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Human Consciousness Influence on Water Structure*

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Abstract — The ability of human consciousness to change the structure of water is indicated by experiments utilizing light scattering indicatrix recordings. Alterations of scattered light intensity, correlated with an operator's intention, can exceed by factors of 10 to 1000 the statistical variances observed before or after operator interaction. Such effects have been demonstrated by several operators, and appear to be operator-specific, although enhanceable by training.

Introduction

Human consciousness is acknowledged to be affected by its environment. The complementary possibility that human consciousness can influence physical objects has not received general recognition from the scientific community, largely because it is difficult to concede any phenomenon that is based only on subjective accounts of observations. Reproducible, quantitative experiments with inanimate objects are needed to substantiate such effects.

The capacity of human consciousness to alter slightly the performances of some electronic and mechanical devices has been demonstrated by Jahn and Dunne (1988), using very large data bases analyzed in statistical terms. It is desirable to discover some other physical target which, being influenced, would change some parameter value by an amount appreciably exceeding its standard deviation in a single experimental trial. The findings of J. Benveniste and others (Davenas et al., 1988) have suggested that water may be such a target. We have undertaken preliminary experiments to search for noticeable consciousness-related effects on water conductivity, surface tension, elasticity, density, refractivity, or light polarization, but again, the effects were too small to show pronounced results in each separate attempt. We then considered the possibility that since many of water's physical properties, including those above, are determined by its structure, an experiment examining the influence of consciousness directly on its structure might provide the sensitive parameter that we need.

Water structure can be represented as a particular scale set, L, of spatial nonuniformity. Of the various methods for detecting the structure in situ, laser irradiation scattering techniques (Sheffield, 1975; Pyatnitsky, 1976) would

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seem the best. To illustrate the problem, let us first idealize the water structure as a set of solid particles, where the scale set is merely the particle sizes. In that case there are two ways to determine the size distribution. First, the intensity of light scattered by the particles in any given direction fluctuates in time, so that spectrum and autocorrelation functions of the fluctuations can be employed to evaluate the distribution. Such a technique has been elaborated (Provencher, 1982) for computation of the molecular mass of solid components in solutions. Second, the intensity of the scattered light depends on the scattering angle, 8. This angular dependence, known as the indicatrix, can also be used to indicate the particle size distribution (Bohren and Huffman, 1983). Both of these methods involve the so-called ill-posed inverse problem, which requires some a ***priori*** specification of the particle properties. Also, since the first method requires considerable measurement time, the distribution needs to be constant over that period. The latter technique is less sensitive to this requirement, but still requires some preliminary information on the particle features and elementary processes of scattering by the particles.

Method

When there are no solid particles in water, its molecular clusters are the main inhomogeneities which scatter the light. These molecular associations are in dynamic equilibrium, hence vary their shape and size during the measurement time. To identify the particular scale of the structure, L, it is convenient to work in terms of the shift in wave vector, q = k – s where k and s are the wave vectors of the incident light beam and of the light scattered at an angle θ. That equation is in fact the statement of conservation of momentum for light quanta of momenta p = hk. Scattering by water occurs virtually without energy loss, $|k| = |s|$, so that the three vectors form an isosceles triangle with apex angle θ. Figure 1 illustrates two different configurations of the shift, from which the value of q may be readily deduced. For a given wavelength of the probe light beam, λ, the wave number shift is

$$q = \frac{4\pi \sin\frac{\theta}{2}}{\lambda}$$

The water that originates the wave vector shift, or momentum change, itself acquires equal but opposite momentum in the interaction. The product qL determines the indicatrix shape $J(\theta)$. Should qL be quite small, $qL << 1$, the intensity $J(\theta)$ scattered in the plane normal to the direction of light propagation would be essentially constant (Rayleigh scattering). In the other extreme, $qL>>1$, nearly all the light would be scattered forward, $8 \approx 0$. In the intermediate case of $qL \approx 1$ (Mie scattering), there may appear resonant angles (Mie resonances) where the indicatrix jumps abruptly.

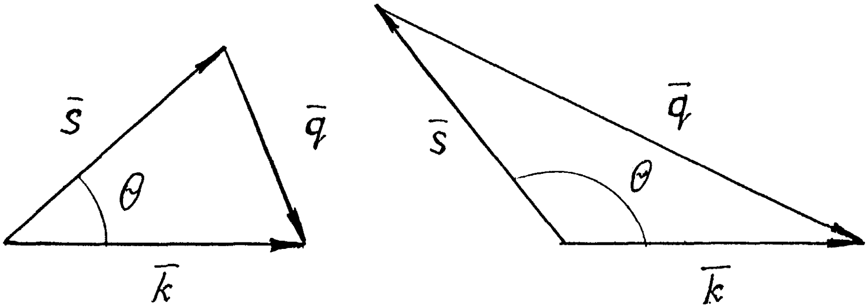

Fig. 1. Wavevector Diagram: k - wavevector of incident light, s - wavevector of scattered light, q - wavevector shift, θ - scattering angle.

Therefore, with

$$L \approx \frac{\lambda}{\sin(\theta/2)},$$

observation of *J(0)* over a broad range of angles would indicate the particle size distribution, if the cluster physical properties, as well as the inverse problem solution, were known.

Unfortunately, neither of these is yet well known for water, but the indicatrix observation nonetheless can indicate disturbances of the structure. That is, by establishing correlations between the indicatrix change and a human operator's effort, other conditions being held constant, the imputed effect on water structure can be qualitatively inferred. In these experiments, we fix the relative intensity while the angle, θ, or time, *t*, is scanned over some interval. Samples are taken before an operator's attempted influence, during the influence, and afterwards, and then compared in an experimental series.

The experimental arrangement is shown in the schematic diagram of Figure 2. The probe laser beam is guided into water through an absorbing stop set, and then into the beam dump through the other stop set. Light scattered by the water volume is observed at an angle 0. The eye image in the picture indicates the light path which actually goes via a reflecting mirror, focusing lens, glass fiber, and monochromator to a photomultiplier. The major pieces of experimental equipment include a He-Ne laser, λ = 632.8 nm, a stainless steel container to collect scattered light, and a data acquisition system.

The container is immersed in liquid from a thermostat to maintain the water at a given temperature level, with variance less than 0.1°K. The container is pressure sealed, and grounded to maintain zero electric potential. Over a

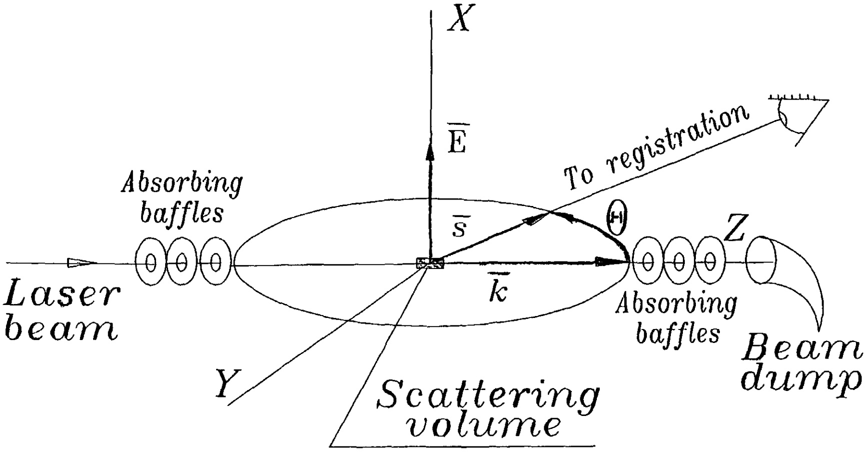

Fig. 2. Layout of **Experiment.**

typical series of not more than an hour duration, the Earth's magnetic field is essentially constant.

Experiment

With our experimental set-up we are able either to scan the angle q. through the interval from 30° to 160° in increments of 1°, or to trace the intensity vs. time dependence at any given angle within the interval. The scattered intensities, $J(\theta)$, are computed as averages over 1024 consecutive readings, and normalized to a greatest $J(\theta)$ value of unity. On the graphs, these $J(\theta)$ values are plotted as dots connected by an interpolating line. The lines above and below indicate the relevant standard deviations. One complete indicatrix scanning requires 8 minutes. **All** of the experimental operations are carried out under computer control, with the computer program prepared before each series.

Preliminary tests have shown that while the indicatrix depends slightly on water quality, the difference is rather small compared with the effect under investigation. Hence, water from the urban supply has been used in the series presented in this paper. However, this water is kept at constant temperature for about two hours before the experiment starts, during which reference standard indicatrix profiles and suitable variances are obtained for comparison with the active results. A human operator takes his place, about a meter from the container, waiting until the reference indicatrix is registered several times. Then he is asked to influence the water structure and thereby the indicatrix profile, which is measured during his effort. After the operator ceases his action, the water is examined again.

More than 2000 runs have been implemented during the period from 1988, with 15 persons tested as operators. Only a few of these have demonstrated evident effects. The others have shown no effect beyond the experimental noise.

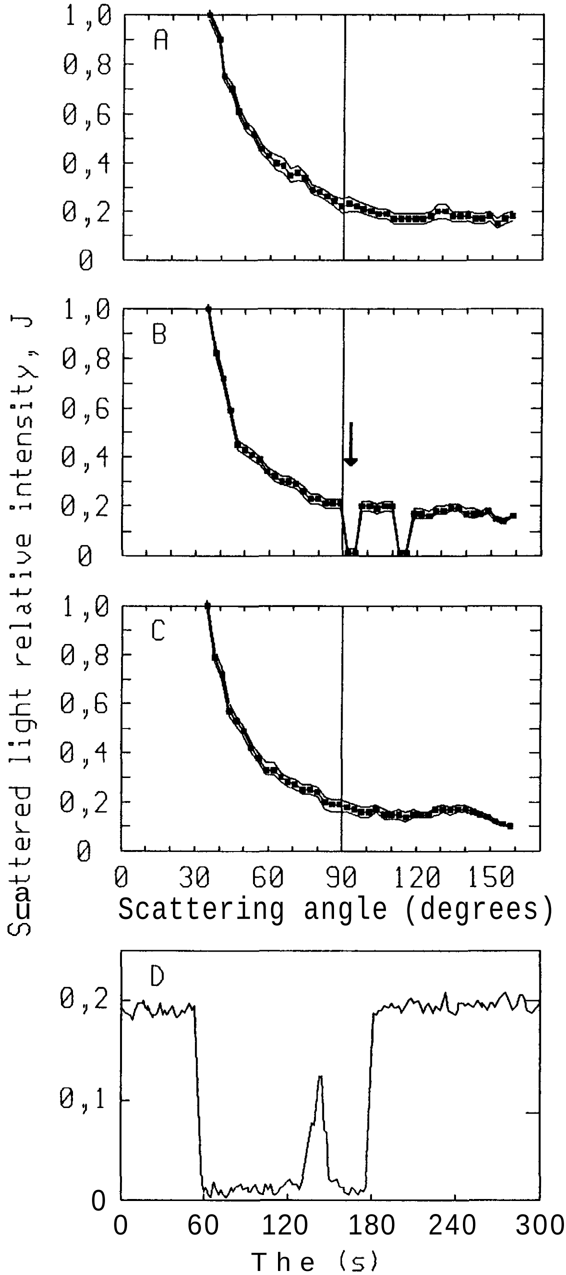

Fig. 3. Operator **4** Effect (February 9, 1993)

A Indicatrix before Operator **4** effort, run #D-1**10**

B Indicatrix for water addressed by Operator, **#D7-1****14**

C Indicatrix after the effort, **#D7**-115

D Intensity time dependence. Scattering **angle**,93°, marked by arrow, ↓, in B, **#D7-OL-9**.

Those operators who displayed interesting attainments have been assigned personal chronological numbers, and some of their results are sketched in the figures. For example, Figure 3 represents the results obtained by Operator 4. Graph A shows the free water indicatrix obtained just before his effort. This is a more-or-less smooth curve with a rather narrow variance. In contrast, the active data, shown in graph B, displays two deep dips which occur in the vicinities of 93" and 112". The standard deviations, however, are essentially the same.

Graph C, obtained soon after Operator 4 stopped his effort, closely resembles graph A, indicating little hysteresis effect. Graph D shows the intensity vs. time dependence for the angle of 93° marked in graph B by the arrow,↓. In this test, the operator waits for a minute without any effort, then attempts his influence for about two minutes, and then relaxes again. The indicatrix changes displayed in graphs B and D exceed the reference water local standard deviations by an order of magnitude, and other attempts by this same operator give similar results, with the exception that the two dips can shift along the 8-axis from one series to another, over an interval of about 30°.

Operator 5 displays even more striking effects, as shown in Figure 4. Comparison of the indicatrix, B, taken during his effort, with A and D, taken just before and just after, shows an increase of $J(\theta)$ for all the large angles, i. e. $\theta > 90°$. This would be consistent with a breakdown of the large clusters into small ones. This operator is especially remarkable in his ability to change his manner and produce quite a different effect, wherein the indicatrix deviations are so huge that one can scarcely recognize the curve (Graph C). Here, a maximum appears in the neighborhood of 135° that is some hundred times as large as that of the free water, as if he were reducing the structure scale to a very narrow range of sizes. In repeated experiments, this is found to shift along the θ-axis, but only within about 10°.

Some operators possess the ability to induce longer-term effects. As shown in Figure 5A, Operator 2 produces an indicatrix deviation that comprises a set of maxima between 60" and 80". After the effort has ended, these peaks migrate towards smaller angles, as shown in Figure 4B, taken 20 minutes later. After about an hour, these details disappear completely.

A second example of pattern persistence is shown in Figure 5C and D. The indicatrix C recorded just after Operator 1 has finished his effort, is characterized by two maxima and some minima. These can persist for some hours, as shown in graph D, which is the intensity-time dependence for light scattered at the angle of 44°, marked by the arrow, ↓, in graph C. In this experiment Operator 1 waits for about a minute and then acts for 40 seconds. Other attempts by this operator show similar results.

A training procedure, wherein an operator can see the immediate result of his effort, has been employed to understand whether a person can improve his performance or change his "signature" via feedback. Such a training sequence is traced in Figure 6 for Operator 6. Compared to the free water indicatrix, A,

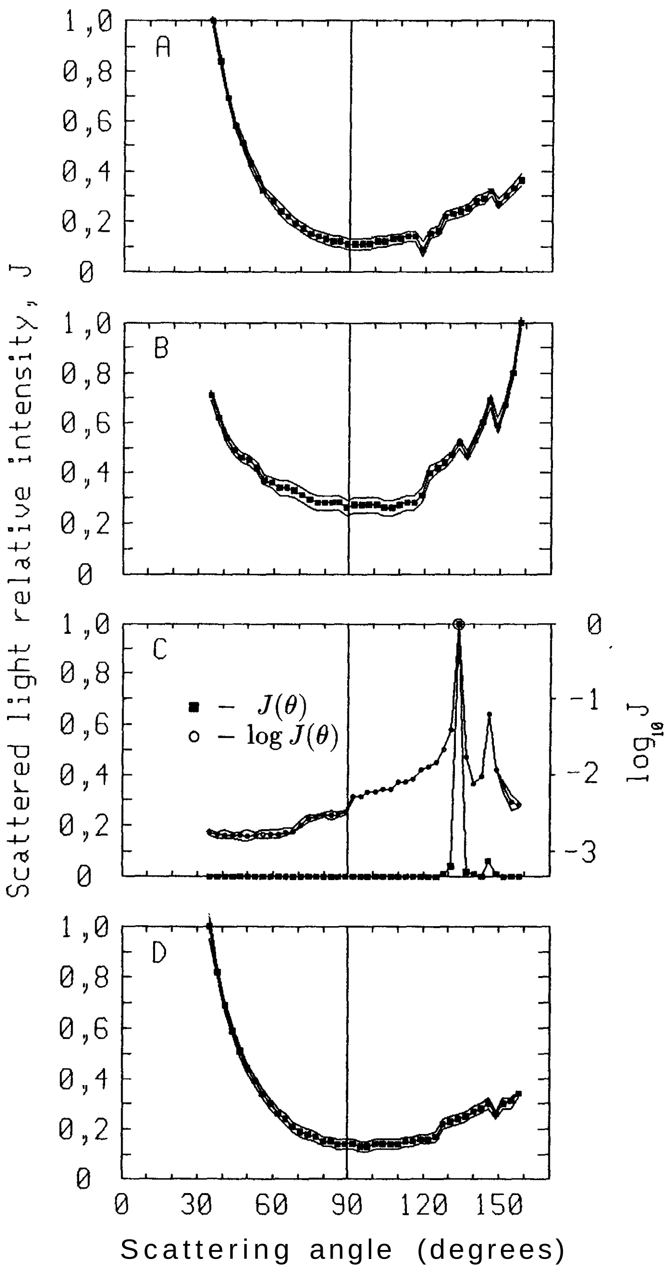

Fig. 4. Operator 5 effect (March 26, 1993).
A Indicatrix before Operator 5 effort, run #D9-61
B Indicatrix for water addressed by Operator 5, #D9-62
C Indicatrix for Operator 5, another effort shown in C, #D9-64
D Indicatrix after Operator 5 effort shown in C, #D9-65.

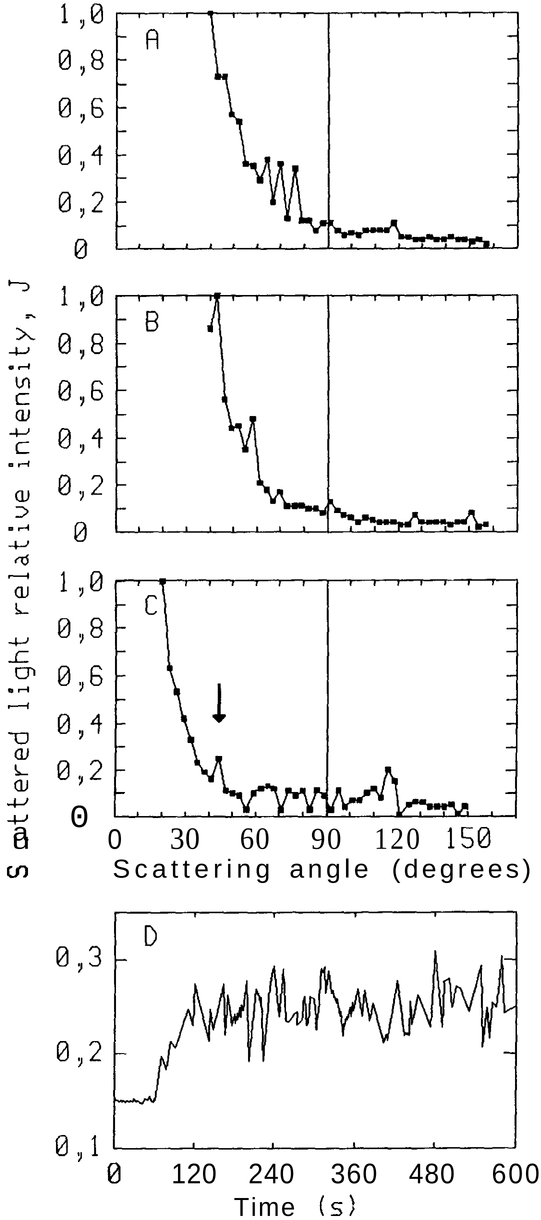

Fig. 5. Long term effects of Operator 2 (February 21, 1990) and Operator 1 (August 30, 1989)
A Water indicatrix after Operator 2, #DL3-5
B Water indicatrix 30 minutes later than A, #DL3-7
C Water indicatrix after Operator 1 effort, #DL1-8
D Intensity time dependence. Scattering angle, 44" marked by arrow, ↓ in C. Record runs 60 seconds before Operator 1 effort, the 40 seconds during the effort, total 600 seconds, #DL1-OL.

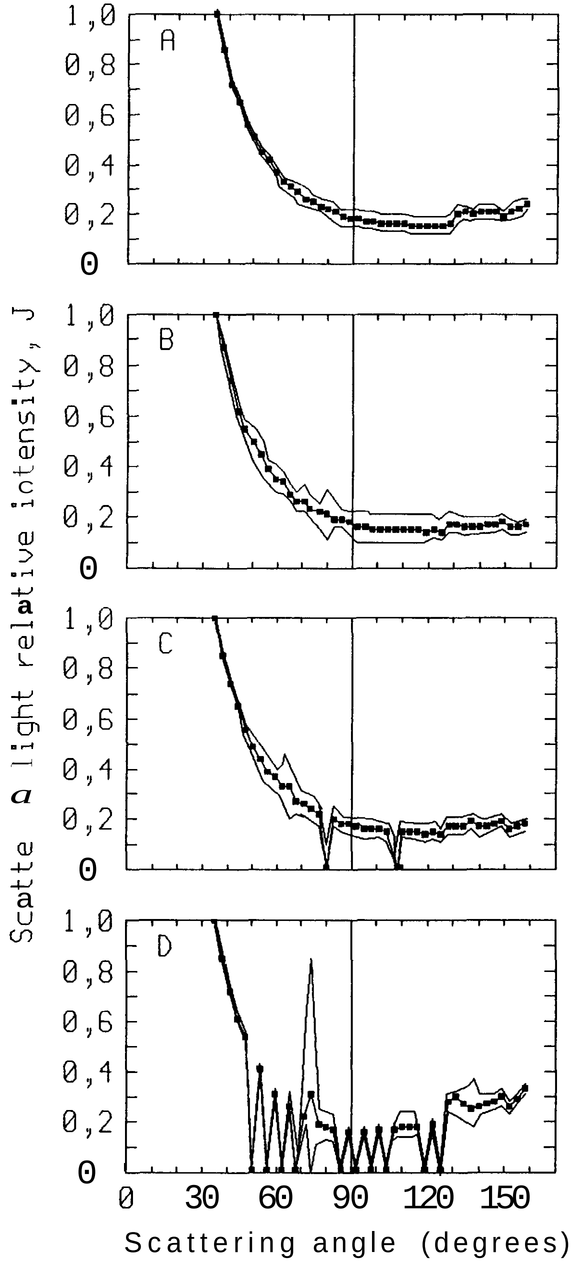

Fig. 6. Operator 6 training (March 11, 1993)
A Indicatrix before effort of Operator 6, #D8-73
B The first attempt of Operator 6, #D8-74
C The second attempt, 20 minutes after the first, #D8-78
D Attempt on the 25th of June, 1993, #D11-26.

his attempt first shows some instabilities at some angles (graph B). On the next attempt (graph C) more substantial changes appear. Apparently, the feedback helps the operator improve his efficiency, and after some training the effect becomes strong and steady, as shown in indicatrix D.

Discussion

The data outlined above suggest that certain human operators can change the water indicatrix, when other parameters are held constant. The results of such human influence do not depend on water temperature and pressure, at least within the intervals of 288° to 310° and 720 to 770 mm Hg, and comparison of the indicatrices and their variances at the beginning and at the end of separate series further validates that operator effort is the dominant factor in the observed change.

Nonetheless, curves A in Figures 3, 4, and 6 reveal that the free water indicatrix and its variance can vary slightly from one series to another. Slight alterations in water composition caused by soluble impurities might be the reason for these small variations. To mitigate this factor, the experimental series were started only after the free water indicatrix became steady, and its variance reached some stable minimum. The factor was also tested directly by purposely changing the water quality. Figure 7 shows Operator 6 indicatrices measured with normal tap water (graph A), boiled water (B), distilled water (C), and deuterium oxide (D). Clearly the changes are quite minor compared to the operator-induced effects.

However, some details of the individual operator effects are found to vary substantially from time to time, as illustrated in Figure 8 which show the results of Operator 4 influence on tap water over four series. Changes occur in both the dip locations along the angle axis and in the dip shapes. Such time-varying influences suggest the desirability of determining indicatrices over all the scattering angles at one time. In that case, frequent repetition of the measurement would track the indicatrix shape history over the course of a given experiment, but unfortunately, we have no such facilities at the present time.

Again, we should emphasize that not all operators produce indicatrix changes that can be distinguished from their background fluctuations, as shown for Operator 4 in Figure 9, for Operator 3 in Figure 10, and in Figure 11 for two series of an operator whose effect has appeared only two times.

The efficiency of those operators who have been able to show significant effects is represented in Table 1, where the data include the operator's attempts during the training.

Our intuitive understanding of what is a valid effect can be defined more exactly by statistical assessment. If the distributions of the local indicatrix measures approximate the Gaussian, with mean m for free water, s for charged water, and similar standard deviation σ for both distributions, then we can calculate the chance probability p for the mean shift introduced by the operator's

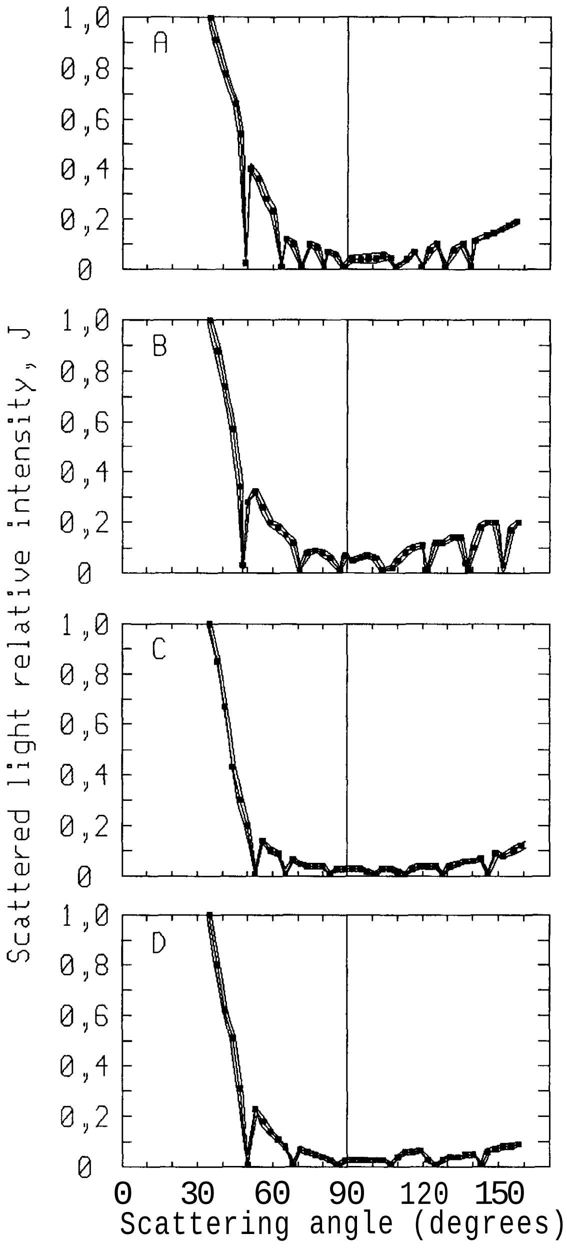

Fig. 7. Operator 6 efforts on water of various composition
A Tap water (June 10, 1993), #D11-15
B Boiled water (July 5, 1993), #D11-31
C Distilled water (July 15, 1993), #D11-61
D Deuterium oxide (August 12, 1993), #D11-102.

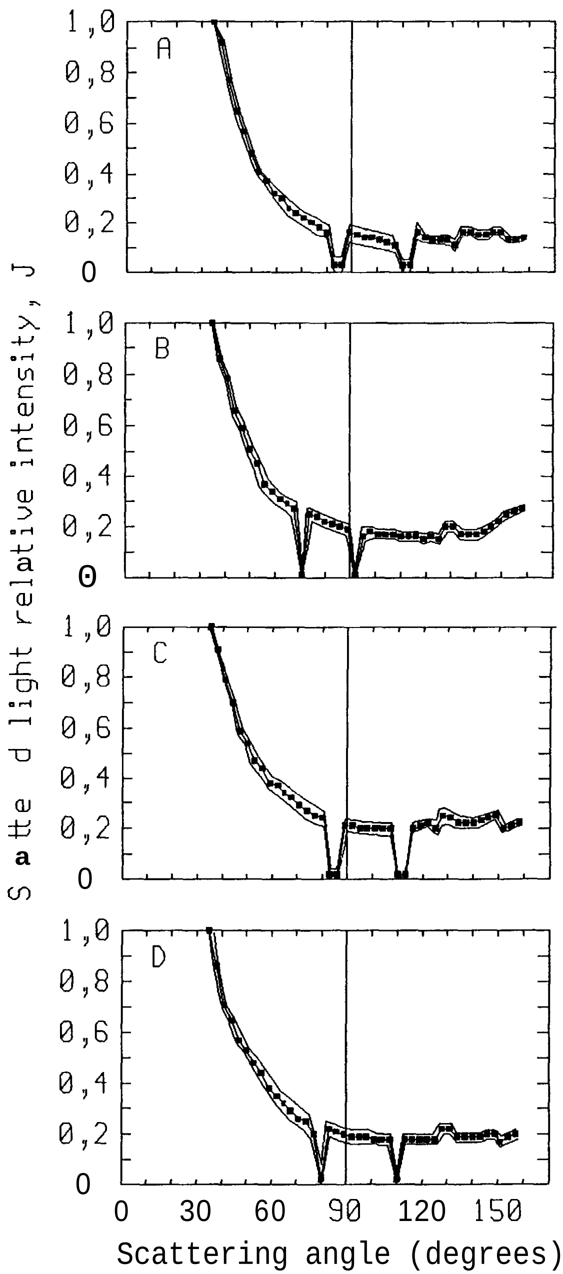

Fig. 8. Water responses to Operator 4 effort (February 19, 1993)
A Run #D7-112
B Run #D7-114
C Run #D7-116
D Run #D7-117.

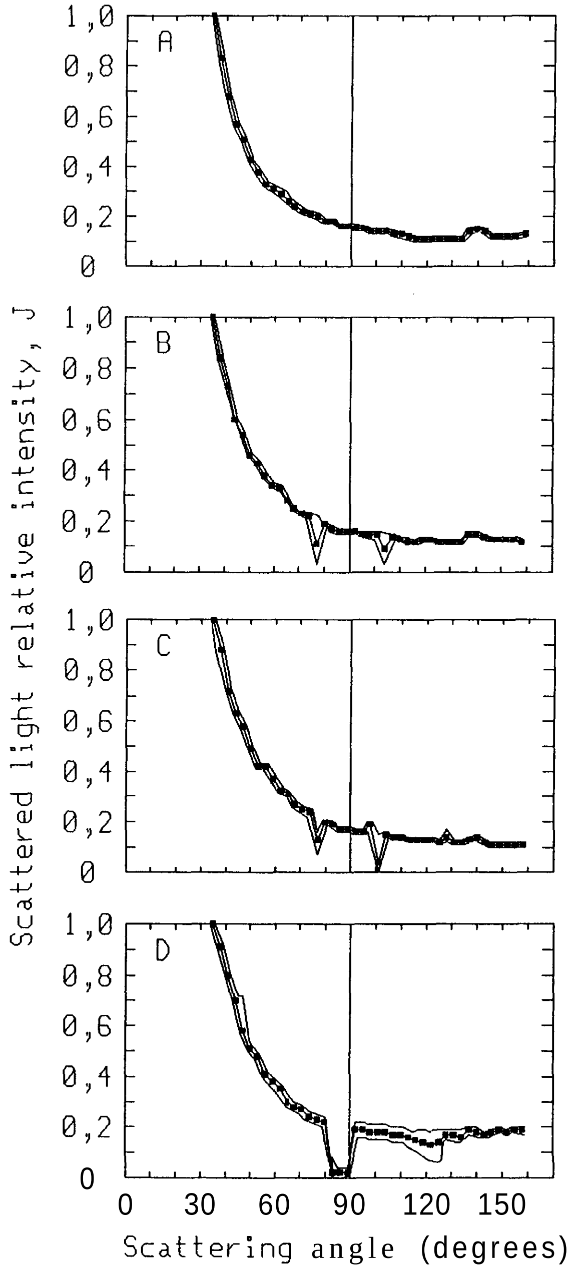

Fig. 9. Operator 4 doubtful results (February 23, 1993)
A Indicatrix before Operator 4 effort, #D8-3
B Indicatrix during the effort, #D8-4
C Indicatrix during the other effort, #D8-5
D Indicatrix during the effort on the 9th of February, 1993, #D7-64.

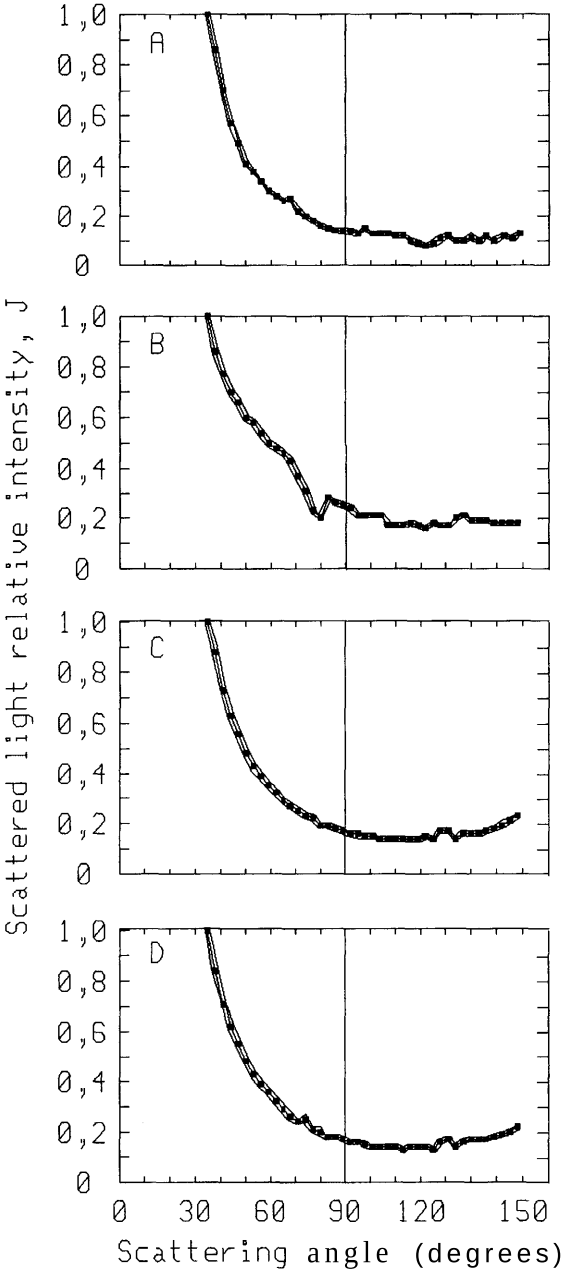

Fig. 10. Operator 3 two attempts with different results (February 10, 1993 and February 9, 1993)
A Indicatrix before effort, #D7-71
B Indicatrix during the effort, #D7-72
C Indicatrix before the other effort, #D8 62
D Indicatrix during the effort, #D8-65.

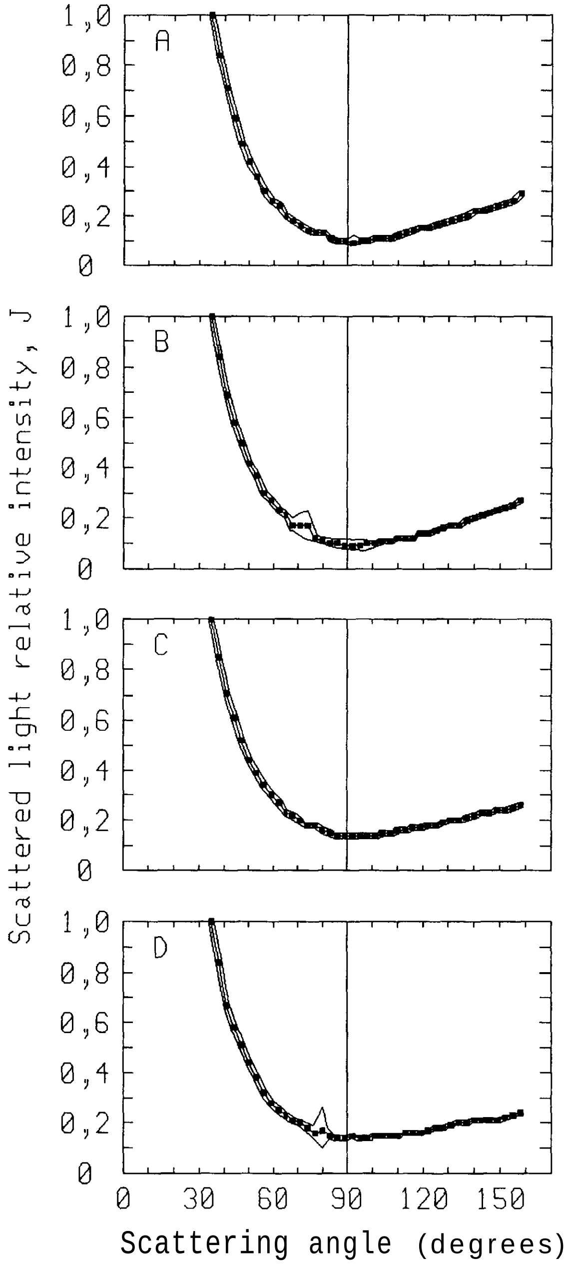

Fig. 11. Two most successful attempts of an operator, April 22, 1993
A Indicatrix before effort, #D10-44
B Indicatrix during the effort, #D10-45
C Indicatrix before the other effort, #D10-47
D Indicatrix during the effort, #D10-50.

TABLE 1
Efficiency of Operators

Operator, Number	1	2	3	4	5	6
Attempts, Total	29	12	47	228	42	123
Evident Results	14	11	10	153	36	67
Doubtful Results	15	1	37	75	6	56

effort. Since the typical experimental effects are acute deviations from the free-water indicatrix at only a few locations in the array of possibilities, any statistical assessment must reflect the deviation measured relative to the local variance, but must do so in the context of a more global description of variability from run to run. Such analysis must also address the effect of multiple testing, i.e., the fact that no prediction is made concerning the particular angle where a deviation is found, out of the 130 possible angles.

The deviations shown in Figure 3 are on the order of 10 σ compared with the local variance, and even when the run to run variance is taken into account (say, by comparing 3A and 3C), and after making a Bonferonni adjustment for multiple analysis, the differences remain highly significant. Similarly, the time-scan of the effect at a given angle, shown in Figure 3D, is visual indication of a clear discontinuity correlated with the operator's effort. A statistical assessment shows the difference to be on the order of 6 σ. Of the examples shown, these are among the most conservative. Thus, a statistical perspective provides relatively formal support for the visually striking changes in the indicatrix traces, related to operator efforts, that have been produced dozens of times in this series of experiments.

Although we have no explanation of the phenomenon, the data represented in this paper would seem to indicate that some human operators can produce a consciousness-related influence on water structure. Clearly, the effect should be verified at other laboratories, and theoretical models proposed.

Acknowledgment

We should like to thank all the participants in these experiments.

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