Journal of Scientific Exploration, Vol. 9, *No.* 2, pp. 159-189, 1995 0892-3310194

Unconventional Water Detection: Field Test of the Dowsing Technique in Dry Zones: Part 2*

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Abstract — This report presents new insights into an unconventional option of locating water reserves which relies on water dowsing. The effectiveness of this method is still rightly disputed. Now, however, extensive field studies — in line with provable and reliable historic accounts — have shown that a few carefully selected dowsers are certainly able to detect faults, fissures and fractures with relative alacrity and surprising accuracy in areas with, say, crystalline or limestone bedrock. A series of *Deutsche Gesellschaft fur Technische Zusammenarbeit* (GTZ) projects involving this technique were carried out in dry zones with unexpectedly high rates of success. In particular, it was possible to locate a large number of relatively small underground aquifers in thinly populated areas and to drill wells at the sites where water is needed; the yields were low but sufficient for hand-pump operation throughout the year. Finding or locating a sufficient number of relatively small fracture zones using conventional techniques would have required a far greater work input.

The relevance of the method used was tested under various aspects. On the one hand, project areas with different geological characteristics were chosen and, on the other hand, the relevant circumstances and project results were carefully examined by geology experts. So far, neither critical consideration of all possible objections nor attempts at reasoning have yielded a conventional explanation for the persistent success of the dowsing technique — an outcome which has been corroborated by a number of specifically designed control experiments and comparative tests. The trend of the reported findings is concordant with that exhibited by the findings from recent scientific research carried out, for example, by a Swedish geological institution and universities in Munich. Provided that certain conditions are met, the results obtained show the dowsing technique to be a serious alternative for ground-water prospecting. It can thus be concluded from these present experiences that the effectiveness of locating ground water in certain hydrogeological situations could be raised significantly if conventionally organized operating teams were to make additional use of appropriately tested and selected dowsers in order to pinpoint drilling spots. Along these lines, a model of integration, which has already been tested on a pilot scale in some of the GTZ projects presented herein, is discussed and proposed for future provisional use. The high success rates described in this report suggest the design of specific tests for future use which may contribute to a scientific clarification of the dowsing phenomenon. At the same time, there is the possibility of an especially useful transfer of practical knowledge concerning water-resource development. Finally, due to its biophysical background the issue

*Part 1 of this article appeared in the previous issue of JSE.

might be of importance to bionics; further treatment should aim at technical simulation of the proven — albeit unexplained — effects of the dowsers in order to create new and more effective measuring procedures.

2. Other Documented Results of Dowsing Techniques

2.1 Munich Project

In spite of numerous efforts in the past, no one succeeded in either generally refuting or clearly proving the relevancy of the dowsing method. In view of this situation, characterized by wide-spread confusion, a new and much more extended scientific study was called for. After intensive and interdisciplinary consultations beginning in 1983, consent was attained to promote an appropriate research project; this was finally started in 1987 and came to end in May 1989. Characteristic results will be succinctly reported hereafter. The details concerning this unparalleled project and its surrounding issues may be found in the comprehensive and explicit project report published in the summer of 1989 [2].

Numerous scientists from different departments of several research institutes in the Munich area participated in that research project. Planning, implementation and evaluation of the experiments were subject to the control of many experts who had been appointed by the supporting Federal Agency, the Bundesforschungsministerium (BMFT) in Bonn. Because of the pronounced interest of the scientific community and the public, the entire project was carried out with peculiarly severe controls and conditions, far above the general and usual standard of research projects. Subsequently, severe criteria were implemented for all the performed experiments, in order to allow as little doubt as possible with respect to the validity of the achieved results.

Two different types of experiments were implemented in order to investigate location-dependent reactions of test persons. The results show with very high statistically founded certainty that such reactions exist; they defy any clarification by traditional and classical means and, as a consequence, speak in favor of the existence of the long debated dowsing phenomenon.

Experiment Type I: Localization of Artificial Objects

The set-up of this rigorously controlled double-blind experiment took place on two floors of a barn. On the ground floor, a position-adjustable arrangement for the simulation of artificial "stimulations" in the form of different pipes had been installed. On the floor above, the test persons had to pass along the 10 m course; utilizing dowsing techniques, they had to localize the respective position of the pipe below on the ground floor. After each individual pass, the position of the pipe was changed by means of a random number generator and the experiment was repeated at least ten times.

In 900 individual tests arranged in 107 series, undertaken by 43 persons, the performance of the dowsers varied from pure chance to very high

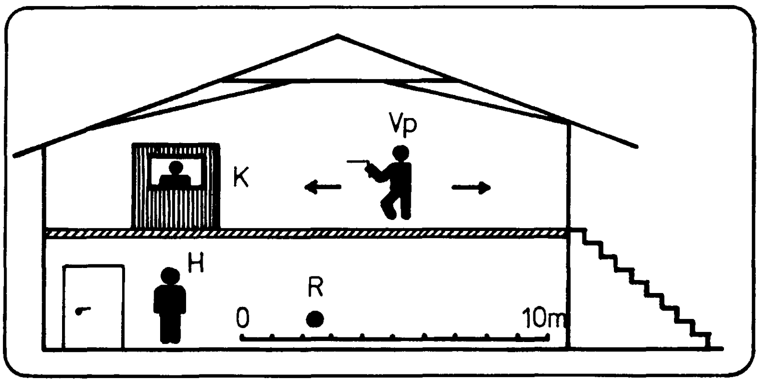

Fig. 5. Schematic description of the barn experiment. In this rigorously controlled double-blind test, an assistant H places a pipe R on the ground floor of the 2-story building at a position determined by means of a random number generator. The supervisor guides the tested person Vp to the 10 m long test course situated on the floor above; by means of the dowsing technique, the person has to find the location of the pipe unknown to her. During the tests, the supervisor observes the person from his control cabin K. A test series consists of 10 runs of the described kind.

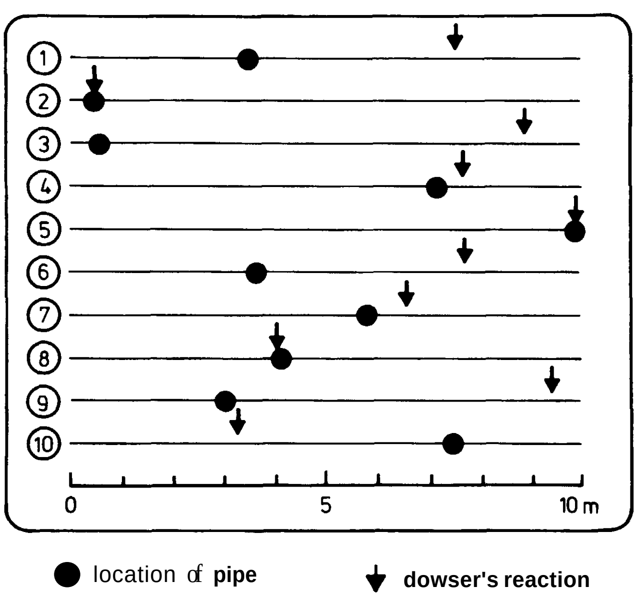

Fig. 6. Result of a barn experiment with GTZ engineer and dowser Hans Schroter. The actual pipe positions and dowsing points are indicated by full circles and arrows, respectively. Although the direct success rate of the 10 individual runs of the shown series did not even reach 50%, the entire result is highly significant and can be reached by chance only with a probability of 1 : 500.

significance. The success rate within an *individual experiment* was disappointingly low. It became obvious that such an experiment to detect relatively small objects by means of dowsing, and carried out in quite an academic way, will be of no direct practical use. Nevertheless, it turned out that the number of highly significant experiment series was three times higher, and the number of significant series twice as high as what could be expected from pure chance expectation. In its entirety, the obtained results could only be produced by a chance with a probability of 1:1000; as a consequence, the data obviously supports the existence of the investigated dowsing phenomenon.

Among the 47 tested persons, the most successful one turned out to be the GTZ expert, Hans Schroter — a most surprising and suggestive fact. Although he had never before tried such a test arrangement, he reached a highly significant result in four different experiment series, each with 10 individual runs; this result could be obtained by pure chance only with a probability of 1 : 1700. Since the experiments were designed in a "fool-proof" manner and even the most critical skeptics could not detect flaws in the arrangement, one must attribute high confidence to the results and the associated interpretation.

It is noteworthy that comparably significant results for such kinds of experiment with artificial pipes have already been reported by at least three independent research groups (see [2] for a detailed discussion).

Experiment Type 2: Detection of Natural Sites

For many dowsers, physiological stimulation may be sensed much more effectively at appropriately selected places in the field than at locations associated with additional artificial objects. That could be ascertained by means a so-called *walk-way experiment,* which operates on the following basis: appropriately blind-folded test persons walk repeatedly along a given test course in the field and try to locate the same supposed reaction zone over and over again, whereby conventional information transfer is excluded to a high degree.

The experiments have been carried out under compliance with a number of precautions. These concerned the elimination of visual and acoustic information, the avoidance of wind, temperature and odor effects, the elimination of orientation possibilities through the soil constitution around the walk-way, as well as a local disorientation of the person before each experiment and the variation of the starting-point on the walk-way. These measures should help to run the experiment as *double-blind* as possible and to make it free of conceivable flaws (see detailed discussion in [2]).

Altogether, 40 persons were tested and about 3000 individual experiments were carried out and evaluated. It was revealed that the major part of the tested persons selected for that type of experiment did not produce statistically significant result. Once more, the mean success rate for an individual experiments was found to be rather low, although it was clearly better than for the barn experiment.

Nevertheless, it is most important to note that 13 of the 40 dowsers obtained

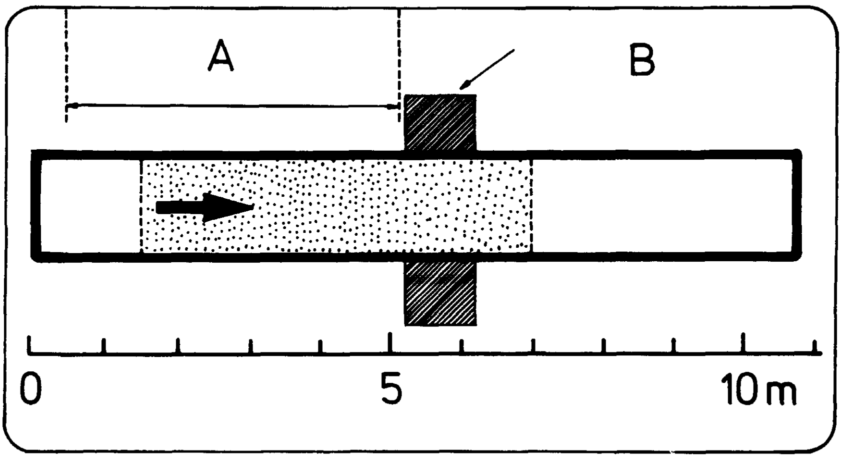

Fig. 7. Schematic view of the walk-way experiment. The plank was especially prepared for that purpose (e.g. the side planks were inclined to allow unaided walking; the entire plank was covered with a carpet to prevent position identification). Here, the plank is 10.8 m long and covers the field area where dowsers are supposed to exhibit reactions (dashed area B). The blind folded tested person is requested to walk along the plank (always in one and the same direction shown by the arrow) and to indicate precisely the reaction zone which was unknown to her. These runs were frequently repeated; before each new run, the starting-point was varied by means of a random number generator (within the indicated range **A).** The dowser always completes a distance of the same length (dotted area).

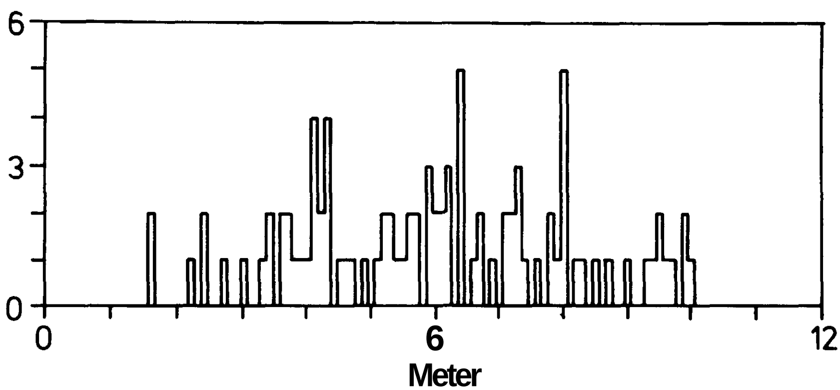

Fig. 8 Results from 40 individual runs of a walk-way experiment carried out on a 13.5 m long plank. The distribution of reaction points corresponds to pure chance and is statistically insignificant. The person did not sense any particular zone and, therefore, did not exhibit any dowsing ability.

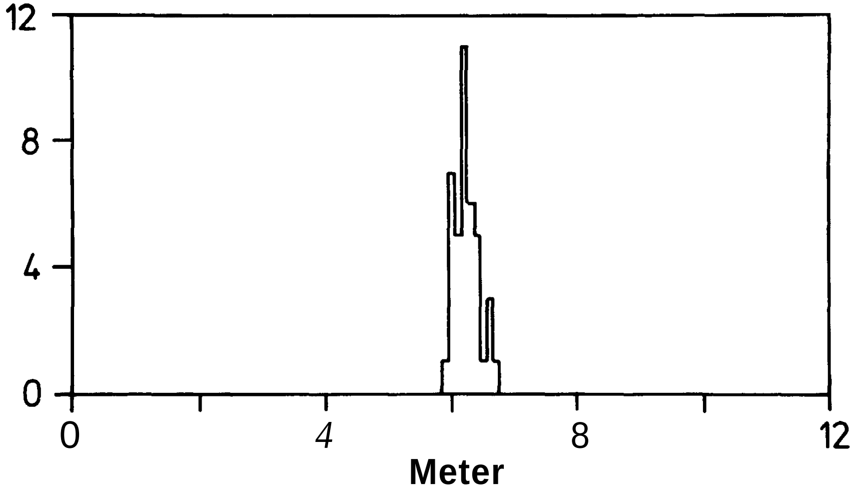

Fig. 9. Result of 40 individual runs carried out on a 13.5 m plank. The distribution of reaction points as a function of location is locally very concentrated and statistically highly significant. The obtained result could be reached by chance with a probability of only 1 : 100,000. The performance of this dowser could not be explained by normal senses and, therefore, points to dowsing abilities.

significant results, and 8 of them even highly significant results. Moreover, 7 of the tested persons were able to reproduce these successful runs. In its entirety, the results could be obtained by pure chance only with a probability of less than 1 : 1,000,000. Again, as already revealed in the barn experiment, this points to the existence of the phenomenon of locating certain sites by dowsing effects.

Total Evaluation of the Munich Project

When all results are evaluated together, they turn out to be highly significant and robust, i.e. neither the used evaluation procedure nor arbitrary elimination of test series or test persons would lower the total significance. The decisive test results can be summarized as follows:

- In the conducted test series the rate of success of average dowsers was found to be bad and could hardly or not at all be distinguished from pure chance.

  In certain test species some dowsers exhibited a sufficiently high success rate which could hardly or not at all be ascribed to or explained by pure chance.
- The performance of the entire pool of tested persons was highly significant and, therefore, could not be attributed to the pure chance hypothesis; furthermore, the observations could not be explained by conventional effects.

The value of this study is given by its completeness and scientific care; for the first time in history, a number of statistically reliable data of extensive proportion could be collected. None of the former studies displays a comparable power of statements. The central issue of the study, though, must be seen in an examination of the *existence* of the supposed phenomenon. For this reason, no attempt could be made to establish the *cause* of the observed effects. Subsequent studies become of primary importance and should involve, above all, investigations of questions concerning earth sciences and physiology. Limited pilot studies of the former kind are already under way (see part 1) and will also be reported in the following section.

2.2 Location of a Fault Zone

During the realization of the Munich project, it was absolutely necessary to find appropriate test sites for the "walk-way" experiments. On one occasion, it was possible to link this aim with a localization of a site intended for a deep well in a valley of the Spessart, situated in central Germany. The geological conditions in that region were partly known from several dozen deep drillings which were sunk to 650 m; below the subsoil which carries surface water not of interest here, New Red Sandstone, Zechstein and Rotliegendes dominate. Since only two of the numerous deep drillings encountered water, it must be concluded that the hard rock exhibits only low, partly no permeability. Nevertheless, the assumption appeared justified that a fault system was present in the valley which might offer adequate sites for the required deep wells. No knowledge about the position of this fault was available; this lack of information can also be inferred from two more recent deep drillings which remained totally dry.

The GTZ expert, Hans Schroter, was informed about the situation. Under scientific supervision he used the dowsing technique to try a location of the fault in the target area, which was about 10 km long and 2 km wide. In addition, he determined smaller faults extending almost perpendicular to the main fault. At one of the intersections so defined he indicated an optimum drilling point (P).

Another dowser, who had a long experience as scientifically working geologist, was confronted with the same task, but without being given any knowledge about the indications produced by Schroter. To general surprise, he located the fault nearly identically. Due to this coincidence, it was decided to integrate the located point P into a test course for the "walk-way" experiments of the Munich group. The subsequent experiments performed at this site with many other dowsers led, in fact, to highly significant results. The preferential points indicated by the test persons often differed from point P by less than 1 m, either before or behind P — this corroborates the assumption that P signifies an anomaly in the subsoil.

In view of these promising results, a check up of the area was arranged in which three different geophysical prospecting methods were employed around

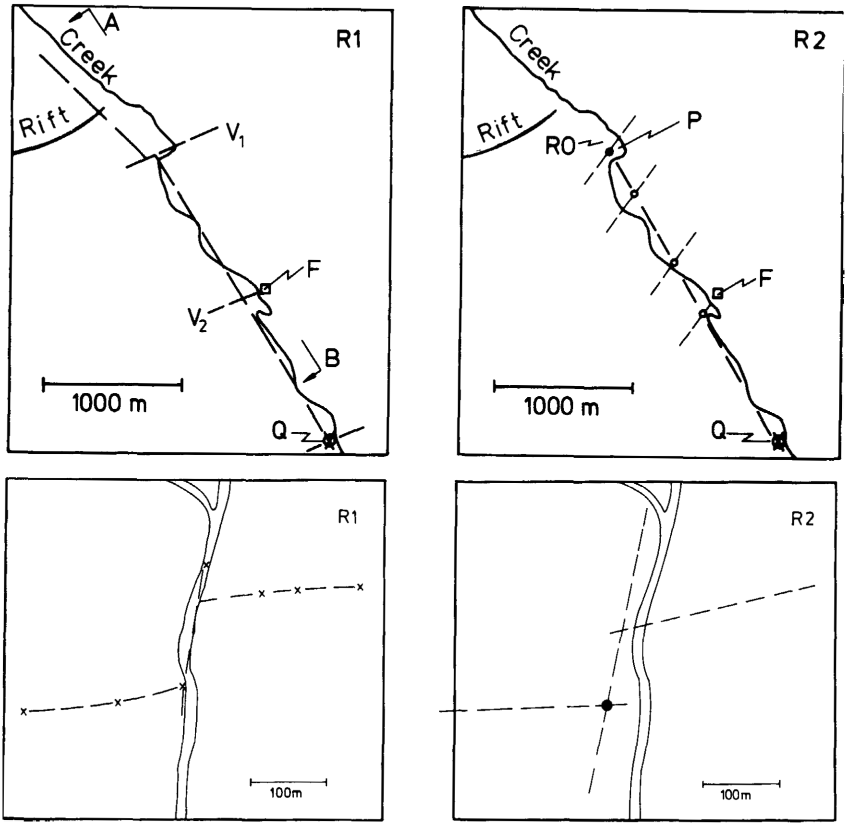

Fig. 10. Experiments carried out by dowser R1 (scientific geologist) and R2 (GTZ expert Hans Schroter) in order to locate fracture zones in a Spessart valley. Above: area to the north of an existing well Q; — fault zone obtained from dowsing procedures; F: earlier unsuccessful drilling; V1, V2: perpendicular faults indicated by dowser R1; P: drilling point proposed by R2; RO: drilling point proposed by a third dowser. Beneath: fault zones predicted by R1 and R2 in an area to the south of the well Q.

the point P; these were electrical soundings (electrical resistivity of the underground), radioactivity of the upper rock formations, and the seismic movements of the top soil. Remarkably, these three objective measuring procedures also supported the particularity of the point P located before by dowsing techniques.

Geo-Electrical Soundings. As position and direction of the fault zone had to be considered as being fixed by the dowsers, geo-electrical investigations could be conducted relatively quickly in the proximity of the point P (asymmetric procedure in the form of the reduced Schlumberger method by utilizing a single moving electrode). As it had already been observed within several other parts of GTZ projects in Sri Lanka, the present results of the measurements could also be interpreted as a verification of the findings produced by the dowsing technique: longitudinal and intersecting faults were found as

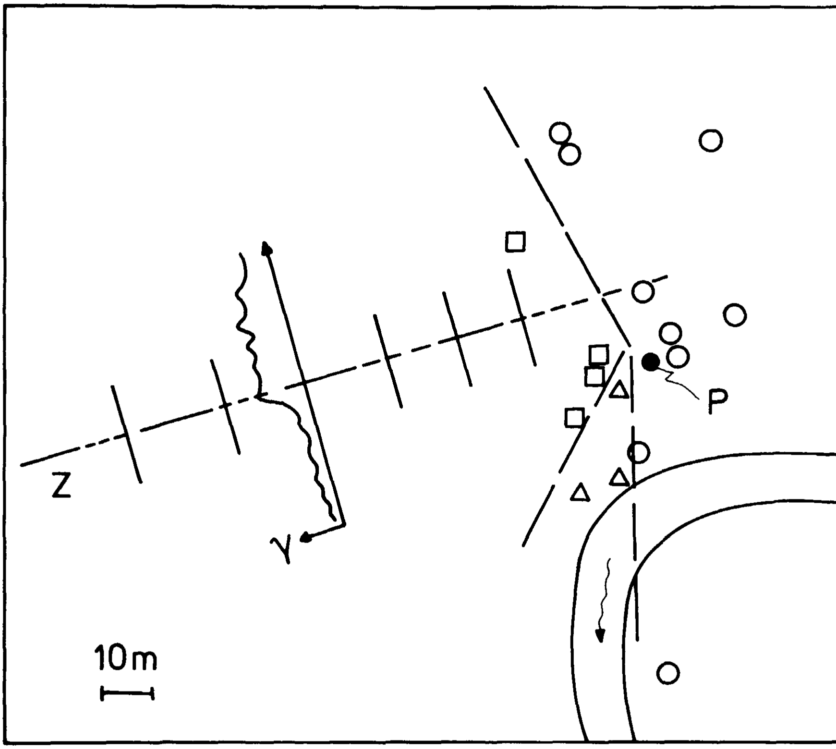

Fig. 11 Geoelectrical soundings and gamma-ray measurements in the environment of the point P. - - - - fault locations determined by the geoelectrical procedure (circles, triangles and squares represent different conductivity in the underground); - — - — - line connecting the points where sharp changes of the radiation intensity emitted from the rocks have been measured.

predicted; only with respect to the exact direction of the transverse faults did some less significant deviations show up [19].

Radiation Measurements. The gamma radiation of the potassium-40 activity of the soil has been detected along several lines on the slope, oriented parallel to the main fault in the valley. At certain positions, all profiles exhibited a sharp intensity step; these points could be linked by a line which, when extended towards the direction to the valley, missed P by only 15 m [19]. Such a relatively small deviation does not deserve too much attention, especially because the dip angle of the fault (relative to the vertical) was not known and might play a certain role.

Seismic. Measurements of the ground vibrations were performed by means of two highly sensitive geophones (Type Mark L4) of the same model and equally calibrated, which had been installed at the point P and at a small distance of 2 m from P (second measurement: 4 m from P). The geophysics experts who carried out the experiment did not expect that oscillations, measured at sites separated by only a few meters, would differ by significant

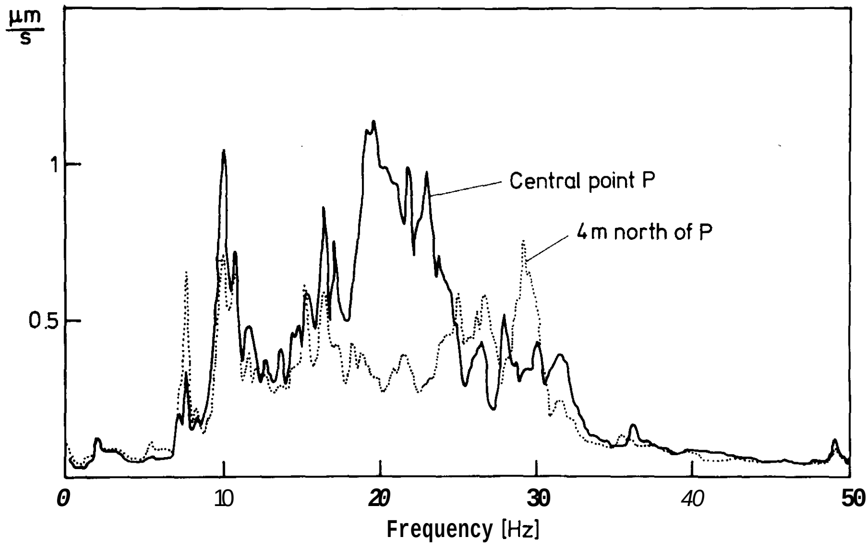

Fig. 12. Frequency distribution of the seismic vibration measured simultaneously at two points, which were separated by only 4 m. The point P is the drilling point determined by GTZ dowser Hans Schroter.

amounts; the wave lengths expected for the vertical and longitudinal oscillations lie, due to the influence of the known sediments in the valley, at about 30 m and 75 m, respectively. With a maximum amplitude below 1 m/s, the registered vibration velocities were within the usual range. The big surprise was that the vertical oscillations around 20 Hz displayed a considerably higher amplitude at the point P than only 2 m or 4 m further away. This clear difference demonstrated once more an anomaly of the underground at P [20].

The results gained from these specially arranged experiments are not at all sufficient to establish a clear correlation between the three indicated types of physical signals and dowsing reactions. Nevertheless, it must be considered as well documented that certain geological anomalies of the underground can be perceived by means of the dowsing technique and that different dowsers reach a degree of agreement which cannot yet be explained by conventional reasoning.

2.3 Location of Karst Water Channels

In 1982, the Swedish university of Lund (Universitets Naturgeografiska Institution of Lund) implemented a comparative study for the location of karst water channels on Gotland Island. For that purpose, three geophysical techniques (Slingram, VLF, ground radar) had been used parallel to the dowsing technique and analyzed with respect to their respective prospecting power for specific tasks [21].

Within two areas of the Gotland Island, 6 test courses and 2 test terrains were selected for the experiments. It was well-known that ground water did not occur in extended strata, but flows through fractures and openings in the limestone (karst). Sometimes, very pronounced karst water channels as well as subterranean rivers and galleries occur.

The first test area near Tingstade was a fenced terrain of 80 x 20 m, protected against observation from outside. Inside, a 22 m long test course and a test field of 50 x 15 m were pegged out. The organizers of the experiment had good reasons to assume that below the area an underground river was present, in a depth of no more than 20 m, but its exact location was not known prior to the experiments.

The second test area included 5 test courses, each of 50 m length, and a test field of dimensions 40 x 40 m; in all cases, the position of the approximately 20 m deep underground river Lummelunda had to be located. The channels and galleries formed by the river were partly 5 m wide and high; this has been reported by divers who had already investigated the river at some points. Again, the exact positions of the river in the test area were unknown before the experiments. The organizers all agreed in their opinion that the surface at and around the test fields offered no signs or indications which could be used for the location of the subterranean channels.

During several test days, 33 test persons were appointed as dowsers. The larger number had dowsing experience before and half of them claimed to have located wells quite frequently. In all 8 experiments, the task consisted in localizing the position of the supposed gallery; on both test fields, the direction had also to be indicated. Each tested person was individually guided to the test area without being watched by others. Those who had already carried out the experiments waited separately from the others who had still to perform the tests. None of the test persons knew the terrain; 30 of the dowsers had never been on the island before. During the experiments, neither the dowsers nor the supervising crew knew the exact position of the investigated channels (double-blind procedure).

After the dowsing tests had come to an end, the three previously mentioned geophysical measuring procedures were carried out, as well as some inspection of the underground river in order to geometrically pinpoint the precise locations of the karst channels. In 7 of 8 cases these procedures were sufficiently accurate. A more detailed discussion of the quite problematic and more or less appropriate technical procedures is reported in other documents [21].

Results of the Swedish Study

Altogether, the results obtained from the dowsing experiments are comparable with the Munich tests carried out in the open field. The majority of the test persons produced dowsing reactions along the entire course (i.e. not just at the places where they actually crossed the channels), but about a third of the dowsers had reliable and statistically significant reactions. **A** total analysis of this data led the authors to the conclusion that dowsers are able to sense

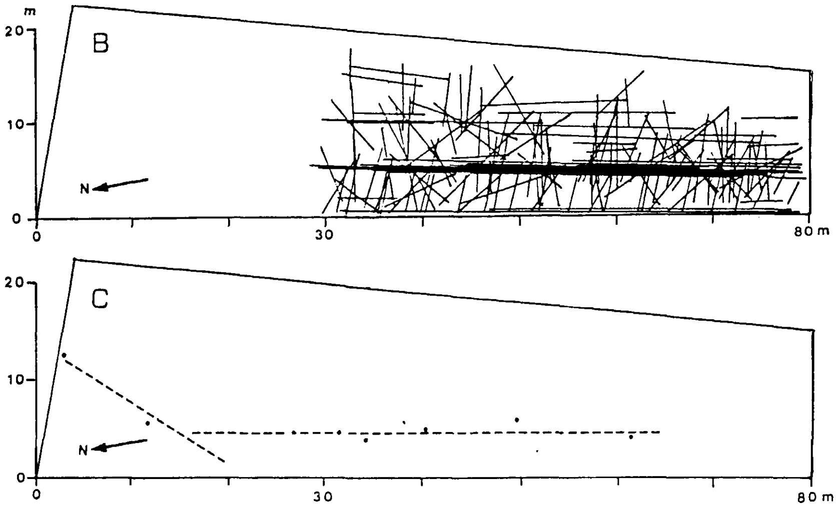

Fig. 13. Results of 29 test persons (dowsers), obtained at a test area situated over karst channels on Gotland Island. Above: plot of all 152 directions and locations indicated by the dowsers and attributed to subterranean channels. Beneath: subsequent result of radar measurement (- - - direction of the main channel).

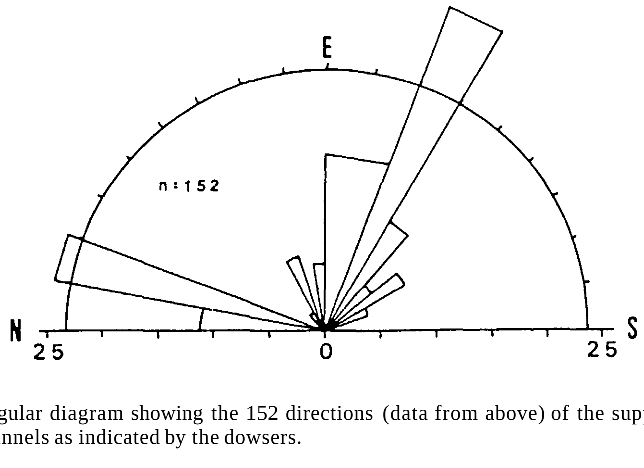

Fig. 14. Angular diagram showing the 152 directions (data from above) of the supposed water channels as indicated by the dowsers.

karst water channels with such a high accuracy that the hypothesis based on pure chance success could not be maintained.

The outcome will be discussed for the case of tests carried out on the 50 x 15 m field. 29 dowsers participated and tried to locate both position and direction of a supposed subterranean channel. When the resulting lines were plotted on a plan, they cover almost the entire field; there was, however, a well pronounced accumulation: more than half of all indicated lines lie on a small tract. The later measurements of the supposed channel by means of ground radar turned out to correspond extremely well with this tract.

When all the directions indicated by the dowsers are plotted in an angular diagram, a most surprising result is revealed: it turns out that the given directions mostly indicate two perpendicular directions (but not the main cardinal points). More than 90% of the lines belong to two groups which form an angle of 90 ± 10°. This is normally the angle between vertical fractures in horizontally situated limestone; geophysical investigations have corroborated this fact also for the karst underground on Gotland.

Among the 6 location experiments of channels along test courses, 5 cases turned out to be significant, whereby 2 cases were highly significant. Along the

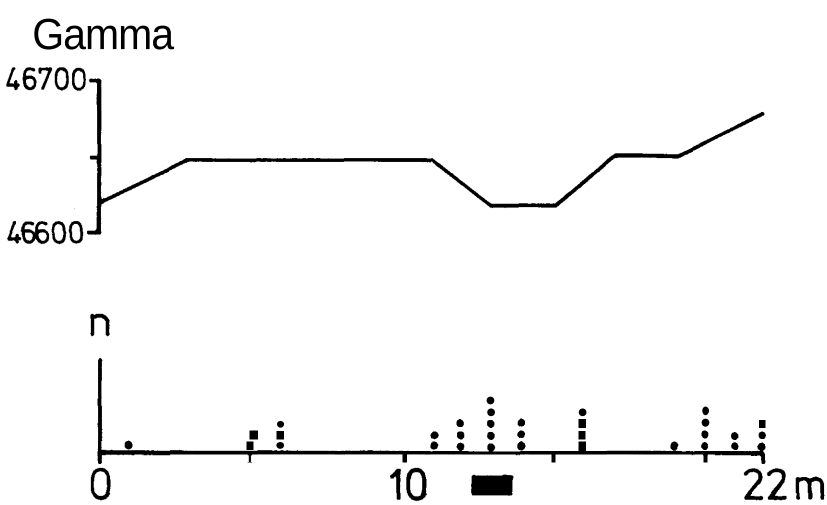

Fig. 15. Result of one of the tests carried out along a course which crosses a subterranean karst water channel. The black square shows the location of the sought channel as determined later by measuring techniques. Above: strength of the earth-magnetic field. Beneath: reaction points of the 20 test persons who claimed to have detected strong water carrying channels.

course with 22 m length, 11 of the 20 participating dowsers produced hits; 11 of the total of 33 reactions occurred within the 2 m wide target interval at the mark of 13 ± 1 m (see sketch). The probability that this result can be attained by accident is less than 1 : 40.

The relative simplicity of the experiments and the observed accuracy of aim of the dowsers suggest that such experiments should also be incorporated into future dowsing tests. The choice of the area will apparently be decisive: karst underground with shallow channels seems to be particularly appropriate for such tests.

2.4 Water Detection by Three Successful Dowsers

Critical observers repeatedly assert that dowsers generally perform so badly in practical field work that they do not deserve serious attention; moreover, a careful analysis of the activity of "famous" dowsers is claimed to reveal mainly failures, except for a few successes obtained by accident. This assessment, in fact, is probably correct as regards the majority of dowsers; nevertheless, it can be shown that an absolute generalization of these statements is completely erroneous. At all times, there have been dowsers who produced continuous and unusual successes with respect to water detection — and, nevertheless, have been commonly ignored. This fact may be demonstrated by means of three examples related to active water prospectors in Germany whose dowsing activities have been the object of a more thorough analysis. The abundance of available information and results allows description of some of the spectacular and well-documented cases.

E. *Kittemann.* This lady dowser, active for over decades in the southern part of Germany, has solved most difficult problems referring to water detection; no one has ever heard of any serious failures. Her most spectacular achievement consisted in an unusually precise prediction of a mineral water source in Tegernsee (Germany). By means of the dowsing technique, Kittemann located a drilling point and gave indications of the depth and the mineral composition of the supposed water source; the predictions were totally opposed to what one would have expected from geoscientific knowledge about the area and, therefore, were considered as being extremely improbable. Finally, after difficult and lengthy debates, drilling took place and confirmed all the dowsing predictions in detail, contrary to all expectations.

That particular case, as well as many other unusual performances of Kittemann have been reanalyzed and are generally well documented [3].

I. *Gronig.* For a number of years, a geoscientist of the University of Bonn has observed the activities of this lady dowser. She repeatedly succeeds in indicating very exactly the depth, quantity and quality of the water she detects by means of the dowsing technique. For example, in the village of Kaltenburg she predicted mineral water in a depth between 80 and 90 m, with a yield of 4 l/sec and a mineral content of more than 1200 mg/l; actually, water was en-

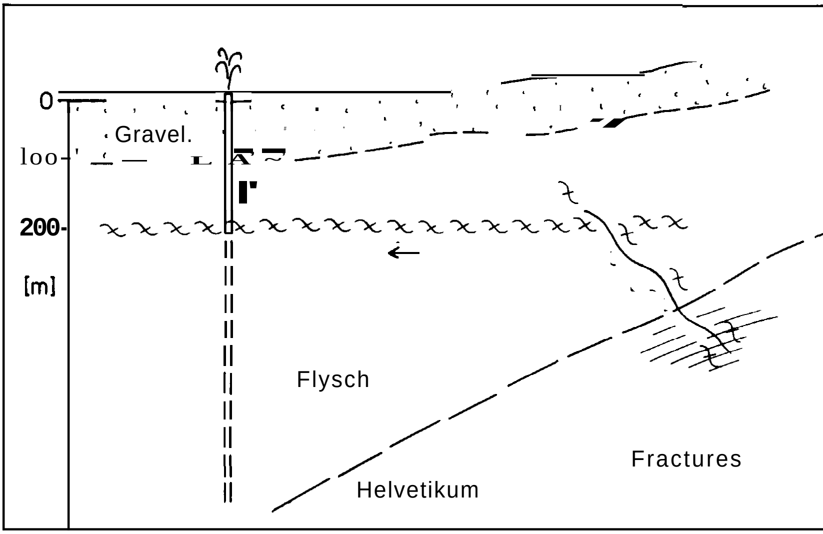

Fig. 16 Schematic sketch of the supposed origin of the 200 m deep mineral water source detected at Tegernsee according to predictions provided by Emmy and Georg Kittemann. In agreement with dowsed information and contrary to geologically substantiated assumptions a further deepening of the drilling did not provide a higher yield.

countered in a depth of 86 m, yielded 4.2 llsec and showed 1400 mgll minerals.

In the village of Bodenfelde, a well with a mineral content of about 1200 mgll had to be found. The chance for success existed because it was known that salt could be present in the underground. However, two former borehole drillings resulted in water with a too low (800 mgll) and a too high (8000 mg/l) content of minerals. Mrs. Gronig immediately located a well point where the desired drinking water was available at a predicted depth of 25 m, with 1200 mgll minerals and a required yield of 1 l/sec.

Particularly impressive is the siting of three drinking water wells with a minimum percentage of arsenic near the village Wulften. The local wells had to be given up because the underground of variegated sandstone sediments led, through a natural process, to a too high percentage of arsenic in the catchment area. Mrs. Gronig indicated two underground streamlets coming from another direction (supposedly originating from a geologically different region) which have been drilled at two indicated positions. In both cases good drinking water was found (without arsenic), and the carefully protocolled predictions referring to depth (between 43 and 66 m) and available quantity (14 l/sec) were absolutely correct.

In the village of Einbeck she succeeded in making exact and useful predictions for three drillings ordered by the city. For the first case, she predicted water at depths of 100, 160 and 230 m with a yield of more than 30 l/sec. A long term pump test actually yielded some 28 l/sec at a depth of 230 m. In order to increase the yield further, the responsible geological state office (Bodenforschungsamt) proposed to deepen the borehole; Mrs. Gronig, though, denied the usefulness of such an action. In fact, deepening to 314 m did not lead to any increase of the water quantity. For the second drilling, she predicted a yield of 26 l/sec at a depth of 113 m; an artesian spring with 25 l/sec appeared at 115 m; pumping at ground level delivered at least 70 llsec. For the third case, the prognosis was 29 l/sec at 180 m; the actual drilling to 240 m provided 33 llsec.

K. Isken. Since 1980 Mr. Isken has been locating drilling points in Germany and neighboring countries in co-operation with a deep drilling company, exclusively by means of the dowsing technique. Particularly convincing is the fact that he guarantees the success of his water detection: no costs are charged when the actually obtained water yield lies below the predicted minimum yield. That remarkable guarantee, which is never given by conventionally operating companies (and, in view of the existing prospecting possibilities, cannot be given with a generally high degree of certainty), has not brought the dowser to ruin, but steadily increased his business. His clients are especially communities and agencies which already had experienced unsuccessful drillings or other difficulties with water prospecting. Therefore, it cannot be argued that these incontestable and repeated successes have trivial explanations, such as the availability of abundant, extended ground water aquifers in the respective prospecting areas.

Astonishingly, no unsuccessful drillings are known, as a result of Isken's method of well point location. However, the required water quantity could not always be provided by a single drilling; in most of these cases the dowser succeeded in carrying out a second drilling not far away from the first well, so that supplementary water quantities could be supplied without affecting the yield of the first drilling.

In 1991 the author arranged for a particular water prospecting at the request of a small town in southern Germany. Two purposes had to be served: first, the town needed a new well with a yield of some 7 l/sec with a sufficiently low content of nitrate; three drillings had already been tried, which were failures despite well-performed geological surveys. Second, the dowsing performance of Schroter and Isken could be carefully checked in one and the same predetermined area. The existing holes had been drilled to depths between 30 and 60 m in a subsoil with significant layers of clay; one drilling was totally dry, and the other two boreholes delivered less than 2 and 3 llsec, respectively, too little for the required supply of the town. Moreover, one had to comply with the regulation that Tertiary formations should not be exploited, which occur between 30 and 40 m depth.

Under appropriate supervision Isken scanned the terrain; he indicated a point where he guaranteed water, but to attain the desired quantity he said that deeper drilling down to some 100 m would be necessary; otherwise, a second location had to be determined. At a later time, Schröter visited the same area, but without being given any knowledge concerning Isken's indications. He determined two drilling spots, where he expected as much as 8 and 6 l/sec in a depth of 40 and 34 m, respectively (supposedly above the Tertiary formation). The supervising geologist had to state that Schröter's first point coincided with Isken's one — quite a surprise, given the relatively large prospecting area. This point was drilled and produced on the spot 6 l/sec good drinking water at 30 m; since the Tertiary formation began at 30.5 m, the advised drilling depth of 40 m could not be realized. Initially, the pump test was satisfactory, but then an abrupt decline to 4 l/sec occurred; this points to a clogging of the influx.

Two clear facts emerge: first, two dowsers agreed in terms of drilling points, and second, the drilling accordingly performed resulted in a higher yield than obtained with three drillings previously carried out on the basis of quite extensive geological surveys.

A detailed discussion of these numerous results and the steadily increasing data base is not the aim of this report and should be conducted in a constructive way within the responsible scientific community, especially since hydrogeological interests with, perhaps, far-reaching consequences may be touched. The aim of this report is to document clearly the existence and activity of continuously successful dowsers, whose performance is not reliably known, neither in science nor in public. This documentation seems to be even more justified, because the disclosed features are not only demonstrably real but are also of significance both from an economical point of view, and with respect to a fundamental scientific search for the truth.

3. Model Representation

When the information available about the activity of selected dowsers is considered most carefully and in great detail, the question which arises may not be *whether* certain aspects of dowsing techniques should deserve serious attention, but *how* the frequently observed phenomena could be brought to scientific attention, eventual clarification and practical use. In order to strengthen the relevancy of this statement, prior to further discussions one should consider four classical objections against dowsing successes, which are very often brought forward by skeptics and critical observers; most likely, the reader may have thought of these counter-arguments in the context of the preceding reports, so that it is helpful and necessary to discuss them more systematically.

3.1 Classical Objections

Skeptics and opponents of the dowsing scene generally assert, based on four types of objection, that a real phenomenon does not exist at all. Of course, the arguments used by critics are to be taken seriously also by the "supporters" as they are often justified. A generalization of these counter-positions, however, cannot be established with respect to all cases of dowsing success, especially when cases like the ones shown in this report are intensively checked and analyzed. On the contrary, one finds that critics — at least with respect to matters concerning water prospecting — ignore, play down or misinterpret significant experiments with traditional persistence. The four arguments can be described as follows:

1. *Debating the facts:* the reported successes of dowsers do not really exist; a thorough research of the corroborated incidence reveals false or misleading reporting.
2. *Probability hypothesis:* the incontestable successes of dowsers represent isolated, single cases and have been achieved by accident.
3. *Trivial success:* successes are unavoidable, because water can be found anywhere in the area of interest, due to an extended groundwater table.
4. *Expert thesis:* the dowsers are endowed with perfect hydrogeological knowledge and, thus, are enabled to identify appropriate drilling points on account of topography, morphology, flora and fauna.

As regards 1, the preceding parts of this report, for example, have demonstrated that this kind of argument is unfounded.

As regards objection 2 it is certain that, on the one hand, the described situation occurs indeed with a certain probability. On the other hand, however, high success rates for large prospecting programs, as reported here, cannot be explained this way.

It is accepted that a single drilling success of a dowser does not permit conclusions regarding his general reliability or the validity of the dowsing technique. A reliable judgment requires a vast data base and its statistical evaluation. This is by no means a simple task.

For example, there may be areas where, due to the prevailing underground conditions, the chance for finding water at an arbitrary point and within a certain depth lies near 30%. To prove reliably an above-chance performance of the dowser, a success rate exceeding 30% is necessary. To ascertain this proof on a statistically safe basis, a considerable experimental effort is required (see part 1.1). It may be noted, though, that numerous *spectacular* individual results have become known which invalidate the chance hypothesis, especially when the respective predictions by the dowser had first to be considered as highly improbable according to initial assessments by experts.

Moreover, objection 2 becomes increasingly doubtful when one considers the numerous observations that the same dowser achieves routine success on occasions when other expert parties had produced nothing but dry holes.

With respect to objection 3, it must be conceded that such regions undoubtedly exist; however, dry drillings are then excluded in whatever way they are organized. If drillings are to be carried out in areas where these hydrogeological conditions are known to prevail, a dowser will hardly be appointed. On the other hand, if the underground conditions are not yet known, chance success cannot, of course, be totally excluded. However, none of the drilling projects described in this report has been carried out in areas where a success rate of almost 100% would have been unavoidable; on the contrary, the prospecting areas have all been recognized as arid areas where conventionally arranged drillings produced rather low success rates.

Objection 4 is more intricate to handle, because it may be justified in certain cases. In most single events its refutation is not possible or requires tremendous argumentative efforts, because with this objection nearly unlimited capacities and intuitions can be imputed to the dowser. The problem is rendered even more difficult, because according to the technical standard (state *of art*) it is not possible to establish beyond doubt whether a selected drilling point, determined by whatever criteria, will really be appropriate with respect to the relevant requirements. Prior to the drilling, different experts will probably have different opinions, and after a drilling a variety of different interpretations, arguments and suppositions regarding the success or the failure of the concerned drilling will be possible. Furthermore, one should not overlook the fact that, in contradiction to objection 4, superficial layers, soil formations and vegetation may even hinder the evaluation of the geological structure in the underground, especially when the water-bearing strata lie deep and are covered with dry and inhomogeneous layers.

Particularly competent dowsers and extensive prospecting results are needed to refute the "expert thesis" as an ultimate and necessarily valid explanation, after objections 1 – 3 have been dropped. To arrive at a reasonable and safe conclusion in such a difficult situation, extended test series or spectacular individual successes are necessary, like those which have been frequently described in this report. For example, when the details of the dowsing predictions are as precise as they are improbable, their practical verification renders the counter-argument unacceptable. In this respect, the reader is referred to the experiments carried out in Sri Lanka (part 1.1), the dug wells on Verde Island (part 1.2), or the identification of drilling points in the plain desert of Sinai (part 1.9).

A final argument against the expert-thesis arises from observed cases where apparently very narrow fissures exist and have to be hit in order to be successful. The necessary accuracy of point location may be in the range of 1 m or even below (see examples in part 1.2 and 1.10). When these cases are accepted — there is overwhelming evidence for them — it must be stated that even the best experts, making use of all conventionally applicable knowledge, are in general not able to pinpoint a drilling site with the quoted precision. Along these lines, it is well known that conventional prospecting does not aim at all at such precision. In addition, it is accepted that in the cases under discussion (apart from very special and appropriately extensive research programs) not even the application of all available measuring techniques, reflecting the present state of art, allows such a refined spatial solution. The described successful pinpointing by dowsing procedures, therefore, must still be viewed as a very special particularity.

3.2 Spectrum of Dowser's Statements

A discussion about conceivable hypotheses requires knowledge concerning the frame which has to be considered as being realistic for the quality of possible dowser's statements. Although only future, specially designed experiments will finally provide this knowledge, the already available observation data allow a number of suppositions indicated below.

Precision of Drilling Site Locations

From a geoscientific view, it is extremely difficult to imagine a very accurate location to, say, a meter, of a deep lying water carrying fracture of small extension. At least, no technical procedure presently exists which would generally guarantee such accuracy. For this reason, the actual *pin-pointing* of conventional sites does not take place as a result of technically obtained data, but is determined by practical considerations. Of course, this does not mean that future improvements of prospecting methods will not be possible; the trend of technical development rather suggests such progress. For example, during the last years, a considerable progress can be observed in the field of instruments designed to receive long-wave electromagnetic radiation (VLF range); this technique allows the detection of inhomogeneities of the conductivity in the underground and, thus, interpretations with respect to site and depth of certain fractured zones.

The site-precision stated by dowsers should not be overrated either. First, location-dependent reactions are not always limited to an extremely restricted area; second, different successful dowsers do not always exactly agree with respect to the exact location of a determined target area. From a careful observation of dowsers actions it becomes obvious that they sense the relevant signals over larger areas and not at all just at the final drilling point. The actual identification of such a *point* seems to result from a (possibly unconscious) subjective selection process, effective due to experience and possibly inherited skill, and subject to errors as any other human performance.

This way of interpretation of the observed proceedings seems to be compatible also with elementary facts derived from geo-scientific knowledge. In general, fracture zones are not oriented vertically but run at a certain angle. Thus, the domains which are supposed to carry water are — seen from above — necessarily extended even if the fracture is indeed only a few centimeters wide. The presence of transverse fractures and weathered zones increases the indetermination of a "precise" location. In general, there is not an optimal *point,* but an extended area for the drilling site. A successful dowser has merely to hit that area whose location and extension he generally cannot reliably predict.

Nevertheless, it has been proven that quite precise locations can be pinpointed by dowsing especially for narrow and shallow aquifers (see dug wells in part 1.2): a very precise location of, say, a 7 m deep streamlet cannot, in principle, be dismissed from a physical point of view. Successful deep drillings, though, have not yet been analyzed with respect to the effective extension of the water-bearing domains in the underground; therefore, in these cases the possibility cannot be excluded that very precise points provided by dowsers may only reflect 'by mistake' an extremely accurately localized promising zone and that successful drillings might be equally possible within a much larger area.

The latest news from the GTZ program in Namibia indicates, to our knowledge for the first time, that dowsing may be surprisingly accurate even for deep drillings. Schroter had sunk a successful well of some 100 m depth after the initial drilling, performed less than 2 m away, had remained dry up to the same depth (part 1.10). Of course, more reliable interpretations of this isolated event require verification by more thorough tests.

Specification of Depth, Yield and Quality of Groundwater

If dowsers were unable to give any indications concerning both depth and attainable yield of alleged groundwater, their practical assignment would not be meaningful. The data from experience undoubtedly show that such indications are indeed possible, at least in approximation. Although an explanation of these facts is more difficult than for the mere identification of a site, basic physical principles cannot be used to argue against the possible existence of such a phenomenon. For example, the most recently developed VLF-technique allows just such detailed information on both a site and the depth of fracture zones, provided that certain conditions are met.

The signals perceived by dowsers may provide a higher degree of information than a single YES/NO statement. In the field of measuring techniques, it is not unusual to infer the distance of a transmitting source by analyzing the intensity, phase angle and time-dependent form of the signal. It is not surprising, therefore, that dowsers can give indications about these variables at all; incomprehensible is rather the precision which — at least in some cases — is apparently or realistically attained.

It must be noted that successful dowsers may not always simultaneously produce reliable information on depth, quantity and quality of the located groundwater. There is some evidence that, in agreement with geophysical arguments, the individual relevant and influential field parameters characterizing the underground, cannot be safely extracted from and distinguished within the total signal received at the surface. It seems, for example, that dowsers are usually not generally able to differentiate between groundwater with low electrical conductivity (drinking water) and a smaller aquifer with a larger conductivity (mineral water).

Finally, it must be emphasized once more that dowsers do not necessarily sense water in the underground, but rather some kind of discontinuities such as parting linears, fault and fracture zones and vertical interconnections at great depth which, however, usually act as natural drainage of the groundwater in the fractured and hard rock. To corroborate this evaluation, it may be pointed to the repeated observation that dowsers are able to find weathered rock formations which do not carry any water (see e.g. part 1.6). Furthermore, the Munich tests revealed that competent dowsers could not successfully locate artificial pipelines, even when the flow was exceedingly high (such as 4000 l/sec); it may be speculated that in these cases the pipe network did not represent a sufficiently significant perturbation of the underground or its surroundings.

These quoted circumstances carry much weight because they reduce the apparently extreme performances within the dowsing spectrum in accordance with scientifically plausible expectations, and because they may provide an important indication for a possible explanation of the dowsing phenomenon.

3.3 Hypotheses

As it seems to be impossible to explain the hard core of the available observations by means of chance success or normal sensory effects, new attempts have to be made in order to reach a solution. The hypothesis offers itself that human beings exhibit a still unknown biological sensitivity to naturally existing fields of physical origin, especially well developed by some dowsers. The conceivable reaction chain is then composed of four parts:

- Existence of physical fields with location-dependent gradients,
- Detection of the corresponding field variable by the human organism,
- Interpretation, classification and selection of the perceived field information,
- Reaction (e.g. by means of more or less sophisticated movements of a dowsing rod) provided that the searched characteristics occur at the location and are recognized by the dowser.

The third part (interpretation) especially seems to be decisive as to whether someone is particularly qualified for dowsing or not. The ability to process that kind of information (which may be principally perceivable) in an effective manner must be expected to vary considerably from person to person. Unfortunately, there is presently no clear conception with respect to the kind of signals which might be utilized by dowsers. It has been repeatedly observed that conventionally measured data on anomalies in the subsoil correspond well with dowsing reactions at the same locations; with this, though, only the reality of the unconventional prospecting technique is verified, but no insight is gained about the underlying mechanism.

It may be added that questioning of experienced dowsers about their location-dependent reactions does not help to clarify the situation, but reveals once more the high degree of complexity of the phenomenon.

The efforts to understand the process are made more difficult not only by the many persons who claim themselves dowsers while exhibiting high failure rates, but also by the few successful dowsers who have at their disposal an exceedingly impressive and improbable potential to correctly predict subsoil conditions. Numerous systematic examples proved that their performance can be exact to a degree which cannot be understood by our current scientific and technical conceptions. Thus, a twofold explanation deficit persists, on the one hand with respect to the primary biophysical mechanism and, on the other hand, with respect to the power to make goal-oriented statements.

Although it must be clearly conceded that one is far from a final explanation, and that only unproved hypotheses can be forwarded, aspects in three directions can be noted which should get attention in future investigations. These are 1) electromagnetic radiation with the inclusion of static fields, 2) infra- and ultrasonic, and 3) direction of the gravitational field.

When these matters are discussed it is important to point out that the sensitivity necessary for the perception of the supposed signals or environmental stimulation is certainly not available while the dowser finds himself in a normal state; he must rather increase his sensitivity, for example by exerting muscular strain while appropriately holding a divining rod in a labile balance. Supporting this argument, the GTZ expert dowser Schroter, as well as other experienced dowsers, claim that they sense virtually nothing while crossing a drilling point without holding a dowsing rod in the described way; only in the sensitized state are they able to get the sophisticated reactions.

Although a number of such observations are available, precise scientific assessments referring to the relation between the above mentioned three types of field variables and dowsing reactions are lacking, as well as the respective minimum sensitivity levels required for an external stimulation of the dowsing reactions.

Independently of the type of signal to which a person seems to be sensitive, it is to be expected that the relevant field variable does not represent a local singularity, but is spatially extended. Therefore, local specific characteristics (patterns) have to be recognized within the extended field in order to succeed in exactly locating an anomaly. Consequently, it is highly probable that one deals not only with the problem of signal reception, but also with a complex analysis of the field information which is likely to be weak and noisy. Therefore, it must be reckoned that a future technical simulation of dowsing performances will not be possible without considerable effort, and it might become understandable why measuring techniques not specially designed have failed so far and have not yet resulted in an acceptable explanation of the phenomenon.

It is important to stress again that experienced dowsers sense a locally confined water-bearing area not only while actually crossing the site, but also when dowsing quite a distance from it, and are capable of heading right towards the site (see part 1.9). This ability is absolutely necessary for scanning large areas quickly and successfully. Incidentally, the illustrated fact is of further consequence: firstly, it proves that the dowsing rod does not function as a YES/NO device, but indicates a well differentiated perception of intensity or quality. Second, the reaction pattern signifies a spatial extension of the relevant signal field — just as one expects on the basis of elementary physical principles.

Three circumstances indicate the possible importance of long-wave electromagnetic radiation in an explanation of the dowsing phenomenon. First, geological perturbations of the underground are usually linked with anomalies of electric conductivity; in particular, the rock surfaces inside a system of water-bearing fractures exhibit clearly modified electrical conductivity, due to aggradation (e.g. clay silicates) or weathering products. Second, there are already measuring procedures (EM methods in various frequency ranges) which are operated at ground level and allow detection of such anomalies to a certain degree. Third, it is now known that biological organisms are sensitive to EM fields in the non-thermal range (see the detailed discussion in [2] and [3]). The future will tell whether a discussion along these lines is promising and whether the relevant frequencies and interaction mechanisms can be found.

Vibrations of the soil may also help to clear the way towards a solution of the problem. As investigations have shown and geoscientific results reveal, fractured and weathered zones are linked with local anomalies of soil vibrations (part 2.2). The strength of soil vibrations is bigger when the rock exhibits less density and less elasticity. However, two difficulties arise: measurements can be carried out with extremely high precision, but the signals are generally covered and masked by perturbation effects of different origin, so that an interpretation referring to underground structures becomes problematic. Furthermore, it is unknown whether a person acting as an active dowser may also exhibit sufficient sensitivity to detect exceedingly small soil vibrations as has been found, to general amazement, to be the case for a variety of animals.

Although the presented arguments still need some criticism and refinement, they are already sufficiently well-founded to enable and promote future scientific discussions which, hopefully, will bring the complex problem nearer to its solution.

4. Recommendations

4.1 Future Experiments

Based on the assumption that the observed phenomenon is attributable to a biophysical stimulation-reaction mechanism, several disciplines from science and technology could contribute towards a solution of the many questions associated with the successful activity of dowsers. Above all, research should be carried out towards two different goals, namely within the field of physics and earth sciences in the direction of the "transmitter" (signal sources), and within the relevant branches of medicine, biology and biophysics in the direction of the "receiver" (signal detector). In the following some test situations related to earth sciences will be described which, according to the results and observations of the reported projects, might be worthwhile considering for future test series.

The results described in parts 1 and 2 lead to the conclusion that, with some indicated restrictions and under certain indicated circumstances, a category of spatially extended geological anomalies or perturbations can be perceived with sufficient reliability by a few qualified dowsers. This refers especially to water carrying fracture systems in hard rock, karst caverns and fracture zones without water reserves. In principle, these conclusions suggest a series of informative tests whose scope and diversified aims exceed the previous approaches reported here.

The experiences gained from the Munich project have repeatedly revealed that certain artificial test situations, such as the attempts to locate pipes or other (small) objects, do not yield notable success rates and, therefore, must be rejected as general qualifying tests for dowsers. In particular, one should strictly refuse "tests" which are allegedly designed to prove the principal existence or non-existence of the dowsing phenomenon, but test only such types of claim which are highly exotic and/or refer to so-called dowsing abilities which have never been made likely by existing serious evidence. For example, certain biased "skeptics" often produce some turmoil by publicizing experiments, in which naive and self-appointed dowsers have to pass all sorts of unrealistic tests, such as the location of hidden coins or other small objects — tests which, for a long time, have been well-known to lead to failure, especially when high success rates have been aimed at.

By contrast, serious scientific tests and experiments with respect to the present context ought to fulfill two conditions: first, a reasonable success rate must already have been observed in similar tests carried out in the past and, second, the test situation has to be well-known in terms of earth-scientific data, and the use of as many geotechnical measuring procedures as possible should be guaranteed. Only then may one hope for a clarification of the many still open questions and a contribution to new insight when previously communicated experiments are repeated and appropriately modified. In particular, the search for correlations between indications produced by dowsers and geologically well defined sub-soil conditions could offer the chance of a better estimation of the real and effective performance capacity given by the dowsing technique and, thus, its realistic range of application.

The necessary tests should be carried out by a team of experts whose task would be as follows: selection of appropriate test areas, implementation of the tests with selected dowsers, geotechnical investigations of the test sites (especially mapping by means of the EM and VLF methods and measurements of the surface vibrations), including excavations and exploration drillings, as well as an evaluation of the results. A project of this type would enable a better description of the still unknown mechanism of the location-dependent dowsing reactions, the development of qualifying tests for dowsers, and the establishment of criteria for the practical assignment of dowsers for geological activities in the field. As a distant aim one might consider an exploitation of the results and revelations which, perhaps, will be obtained, especially with respect to the improvement of geo-technical instruments for groundwater prospecting and location of anomalies in the underground.

According to the observations of successful dowsing activities which seem to be reasonably reliable, possible promising test sites and test situations may be ordered into at least three categories:

Streamlets Close to the Surface. The task consists in locating locally confined streams with small water flow and little depth of, say, a few meters below ground with an accuracy of, say, one meter. That kind of experiment succeeded on Verde Island within the scope of dug well location (part 1.2) and is worthwhile for controlled repetition. By means of dug holes (wells) the exact constitution of the underground could be clarified so that the predictions of both the dowsers and the conventional experts could be checked.

Deep Fracture-Bound Water. This test deals with the detection of fracture zones in hard rock which do not necessarily outcrop at the surface, and may be covered with thicker layers and sediments which may even carry surface water. Such situations typically occur in dry zones and have been described in detail within the Sri Lanka project (part 1.1). Exact knowledge about the actual conditions in the underground can only be provided by several very closely spaced, vertical test drillings. Fundamental parameters are extensions of the fracture zone (width), quantity of the extractable water (yield), as well as electrical conductivity of the fractured walls and water eventually encountered. The location of dry fracture zones without any provable water resource would represent a particularly revealing variation of the experiment.

Galleries and Caverns in Karst Formations. The experience gathered within both the projects in Congo and on Gotland (see part 1.4 and 2.3) show that sufficiently extended cavities in karst formations can be the object of experiments. The relevant depths should lie between a few meters and 30 meters. It has been shown that a verification of the prevailing conditions is feasible by technical measurements, provided that the area is appropriately selected. Small test drillings may complete the necessary base of information.

Finally, it should be pointed out that many other sites are appropriate for the purpose of tests, as long as underground anomalies in terms of locality and quality are geologically well-known. Thus, different dowsing tests can be thought of, such as above systems with cracks or caverns which have been measured in detail, in areas with numerous existing observation drillings, or above trenches in loose rock which are sufficiently deep, filled up again, and on whose bottom pipes may be placed, carrying water or not. In any case, the target sites should never be recognizable by normal sensory means; otherwise, adequate measures have to be applied to shield the tested persons effectively during the tests.

In no case is it realistic to anticipate that dowsers are able to predict any arbitrary situation, as is repeatedly asserted by uncritical parties. For this reason, future tests should not only be carried out in order to check certain supposed capacities of dowsers, which are only weakly observed, but to determine the limits of comparatively reliable dowsing techniques. In this way, by means of selected geophysical tasks, it may be established where the dowser will be successful and where he will fail. Where he is successful the entire available range of modern measuring techniques should be put into action in order to search for local field gradients and anomalies. By the exclusion principle, many tests of that kind performed in geologically different areas might then help to find out what kind of physical information a dowser may perceive.

Moreover, there is the opportunity to scrutinize the activity of those dowsers who are engaged in practical water prospecting and definitely display an unusual success rate, so far unexplained. Parts I and 2.4 demonstrate the existence of such persons and stress that it would be very revealing if competent geoscientists would accompany and observe these cases in detail. That way, the diverse indications and circumstances of the respective prospecting cases would be sufficiently well known to permit clear conclusions about the supposed reality of the dowsing phenomenon.

With regard to the development of theoretical models one must not ignore the already outlined observation that dowsers who were successful in indicating a rather low water yield during the location of fissures in moderately weathered rock could, by comparison, not or only with vanishingly small success sense huge quantities of water flowing through artificial pipes of well confined dimensions. Accordingly, one could try to find out how large water domains or extended electrically conducting surfaces have to be in order to be recognized by dowsing techniques. In particular, one should check the well-founded supposition that dowsers, contrary to common opinion, do not at all react to water as a chemical substance, whether flowing or stationary, but rather are susceptible to secondary effects such as those that are induced, for example, by water running along fracture walls, thereby producing aggradations which modify and increase the conductivity of the affected rock areas.

It is worthwhile to add here, that due to the distribution of the first edition of this report a specially arranged symposium took place in July 1992, entitled *Unconventional Wuter Prospecting* (Frankfurt a.M., Germany). The participating scientists, mainly members of the earth science community, agreed that a well designed research project ought to be carried out along the lines discussed above. Such actions are also expected to stimulate replication tests by independent researchers; from a scientific point of view this is absolutely necessary because otherwise no long-term acceptance of the phenomenon, along with its incorporation into accepted knowledge, can ever be attained.

In the course of such investigations, a large number of dowsers from different countries should take part. There are many indications that numerous qualified dowsers can be found. At present, since the field of dowsing is still not appreciated but viewed skeptically and often with hostility, these dowsers work without much public attention and are not widely known. It can be expected that well organized inquiries in various pertinent circles will be successful so that one must neither fear a shortage of qualified dowsers nor an unacceptable dependence of a research program on one or a few particular dowsers.

4.2 Model for Integration

Participation of Dowsers in the Solution of Geological Problems. The number of available reports mentioned above shows that dowsers may be qualified to participate in the solution of basically hydrogeological problems. In spite of our still limited knowledge about the effective performance potential of the dowsing technique and its definitive explanation, it clearly appears that in certain field situations a systematically higher success rate can be reached if selected competent dowsers are appointed to cooperate in such projects. For the effective implementation of such a model of integration, which is already realistic today and has been tentatively applied by GTZ, four conditions should be met:

- The widespread fear by established scientists and institutions of getting involved in a subject like dowsing, commonly regarded as unscientific, has to be reduced and replaced by broad-mindedness; in light of these results and the reactions by scientists who have actually considered the recent data, such an attempt should now be possible and justified.
- The proposed cooperation must be defined, organized and controlled by geological expert teams; dowsers must never be authorized to work independently on geological problems.
- Qualification of dowsers should be established by means of new tests still to be devised, and to be conducted by scientists.
- A meaningful range of appointments of dowsers for field work must first be better defined. Today, there is still considerable uncertainty as to the possibilities offered by a most suitable utilization of dowsing techniques.

Especially in larger projects, e.g. within the detailed GTZ programs for water prospecting and well implementation in arid areas, integrated dowsers would play a decisive, but still comparatively small role. The important project preparation work would remain totally unmodified and hydrogeological investigations in the target areas would likewise remain. The appointment of dowsers should only be planned for pinpointing of effective drilling points. But even then the presence of a competent geologist is advisable whose task would be to check the dowser's predictions from the geological and (drill) technical side and to reach the best possible consensus with the dowser.

A model for integration of this type would present different advantages. First of all, projects for rural drinking water supplies in dry areas with crystalline or karst rock basement could be carried out much more efficiently in many cases. In such programs, mostly hand pumps of a limited capacity have to be installed; for this reason, the location of smaller water carrying fractures is perfectly adequate, but as has been depicted above, if these sites are detectable conventionally, this can only be done by means of an enormous input, especially when covering layers are thick. In such cases, the dowsing method does represent an attractive additional alternative, even when the desired drilling point lies in a more populated area where the use of classical prospecting procedures is made even more difficult due to problems arising from many perturbation effects.

Finally, it must not be overlooked that the proposed model of integration, presently tested by GTZ in a simple version during the Namibia program (part 1.10), would be of great help in many other areas already prior to its more thorough scientific scrutinization. The rapidly growing water shortage in many regions of the world cannot be relieved or stopped within acceptable time by the application of presently available conventional techniques. In addition to existing efforts, immediate use of the suggested integration model would enable a significant contribution to the advancement of water supply programs, beneficial for many people.

In the long term, there is the possibility to substantiate the performance of successful dowsers by technical measuring procedures and to optimize accordingly prospecting methods. In this connection, it may be noted that in recent years a number of sensory and analytical abilities of highest quality exhibited by biological organisms have been reconstructed by bionic techniques and successfully applied. Given that case, one could ultimately dispense with dowsers, but as long as this goal is not at hand an application of the quoted integration model may be regarded as an effective and economic interim solution. In the meanwhile it remains to hope that the results published and arguments presented in the present report will contribute to progress along that direction and induce a more frequent use of the still unconventional prospecting method.

Acknowledgments

The list of colleagues and supporters is far too extensive to delineate in full, but specific mention must be made, for a broad range of reasons, of a number of persons. For suggestions and information referring to the subject studied here, as well as for a critical examination and correction of essential parts of the manuscript, I thank A. Apostol (New York), Prof. Dr. H. Berckhemer (Institute of Geophysics at the University of Frankfurt), Dr. A. Berktold (Institute of Geophysics at the University of Munich), Prof. Dr. E. Bockh (BGR Hannover), Dr. Eisenburger (BGR Hannover), Prof. Dr. H. Gebrande (Institute of Geophysics at the University of Munich), Prof. Dr. A. Hahn (Niedersachsisches Landesamt fur Bodenforschung), R. Koschel (GTZ), P. Krause (GTZ), P. Menche (GTZ), R. Rammner, Dr. U. Schreiber (Geological Institute of the University of Bonn), and Dr. W. Stengel-Rutkowski (Hessisches Landesamt fur Boderzforschung). I am particularly indebted to Tom Williamson (Preston, England) for enlightening discussions and his support in editing the English translation. A generous grant by the Schweisfurth-Stiftung, which contributed to produce the present edition, is highly appreciated.

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