema experience will obviously have a greater impact than that of a small TV.

3.5 Sensory Sweeping

This operational principle evolved out of our observations while working with Sensora multi-sensorial programming. It is a working hypothesis that while not necessarily scientifically established, seems to point to an interesting field of study.

The idea behind it is quite simple and is based on the well-known principle according to which “what you don’t use, you lose”: neuronal pathways in the brain need to be used and exercised in order to develop, otherwise they gradually whither away. It is also known that many neuronal structures in the brain have a continuous mapping to parts of the body: for example in the significant portion of the brain dedicated to skin perception and the sense of touch, contiguous skin areas are mapped to contiguous brain areas. Therefore sweeping a kinesthetic stimulus over a continuous area of the body activates matching neuronal pathways over a corresponding continuous circuit in the brain. In certain types of therapy, such continuity is thought to help in restoring and developing neural interconnections⁷.

From these factors it can reasonably be inferred that repeatedly performing such a sweeping pattern can bring about a beneficial “exercising” of neuronal pathways.

The Sensora instruments allow many different types of sensory sweeping, which are extensively used in the sessions:

- The Transducer Chair is optimized to perform kinesthetic stimulus sweeping over programmable patterns; in fact to our knowledge it may be the only existing instrument permitting this type of work. Our ongoing tests are helping to understand which types of patterns, speed and rotational direction bring about different responses in subjects.
- The Light Modulation projections allow the generation of precise sweeps across the color spectrum. These effects are amongst the most spectacular and subjectively pleasing to the eye. In a related phenomenon, sweeping patterns combining complementary colors have been found to be especially potent.
- The spatialized soundtrack allows the generation of sounds continuously moving across the surround sound field. Here again, various types of patterns, speed and rotational direction bring about different responses in subjects.

3.6 Multi-Sensorial Synesthesia

We are all familiar with the synesthetic capabilities of our senses: under the right circumstances different senses can merge and blend. The Sensora fully exploits this phenomenon: being simultaneously immersed in fields of light, sound and kinesthetic sensations brings about an effect that is greater than the sum of each individual sensation.

In a Sensora session this multi-sensorial synergy has important subjective consequences:

- It can bring a sense of fusion and unity to the experience
- It can heighten the overall intensity of the experience
- It can facilitate the letting-go that brings a deeper relaxation

As an interesting note, we can add that we also experimented with integrating olfactory sensations within Sensora sessions. As is well known, the sense of smell has a high synesthetic capability, and we indeed obtained excellent results. However we had to abandon this path for practical implementation reasons: odors cannot be switched off as easily as sound or light, and eventually permanently permeate the session room.

3.7 Bypassing the Mind

We consider that a key aspect of the success of the Sensora process is its ability to create an environment in which the user can remain at rest, essentially doing nothing, *without becoming bored*.

If someone can be brought to a state of restful inactivity, relaxation will naturally unfold. The problem is that in our “MTV age” most people’s attention span is notoriously short: this state of inactivity quickly becomes monotonous and dull, and it cannot be maintained for any length of time. Some stimulation, something *interesting* is required to hold one’s attention... But stimulation will automatically disrupt the restful state.

A way out of this paradox is to use stimulation that is fascinating and beautiful enough to hold the attention, while presenting a minimum of form or message capable of triggering the mind’s activity. In the Sensora this is achieved with the correct blend of selected sensory elements.

The primary factor in this approach is the use of light projection with only *pure colors*. Recent PET-Scan studies⁸ have shown that most of the brain’s visual centers and associated cognitive processing centers,

which are normally activated by visual forms or images, remain quiet when the eyes are viewing pure colored patterns. This suggests that the experience of color is a sensation complete in itself, not requiring subsequent analysis or interpretation by the brain, permitting most brain centers to rest.

Another factor involves the rhythm of sensory transitions, which when held within a certain range maintains aliveness while not disrupting the restful state.

3.8 Stimuli Dosage

In the course of our experimentation we have found a very wide spectrum in people's sensitivity to multi-sensorial environments. On one extreme are individuals who are easily overwhelmed by the slightest stimulus; on the other are individuals for whom the most extreme effects remain bland... A guiding principle in the development of Sensora programs has therefore been the careful dosage of the different sensorial parameters.

Each of the 3 sensory sources in the Sensora has the potential to be rendered so intense as to become unpleasant, and their combination synergistically even more so. With this in mind, we have carefully calibrated each operating parameter of the Sensora instruments so that they can be used over a full proportional range, from a null value up to the maximum setting.

For example, at its minimum settings the LPA-1 light projector is capable of generating a precise range of very low phosphene-like light levels, near the limit of the vision's sensitivity threshold. We have found that occasional phases using these evanescent light levels, disappearing into darkness, are particularly valuable.

Similarly, although the Sensora's brainwave entrainment light effects can be set to a full stroboscopic pulsation, we have found it advantageous to be able to reduce them to a subtle, barely perceptible shimmering in the light patterns, with most applications falling somewhere in between these extremes.

As a way of dealing with people's various sensitivities, we have created a library of Sensora programs with graduated relative intensities. The "Relaxation Series" programs are soft enough to be enjoyed by all users, while the "Energy Series" programs are designed for users looking for more intense experiences.

Epilepsy Risk:

Exposure to pulsating light may increase the risk of an epileptic seizure in a small proportion of the population. This risk is minimal (current research indicates that 1 in 20,000 adults over 25 have this photosensitivity)⁹ but must still be considered.

In the case of the Sensora, since the light pulsations used for photic driving are generally softer than those used in common brainwave entrainment devices (such as light goggles), the risk is further minimized: not a single case has been encountered since the beginning of our experiments. Nevertheless, to accommodate people who are known to be at risk, the SD-1 Sensor Driver provides a control allowing the removal of brainwave entrainment modulations from Sensora sessions while maintaining all other sensorial aspects intact.

3.9 The Aesthetic Factor

As a rule, mind machines are designed to bring about results by applying certain basic mechanisms, such as generating light or sound pulsations for brainwave entrainment, or projecting specific color sequences: their intent is to implement objective and scientific processes, as do laboratory instruments.

With the Sensora, we attempted to develop an approach that merges such objective processes with the subjectivity of the mind's perception – somewhat like developing a musical instrument. This approach works by considering a session both as an objective process involving precise sensorial parameters *and* as a work of art to be enjoyed aesthetically.

This in turn defines certain new requirements for the instruments involved: they must be able to generate aesthetically pleasing sensations as well as performing their objective functions. In order to be successful, the system must be composed of high-quality elements: colors with a high degree of chromatic purity, excellent sound system, well-designed environment in the session room, programming capable of dealing with the subtlety of delicate sensations.

Under appropriate circumstances, very few people can avoid being touched by the beauty of pure colors and sound. The Sensora works at a broader level than simpler mind machines, because it can provoke an emotional response of this kind. This opens wider possibilities – but also makes the quantification of its effects more difficult.

3.10 Archetypal Evocation

This last operating principle completes the shift towards a more inner-oriented, psycho-sensorial perspective.

Pure colors and sounds are fundamental building blocks of our perception; in the Sensora programs we have an opportunity to use and combine them in order to evoke timeless universal experiences that can be described as “archetypal”.

Here are a few examples illustrating this principle:

- The heartbeat rhythm is immensely potent. Light pulsations based on this frequency (around 1.3 Hz) and its harmonics have a powerful impact, especially when accompanied by matching sound beats. This is a rhythm that has been used for ages in shamanic rituals around the world.
- The resonance frequency of the Earth electro-magnetic field (known as the *Schumann Resonance* frequency, around 7.8Hz) creates especially pleasing and harmonious light and sound pulsations. This may be understood when one considers that this frequency has always been pervading the atmosphere and is probably deeply embedded in the organic processes of life itself.
- The innate fascination exerted by light pulsations can be linked to the flickering of fire, which has been a symbol of security and comfort (as in gazing at a camp fire) from the earliest days of human evolution.
- When used at low intensities the Sensora light projections can be reminiscent of a starry night, creating the impression of floating in the infinite expanse of the Milky Way.
- The hemispherical projection screen of the Sensora presents a round shape that we have found instrumental in bringing about an overall impression of wholeness. It helps create in the user the sensation of being at the center of a cosmos; an archetypal analogy would be the feeling of being at the center of a “Medicine-Wheel”.
- Natural sounds have an unparalleled capacity to open the doors of one’s imagination, and can help to tap into a wide variety of archetypal and ancestral memories. We have been creating our own spatialized recordings of exceptional natural

sounds from around the world, which are extensively used in Sensora soundtracks.

All these elements contribute to extend the perceptual context of a Sensora session towards a more “magical” experience.

4 Therapeutic Applications

4.1 “Inner Entertainment”

The most obvious applications of the Sensora are sessions designed to simply enjoy its multi-sensorial environment, as a kind of “inner entertainment” that helps to harmonize the user’s mood.

Each Sensora session is a self-contained multi-media program, with a complete process unfolding and coming to a conclusion. We have found a session duration of 20-25 minutes to be an optimal compromise: it is long enough to allow the user to shift into a new, refreshed mental state, while remaining short enough to ensure the installation’s cost-effectiveness.

We have created a number of sessions optimized for the following processes:

Relaxation:

This is a very natural application for the Sensora, with numerous therapeutic applications. Relying on pacifying colors, slower rhythms, Alpha/Theta brainwave frequencies, flowing soundtracks, the Sensora “Relaxation Series” sessions can efficiently bring users to a state of deep relaxation.

Creativity Enhancement:

These sessions, which we call the “Energy Series”, use a range of colors, frequencies and sounds that have more stimulating and invigorating effects. By nourishing the senses while giving the mind a rest, they can constitute an energizing and centering prelude to activities requiring mental creativity.

Guided Meditation:

Each session from the “Meditation Series” guides the user through a simple and effective meditation technique. They provide an enjoyable way to experiment with meditation and its inner exploration.

The Sensora as a hi-tech relaxation space can be used in numerous locations:

- Spas and Resorts
- Health Centers and Private Clinics
- Corporate facilities for employees
- Waiting lounges for airports

4.2 Mind Machines and Meditation

The therapeutic properties of various types of meditation are gradually being established. But in order to be effective, meditation techniques must be learned and practiced: meditation requires a certain discipline and dedication. What role can “mind machines” such as the Sensora play in enhancing meditation?

In essence, meditation can be said to be a purely subjective process of consciousness looking into itself. Taking this into consideration, our point of view is that no external stimulus introduced by a machine can “generate” meditation: the meditator has to “do” the looking, no machine can do it for him/her...

What a machine *can* possibly do is to generate an environment where this process of looking is facilitated, i.e. where the meditator will find it easier to remain present and aware. This will happen in an environment where the brain’s mental activity is quieted down, where an atmosphere of harmony and security dissolves current worries and leads to greater inner ease.

So while we would certainly not claim that the Sensora “produces” meditation in users, it has been our experience that it can be a beautiful support to meditation. We have also seen many instances where people having no prior experience of meditation have “accidentally” been drawn during a session to a state of inner silence that has left them quite puzzled...

4.3 Support for Psychotherapeutic Processes

Our experience has clearly established the potential of a multi-sensorial tool such as the Sensora as a support for psychotherapeutic processes. The exact mechanisms through which this support operates remain to be explored in details, and promise to reveal valuable insights into the burgeoning science of applying light and sound to therapy.

One possible interpretation relates to the fact that the Sensora environment can often lead to semi-hypnagogic mental states, where one floats in intermediate stages between waking and dreaming. In these states the boundary between the conscious and unconscious mind seems to become more permeable, and the unconscious can occasionally release memories, feelings or insights.

In practice we have found the Sensora to act as a kind of *amplifier*, capable of intensifying various psychotherapeutic processes through the totality and focus brought about by its immersive environment.

We have for example successfully used it together with techniques involving counseling, as well as early-childhood regression, and hypnotherapy.

As a support to psychotherapy sessions, the Sensora can be used in various ways:

- **Before a session:** the Sensora brings the client to a state of deep relaxation and receptivity, from where it is easier and faster to move into real issues during the subsequent psychotherapy session.
- **After a session:** the Sensora is a safe space where the client can settle down and integrate whatever issues may have come up during the psychotherapy session. We have seen cases where a client came to a spontaneous resolution of inner conflicts brought in focus by a session, while simply relaxing in the harmonious Sensora environment.
- **During a session:** our experiments with conducting sessions in the Sensora room, alternating between therapy and multi-sensorial breaks, indicate that there are a multitude of creative ways to combine both.

One of the most touching events in our research has been to witness the broad smile and tears of a deaf and dumb young woman, who explained that while lying on the Transducer chair she had for the first time been able to sense sound and music through her skin. This type of feedback has all along helped us to persevere in this work.

4.4 Future Prospects

No medical application can be claimed for the Sensora, since no systematic research in this field has as of yet been performed. Some doctors have however expressed interest in exploring possible applications in fields where relaxation and sensory stimulation are known to be beneficial.

For example, simpler sensory stimulation devices are already in use in a number of countries for the treatment of autistic and multi-handicapped children. Other potential applications mentioned relate to:

- Treatment of sleep disorders
- Treatment of addictions
- Rehabilitation of cerebral poly-traumatisms
- Pre-surgery preparation and relaxation
- Experimental cancer healing modalities involving positive visualization
- Behavioral Therapy
- High-performance sports training

In all these cases, the Sensora could potentially be a valuable tool both with its existing programs and especially as a hardware base for developing optimized multi-sensorial programs.

4.5 Call for Research Projects

We are convinced that the science of using light and sound for therapeutic purposes will greatly evolve in the 21st century: systems such as the Sensora are but the beginning of a whole new field of research.

We invite any researcher interested in exploring the application of the Sensora to his/her field of work, including psychotherapy, psychology and medicine, to contact us. We are open to supporting research projects in various ways.

Readers wishing to obtain further information on the Sensora are invited to browse our web site at www.sensora.com and/or to contact the author.

About the Author:

Anadi A. Martel entered University at the age of 16 and completed graduate studies in Theoretical Physics. After spending a few years in India he decided to become an independent researcher, specializing in electronics design. Starting in the 1980s he developed a variety of unique sound and light devices. More recently he has been experimenting with ways of bringing them together into multi-sensorial systems. The current outcome of this research is the Sensora, which was developed in collaboration with Ma Premo, a psychotherapist. He can be reached at Sensortech Inc. (605 Blvd Mont-Rolland, Ste-Adèle, Québec, Canada J8B 1L8, Tel/Fax: 450-229-3992), or by email at info@sensora.com

Notes:

¹ The SSP-100, SSP-200 and OPS-1 sound processors designed by the author are manufactured by Omnisound Corp. (San Rafael, CA)

² A. Martel (1991), *Light Intensity and Color Modulation System*, US Patent #5,070,399.

³ For a pioneering study on the subject of EEG interpretation of mental states: Maxwell Cade & Nona Coxhead (1979), *The Awakened Mind*, Element Books.

⁴ See for example: Michael Kalloniatis & Charles Luu (2000), *Psychophysics of Vision*, <http://webvision.med.utah.edu/temporal.html>

⁵ An introduction to Syntonic Optometry can be found in: Dr. Jacob Liebermann (1991), *Light - Medicine of the Future*, Bear & Company.

⁶ Ref: Dr. Fritz Hollwich (1979), *The Influence of Ocular Light Perception on Metabolism in Man and Animal*, Springer-Verlag.

⁷ As shown in “somatic reeducation” techniques such as the Feldenkrais *Awareness Through Movement* method.

⁸ Ref: CJ Lueck, S Zeki, KJ Friston et al (1989), *The colour centre in the cerebral cortex in man*, Nature 340:386–389.

⁹ Ref: Ray Wolfe (2000), *Light/Sound Systems and Seizures*, AVS Journal, Vol 1 #1