DIRECTLY OBSERVABLE VOLUNTARY PK EFFECTS:[1]

A Survey and Tentative Interpretation of Available Findings from Nina Kulagina and Other Known Related Cases of Recent Date

by

H. H. J. Keil
(University of Tasmania)
Australia

Benson Herbert
(Paraphysical Laboratory)
England

Montague Ullman
(Maimonides Medical Center)
U.S.A.

J. G. Pratt
(University of Virginia)
U.S.A.

[1] In this paper we are introducing the term 'directly observable PK' for those instances of paranormal influence upon matter that can be clearly recognised in a single event. This kind of occurrence contrasts with a PK effect that can only be inferred on the basis of statistical analysis and evaluation of a number of events, such as the results based upon the throwing of dice. Previously, the term 'PK on static objects' has been used, but this is not satisfactory since not all instances of directly observable PK involve initiating motion of an object. It may, for example, involve stopping a motion that is already occurring (such as the pendulum of a clock) or changing the direction of motion of an object in a paranormal way. Also, 'directly observable PK' will satisfactorily cover physical changes that are not directly connected with movement of objects, such as changes of temperature or of physiological condition. The word 'voluntary' indicates that the changes take place under some degree of conscious control by the subject, whereas a poltergeist event would ordinarily be an instance of directly observable involuntary PK.

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INTRODUCTION

Nina Sergeyevna Kulagina is a Soviet citizen who lives in Leningrad. Born in the mid-twenties, she is married to an engineer, and they share an apartment with the family of a married daughter. The thing that sets Kulagina apart from millions of other Soviet women is her apparent ability to move small objects by consciously willing them to move as well as to cause other kinds of directly observable PK effects.

As this survey paper will show, a number of scientific investigators have observed her producing such results during many sessions and under a large range of conditions without discovering any ordinary explanation for her effects. Scientists outside the USSR learned about Kulagina when a film was shown at an international parapsychological meeting in Moscow in June 1968. The interest generated by that film led to intermittent efforts on the part of Western parapsychologists to make first hand observations of Kulagina. These efforts resulted in a slowly accumulating body of evidence that supports the claims made by Soviet and Czechoslovakian investigators. This paper will survey the findings that are available until now from all sources.

Considered against the background of the history of psychical research, the performance of Kulagina falls in the category of 'physical phenomena'. From the point of view of modern parapsychology the earlier claims of voluntarily produced paranormal physical effects are generally regarded as defining a large but murky area of research, one that arose out of the spiritualist movement and became hopelessly entangled with the practices of fraudulent mediums. Yet the large amount of laboratory work on PK since the mid-thirties and the resulting evidence for 'mind over matter' based on statistical findings have forcefully raised the question whether directly observable PK should not still be taken seriously, not only as a logical possibility but also as a current research challenge.

Indeed, there are signs that parapsychologists, spurred on in part by the example of Kulagina, are now turning their attention once more to some of the older studies on physical phenomena. Three cases may be cited here as historical examples of such research that are relevant antecedents to the current renewal of interest in directly observable voluntary PK. (1) D. D. Home was credited with producing during his career as a psychic a century ago very striking physical phenomena, under favourable conditions for observation (full light). As a result he was at the time and remains until today in a class to himself. From the scientific point of view, he

is best known for the sessions that William Crookes conducted with him from 1870 to 1873 (Medhurst, Barrington, and Goldney, 1972). (2) Half a century later Rudi Schneider, an Austrian youth in his early teens, started upon a fifteen-year career as a trance medium during which he was studied by a number of investigators in several European countries, often under rigorous and advanced experimental conditions. A recent re-examination of his performance concludes that his striking physical effects were genuine PK demonstrations (Gregory, 1971). (3) The third historical example is Stanislawa Tomczyk, a Polish sensitive whose physical phenomena were investigated during the years 1908-1910 by Julien Ochorowicz and other scientists of the period. Tomczyk's effects were, among these three historical cases, the most closely similar to those produced by Kulagina, the chief difference being the fact that the Polish subject's abilities were demonstrated (mostly) during hypnosis while Kulagina works in a waking state. Thus far, there has been no modern re-evaluation of the Tomczyk research.

In recent years all of the authors, as well as other visitors from the West, had one or more opportunities to observe Kulagina. Although we were unable to work with her under laboratory conditions, various controls were introduced and the general conclusion is that a good case exists to accept Kulagina's PK abilities as genuine. It is not very likely that without laboratory facilities further observations will remove those reservations which may still remain. Consequently future observations should perhaps be primarily concerned with finding answers to specific questions. It is hoped the following summary of observations of Kulagina's phenomena will help in formulating suitable questions to be tested in the future. It is also hoped that this summary will encourage the construction of theoretical frameworks for which there is a strong need in parapsychology and for PK in particular. In this paper the available publications and other communications by scientists from Eastern countries will also be included. Although the scientific reporting of the Soviet research is not yet complete, all our observations suggest that the investigations carried out by our Russian colleagues were carefully controlled, skilfully executed, and at times involved laboratory facilities of a high order of sophistication.

It would, however, be misleading to say on the basis of the available evidence that the Russian investigations progressed along the lines of a long-range study of which stage after stage was systematically completed. Little is known about Vasiliev's early work with Kulagina, but apparently since his death in 1966 investigations were largely carried out by scientists on a part-time

basis who were working primarily on other projects, some of which may have included elements which justified the interest of the investigators in certain physiological characteristics of the subject. There seem to have been long periods lasting for months during which the Russians did not carry out any work with Kulagina. However, some of these interruptions were due to health considerations for the subject, and it is possible that all of the long term interruptions were due to such reasons. With some uncertainty as to how much time could be spent on projects with Kulagina which had only limited connection with the primary research activities in which the Russian scientists were engaged, it is not surprising that Kulagin (1971), the engineer husband of the subject, referred to these investigations as being somewhat chaotic because they were carried out by different scientists from different institutions with the use of different recording equipment.

Kulagina is now in her late forties. She is a grandmother and at present she has been an active PK subject for approximately 10 years. She has frequently been described as a beautiful, slightly plump woman with somewhat Slavic features. Ullman (1971) noticed a fullness of her neck which suggests a possible thyroid condition. She is hospitable, calm, and friendly, and it is difficult to find any specific personality characteristics that would suggest that we are dealing with one of the most remarkable PK subjects. There are a number of physiological measurements which may have a bearing on her abilities. It has been reported that a strong magnetic field has been measured around her body when she is demonstrating PK. The voltage potentials measured at the front and back of her scalp show a difference about 10 times as great as in most other persons. It is not clear whether this difference remains equally great without much variation or whether it occurs only during PK activities.

The above statements were made by Sergeyev (1970a) and others and have not been published by the Russian scientists; they should be regarded as tentative only because it is possible that translation difficulties introduced errors. Specific physiological changes during PK will be discussed separately.

HOW IT STARTED

It is not precisely clear how Kulagina first realized that she had PK abilities. In a discussion with Thelma Moss (1971) Kulagina indicated that she first discovered her eyeless sight of colours accidentally when she noticed that she had picked out the correct threads for embroidery without looking. As eyeless sight investigations were pursued in the USSR in the early 60's with some publicity

Kulagina mentioned her success to a physician during a medical consultation. This led to experimentation and to Vasiliev's taking an interest in her as an eyeless sight subject.

Rejdak (1969) agreed that Vasiliev began by carrying out these dermo-optic experiments with Kulagina and that he discovered her PK abilities when he asked her to try to move a compass needle. This suggestion was based on investigations by Tanagras of Cleio (Herbert, 1972a; Tanagras, 1972) of which Vasiliev was aware. Rejdak (1970) pointed out that when Kulagina moved the compass needle for Vasiliev the first time, she had not tried this before and was quite unprepared. This has sometimes been interpreted to mean that Kulagina had never tried or experienced PK before.

This account from Rejdak would be in some disagreement with the statement given to Thelma Moss according to which Kulagina became aware of her PK abilities during eyeless sight experiments when she noticed movements of some of the objects and then continued deliberately with such movements. It is probably correct that when Vasiliev first asked her to move a compass needle, Kulagina had not thought about this and was neither mentally nor in any other way prepared for this task, yet it is possible that she had already started to become aware of her ability to move objects.

Kulagin (1971) indicated that she first practised moving black envelopes (as used for storing photographic paper) in a darkened room. Probably this refers to a period after she had tried the compass needle for Vasiliev. Kulagina's account to Moss suggests that some more or less spontaneous PK occurred at this early stage. According to Sergeyev (1971a) Kulagina experienced no further spontaneous PK phenomena. However, occasionally objects continued to move with one further jerk, just after Kulagina had been successful with a deliberate movement and then stopped her effort (Kulagin, 1971). The same effect was also observed by Keil and Fahler (1975).

SUGGESTIONS OF FRAUD

Psychokinesis is, within the scientific paradigm generally accepted today, an inherently incredible concept. It is natural, therefore, that the sceptical scientist should seek to escape from accepting PK by looking for some normal way of interpreting what would otherwise stand as evidence for its occurrence. With results for which the evidence for PK is based upon inference from statistics, the sceptic has the opportunity of choosing among several possible alternative interpretations. In the case of directly observable events that clearly appear to violate known physical laws, however, the issue is reduced to a simple choice: either the events are due to PK or they

are produced by fraud. It was predictable, therefore, that accusations of fraud would be levelled against Kulagina, not because of any direct evidence that trickery was used but because the effects observed and reported were obviously impossible, in the sceptic's view, in the absence of fraud. We choose, in the face of this situation, to deal with this issue at the start of the paper, rather than at the end after the results have been presented.

Kulagina has been accused of fraud but so far no direct evidence exists that she ever used deception during her PK demonstrations. It is likely that Vasiliev had some trouble (Ryzl, 1969) because Kulagina had financial and/or other difficulties which resulted in her being involved in a court case and receiving a short jail sentence. It is not clear whether she was unable to pay some money or whether she had engaged in some kind of illegal black-market operations or both. It is clear, however, that these charges had nothing to do with her PK abilities. Critics of Kulagina were quick to claim (Chijov, 1968) that any fraudulent dealings in other areas justify the inference of fraudulent PK. While it is not entirely clear what led to Kulagina's difficulties with the law it must be remembered that transgressions that would be minor in the West can be more serious and therefore have graver consequences in the USSR. From the evidence available it would be unreasonable to suggest a character defect.

A second source of critical comment was based on a report by the Institute of Metrology which included a statement indicating that a strong magnetic field was detected around Kulagina's body. It is not clear whether some or all members of the investigating team of this Institute concluded from this that Kulagina was concealing magnets (though no search was made and therefore there was no direct evidence of hidden magnets) or whether this interpretation was given later by critics (Chijov, 1968). The investigation of this Institute was also mentioned in support of Kulagina (Kolodny, 1968) who quoted (p. 107) the following paragraph from the report apparently written by the Institute team under D. I. Mendeleyev:

"The committee notes that the transference of objects took place. An aluminium pipe (diameter 20 mm and height 47 mm) was moved 90 millimetres, and a container of matches was moved over a similar distance. Aluminium pipes were moved both under a glass lid and without the lid. Observation by a section of the committee was carried out both in direct proximity and from a distance with the help of a television camera. The committee at the present time cannot give an explanation of the observed phenomena of the transference of objects."

It seems fairly certain that although the above-average magnetic

field around Kulagina was measured, the question whether she was hiding magnets was not directly investigated by the Metrology Institute. Russian physiologists working in Leningrad, among them Sergeyev, mentioned in discussions that a relatively strong magnetic field is one of the physiological characteristics of Kulagina. It seems very likely that Sergeyev was able to rule out to his own complete satisfaction the accusation that this field was created by hidden magnets.

While there seems to be no direct evidence of any deliberate cheating in Kulagina's PK activities, it is nevertheless appropriate to ask whether she could have used trickery all the time. This question cannot be resolved in absolute terms but the evidence against trickery is quite substantial. Russian scientists have carried out a large number of observations and experiments. No exact figures are available but from discussions it is clear that at least 100 to 200 or more separate observation sessions were conducted, some of them in laboratories with sophisticated monitoring equipment. It could be suggested in the West that because Russians had not experienced a period of fraudulent seances they may have been misled more easily. Not all the Russians' observations were carried out by scientists under laboratory conditions, but many of them were; and the few written reports which are available (Kulagin, 1971; Rejdak, 1968; Sergeyev, 1971b) suggest that the investigations were carefully controlled to insure that fraud could not explain the phenomena. The additional direct observations by visitors from the West (Fahler, Herbert, Keil, Pratt, and Ullman), included a number of new controls, and it seems appropriate at this time to include in this survey all the material that is available from the East and West.

A detailed study of two Russian ciné films which became available in the West revealed many features which made fraud very unlikely and did not reveal any suggestions of fraudulent manipulations (Herbert, 1969a; 1969b; 1970a; 1970b; 1970c). Some of the discussions of particular investigations as summarized in this survey also support this positive view. From all the evidence now at our disposal it seems reasonable to conclude that Kulagina does not behave like a person who is trying to conceal something.

THE RANGE OF PK PHENOMENA OBSERVED

Movements of Objects Initially at Rest

Movements of objects were most frequently observed as fairly smooth to somewhat jerky sliding movements. When Kulagina first started to experiment she tended to move objects away from her

(Kulagin, 1971). Now objects are usually moved towards her, but also in other directions. Predominantly circular movements have also been observed (Keil and Fahler, 1975; Kulagin, 1971).

The surface on which objects were moved varied from glass and plexiglass to wooden table tops sometimes covered with a tablecloth. Somewhat surprisingly there seems to be little difference in the way objects move in relation to these different surfaces.

Kulagina found it relatively easy to move long objects in an upright position, such as cigar containers made from a thin nonmagnetic metal, tall glass objects, and even cigarettes standing on end. It was noted and it can be observed on film that cigarettes are moved with a high degree of stability; that is, they seldom fall over, except when moving towards the edge of a table top, etc. In an attempt to simulate such a movement it was found that placing a steel pin inside a cigarette made it possible to move the cigarette with a magnet held under the table top. However, it was not possible to keep the cigarette in an upright position for more than 25 to 50 mm, much less than can be seen repeatedly in films (Herbert, 1969a).

Continuous sliding movements usually last for a fraction of a second to a few seconds. While Kulagina has moved objects over longer distances of the order of 30 to 40 centimetres, this seldom happened as one continuous movement. As can be observed in the films, the movements vary only a little in speed and are always slow enough to be observed as sliding movements. That is, the complete movement cannot be attributed to an initial momentum applied during the first part of the movement which then continues to propel the object along the rest of the way. In other words, the movements are slow enough to require a force as long as a movement occurs.

The size of the objects varied from a single match to large glasses and other containers, including a 10-centimetre plexiglass cube. Kulagina has apparently been able to move a particular object previously selected among others nearby (Rejdak, 1968). Kulagin reported that she was able to move along a predetermined course one match from a group of matches thrown on the table. Rejdak (1969) observed a similar demonstration. Not infrequently, though, it appeared as if a particular nearby object moved instead of the selected one. For Western observers communication difficulties added some uncertainties to these questions. However, in one case it seemed fairly clear that Kulagina was attempting to move small objects inside a sealed 10-centimetre plexiglass cube when the whole cube moved instead (Pratt and Keil, 1973). Except when small objects such as matches are moved as a group, there are few

indications that a strong movement of a particular object results in some movement of other objects in close proximity (.5 to 5 or more centimetres). However, the "A" film (Herbert, 1970b) shows the movement of one object while simultaneously the compass needle approximately at a distance of 10 centimetres is apparently also set into motion by PK. This would suggest that the PK force is at least occasionally to some degree exerting itself in a wider area around the object which is moved. A cylinder standing on end (about two centimetres in diameter) moved through aquarium gravel and pushed most of the gravel aside as if there was no force acting on the gravel itself (Pratt and Keil, 1973). However, when Kulagina attempted to move a pile of the gravel alone she later reported to Sergeyev that she saw a few grains jump slightly even though no movement of the pile could be observed in film (Sergeyev, 1970b).

Kulagina has been observed to move more than one object simultaneously. This has happened in the following ways: (1) Object A moves until it comes into contact with object B, then they continue to move both together in a way that could be due to A pushing B (Keil and Fahler, 1975). (2) Small objects (such as, say, 20 matches) are moved as one group in approximately the same direction. This phenomenon looks similar (Herbert, 1970a; 1970b) to moving 20 iron nails with a magnet. (3) Two or more separate objects move simultaneously in the same direction (Pratt and Keil, 1973). (4) Two separate objects move simultaneously in different directions. This was reported by Sergeyev and observed on a film made by Kulagin. The "B" film discussed by Herbert (1970a) also includes a section in which three different objects (two upright match boxes and an upright cylindrical object) are shown as they simultaneously move in different directions. (5) A group of matches arranged in a star pattern was also observed to move in many different directions (Sergeyev, 1971b). When simultaneous movements of two or more objects occurred no clear pattern emerged with respect to the beginning and end of these movements. That is, at times they would start and stop simultaneously, at times one after another, and so on (Kulagin, 1971).

During the movements there was no obvious change in the shape of solid objects (Kulagin, 1971). The movement of an ink blob was described by Kulagin (1971, p. 59): "When liquid has been moved (an ink blob on a piece of paper), the shape of the blob changed. It elongated in the direction of movement, then gradually changed into a 2 cm long and very thin line, which over a distance of 5 or 6 mm separated itself from the original blob."

There are also a report (Kulagin, 1971) and a ciné film referring

to eggs in their shells floating in a saline solution moving some distance through the solution.

Altering the Movements of Objects Already in Motion

It may be reasonable to include the movements of a compass needle under this category because quite frequently the needle is seen in film to reverse its direction of rotation beyond the degree of merely returning to its normal north point. Kulagina has frequently relied on the extent of PK-induced movements of a compass needle as an indication of her readiness to demonstrate more difficult PK. Complete 360° turns of the needle have been observed. Rejdak (1969) reported more than 10 revolutions.

Kulagin reported the stopping of a pendulum and starting a new movement with the pendulum swinging in a different plane: "The subject moved a pendulum formed by a copper disc 10 mm long. The disc was placed in a glass cylinder, height 250 mm, diameter 75 mm. When regular oscillations of the pendulum were achieved, the pendulum stopped and the direction changed to one perpendicular to the previous oscillations. The pendulum then oscillated to its maximum possible amplitude. This experiment was repeated many times with good results." (Kulagin, 1971, p. 62.) Kulagin's film also included a section in which Kulagina stopped a large clock pendulum. The initial movement of the pendulum was apparently due to the clock mechanism. The note by Kulagin above suggests that the subject was also able to initiate such an oscillating movement.

During one session (Keil and Fahler, 1975) Kulagina moved a table tennis ball suspended from the centre of the top of a 10 × 10 × 10 cm plexiglass cube (one open side facing Kulagina). The ball was suspended by a light suspension spring. The spring was light enough to be partly extended on account of the weight of the table tennis ball, which was suspended approximately 15 mm above the floor of the cube. The device was initially constructed in order to make the start of an upward vertical movement easier (assisted by the spring, only a fraction of the weight of the ball would have to be lifted initially). However, due to communication difficulties this plan was not conveyed to Kulagina and she proceeded to move the ball like a pendulum. Most likely some of these oscillating movements were due to PK, but some of them could also have been partly or completely due to physical movements of the subject. Later she managed to carry out two types of interesting movements which can be more confidently attributed to PK.

While the ball was uniformly oscillating like a pendulum in a plane approximately perpendicular to Kulagina's line of vision

with the ball reversing its direction of swing while still at least 20 mm short of touching either of the side walls, the ball banged suddenly against one side wall and then against the opposite one. It continued swinging back and forth several times, knocking against the side walls with an audible noise. There was no physical movement of Kulagina (or any other movement of the table on which this device was resting) which could have caused this sudden increase in movement. It is possible that, once the first sudden movement was induced resulting in a bang against one side wall, the following movements occurred normally with gradually reducing intensity.

Later a different movement of the suspended ball was observed that was even more impressive. The ball was depressed approximately 15 mm where it was held on the bottom surface while it was moved slowly along the "floor" of the cube somewhat diagonally towards Kulagina. The progress of the movement was once interrupted and the ball moved somewhat back to its normal position while still almost on the floor of the cube but without quite reaching the central point. Finally it moved all the way towards the open side of the cube (which faced toward the subject) and stopped there briefly. The spring was considerably extended at this stage, and when Kulagina relaxed the ball jumped back on account of the spring. Most of this sequence was filmed.

This demonstration was particularly impressive because the cube containing the table tennis ball already attached by the spring had been introduced for the first time on this occasion, and this set-up had remained within clear view of the observers throughout. It would not be possible to produce a down movement of the ball and the vertical extension of the spring without special preparations that would not likely go undetected under the circumstances. A string would need to be attached to the ball and threaded through some device directly below the ball without anybody noticing it, and these preparations would need to remain invisible thereafter. A movement towards the open side could conceivably be done by prepared trickery, but it seems difficult if not impossible to carry out both movements simultaneously with a thread (Keil and Fahler, 1975).

A hydrometer floating in a saturated saline solution was prepared by the experimenters in such a way that it was surrounded by an earthed metal-wire screen and monitored by a sensitive electrostatic probe (Herbert, 1973b). After examining this set-up at close range, Kulagina sat in a chair separated from the table with the apparatus by three to four feet. While she gazed in the direction of the hydrometer it floated away from her to the maximum distance,

moving approximately 6.5 cm. After remaining stationary for two minutes, the hydrometer floated steadily and slowly in Kulagina's direction until it reached the wall of the container nearest her. During these movements the electrostatic probe registered no change. Subsequent tests by the experimenters failed to find any way in which the movements of the hydrometer could have been produced normally.

Kulagina moved the pans of a scale that was in balance and then prevented further movement when 10 grams were added to the higher pan. "Equal weights of 30 gm. were placed in each pan, and she succeeded in holding down one of the pans for 6-8 seconds. An additional weight of 10 gm. was placed in the opposing pan but this did not affect the experiment. When the subject ceased to concentrate then the heavier pan at once descended." (Kulagin, 1971, p. 62.) The PK movement of scales is also recorded on film (Herbert, 1970a).

A still photo exists of Kulagina levitating between her two hands a small ball (perhaps a table tennis ball). Sergeyev (1970a) verbally confirmed that he had observed this phenomenon though it is not clear that he himself took the photograph. However, he did mention that she is able to move 30 gm. vertically (Sergeyev, 1971a). No further details are available.

PK and Biological Systems

Kulagina was reported to have changed the rate of beating of a disembodied frog's heart and to have stopped the heart altogether after twelve minutes (Ullman, 1971). Normally a frog's heart is expected to beat about four hours under similar conditions. Sergeyev had recorded the heart beat. The cardiograph had registered a sudden increase in electrical activity just before the heart stopped, as if by an electrical shock. The heart could not be restarted by electrical impulses (Herbert, 1973b).

Kulagina also reported that, proceeding in the opposite direction so to speak, she had revived fish in an aquarium when they appeared to be dead. It is not quite clear whether these fish were examined carefully enough to be pronounced dead. At any rate, Kulagina apparently managed to revive them to a point where they could swim about. In one case a fish was floating on the surface upside down. After revival it turned over and began to swim. In another case she succeeded in a similar way with a fish at the bottom of the aquarium which was assumed to be dead. Her daughter made her stop one of these revival attempts because the fish, although moving, obviously had difficulties. Kulagina mentioned that one fish swam several minutes after revival. It is not clear whether it continued to

move after Kulagina stopped her attempt to revive it by PK. Apparently none of the fish moved about more than a few minutes (Sergeyev, 1971a). It was assumed that the fish were dead soon after Kulagina stopped inducing movements by PK. However, it could be argued that the fish were not dead to start with and remained alive after the PK attempts for periods of perhaps hours although they appeared to be dead. In other words, even assuming that Kulagina succeeded by PK to stimulate fish into moving again it is not certain that these were dead fish to start with.

Sergeyev (1971a) also reported that Kulagina induced in a sceptical man EKG changes suggestive of an acute coronary thrombosis. The man became so ill and frightened that she had immediately to reverse the process. There is no doubt this phenomenon could be due to suggestion, and it may also be placed under the category of healing (first negative and then positive). Sergeyev reported to Keil and others in personal communications that Kulagina has been successful in accelerating healing processes and recovery from illness, but no published details are available. While the possibility of suggestion cannot be ruled out with certainty, one of the authors (Herbert, 1973) had sensations from light contact of Kulagina's hand which are difficult to explain on the basis of suggestion alone.

Kulagina can, by placing her hand on a person's forearm, induce a sensation that feels like very real heat to the point of being painful. There are differences between individuals as to how severe the heat appears to be, and one person may experience substantial variations from trial to trial. It is of course impossible at this stage to sort out how far these differences are due to variations in the physiological and psychological states of Kulagina and to the force of suggestion in the subjects as opposed to some hitherto unknown energy variables operating within the subjects and influencing their sensations and physiological conditions.

Herbert (1973b) reported unbearable pain which he continued to endure only as a personal sacrifice for science, so to speak. Cassirer felt nothing on one occasion and a real heat sensation on another. Keil and Fahler (1975) felt strong heat and pain sensations but not to a degree that made it too difficult to endure them. Both Herbert and Fahler had "burn" marks on their arms which were visible for several hours. No blisters or other negative after effects developed.

There is also a strong indication from the way Kulagina uses her hands during a PK demonstration that they may play an important part in her ability to cause and to control to some extent the movement of objects. Consequently, if a clearer understanding could be reached about the heat sensations, it could also provide

useful information regarding the basis of her PK performance.

While Kulagina put her hand on Fahler's arm a mercury thermometer at body temperature was placed directly between Kulagina's hand and Fahler's arm. The thermometer showed no change. According to Kulagina this seems to be in agreement with theoretical expectations of Sergeyev. Full physiological details are not available, but there is no doubt that heat sensations can be produced by Kulagina's touch through physiological changes that have not yet been clearly identified but that do not show a rise in temperature in that area of the body.

Kulagina had a piece of lead approximately 2 mm thick and 4 cm wide with which she partly shielded her hand while touching Keil's arm. The subjective sensation was quite definitely that the lead blocked whatever produced the heat sensation. However, it is possible that the lead as a relatively cool metallic object simply produced a cooling effect rather than a shielding effect. If the lead acted as a complete barrier then the shield should remain effective over a long period of time. For the length of time that these demonstrations were carried out (about two to three minutes) this seemed to have been the case. However, it is possible that the cooling effect of the metal could have remained effective over a similar period.

Primary Photographic Effects

Sergeyev reported (to Keil and Pratt as well as others) that Kulagina was able to influence by PK photosensitive material, producing simple patterns such as a cross or a letter. No examples of these results are known in the West. It is not certain under what conditions these patterns were obtained, i.e., whether Kulagina simply concentrated on a piece of unexposed photographic film in an opaque container or whether she was allowed to move her hand over it, perhaps writing out the pattern. In an attempt to obtain some kind of image on Polaroid film a cylinder was placed on the lens of the camera and Kulagina concentrated, presumably on the cylinder, while the shutter was open. On the same occasion she moved the cylinder (of a kind that had affected regular unexposed film) by PK while a roll of unexposed Polaroid film was resting on top of the object. These attempts were not successful in affecting the film (Pratt and Keil, 1973). The patterns which Kulagina was able to obtain on ordinary film were not as elaborate as structured pictures produced on Polaroid film by Ted Serios (see, e.g., Stevenson and Pratt, 1968). Kulagin (1971) also briefly mentioned simple patterns but added no further details.

Secondary Photographic Effects

For a number of sessions Sergeyev was particularly interested in the effects which were obtained when Kulagina moved objects which rested on opaque containers with unexposed photographic film. After normal development procedures the material showed traces of the movements. Kulagin (1971) indicated that the objects by themselves were not radiating anything that could produce these traces. Nor could they be explained by any other normal means. It is not clear whether such traces appeared only when Kulagina moved an object by PK or whether they also appeared when she concentrated on it without producing a movement. There is a suggestion of a temporary radiation from the object (producing the exposed film areas) because the strongest exposures occurred wherever the object rested briefly between movements. It would also be interesting to know whether an ordinary movement of an object pushed along by Kulagina's hand results in any traces on the photographic film, though we were told that control tests in which someone else simulated Kulagina's PK showed no effects. Obviously if a paranormal secondary effect can be regarded as clearly established, it would further support Kulagina's paranormal abilities, because even if an object is pulled along with a string it should not produce such traces.

As mentioned earlier under the topic of physiological findings, other secondary effects were obtained by placing a 35 mm negative film (in an opaque cover) around Kulagina's head while she attempted to move objects by PK. The effects obtained were clearly visible flashes and suggest discharges of a high order of magnitude. No details are available as to the range of conditions under which Kulagina can obtain these effects, and it is not known whether similar flashes can be or have been recorded with subjects other than Kulagina.

Evocation of Crystal Luminescence of a Luminophor

Little is known about investigations of this kind and Kulagin's statement is quoted here in full: "Production of 'cold light' in photographic emulsion and a change in the spectrum of visible light absorbed in the liquid crystal. All this without any physical, chemical or other means being used." (Kulagin, 1971, p. 56.)

PHYSICAL MEASUREMENTS RELATING TO THE OBJECTS MOVED

Kulagina was able to move a large variety of objects of different shapes and sizes. It seems safe to suggest that to date a minimum of the order of 100 different kinds of objects have been involved.

For sliding movements on a horizontal surface the weight varied from a few grams or centigrams to 50 grams on some occasions (Rejdak, 1969). More rarely even heavier objects were moved, such as a glass vase weighing 380 gm. (Kulagin, 1971) or even up to 500 gm. as reported by Sergeyev (1970a; 1971a).

No obvious differences in the movements were noticed between objects made from different materials. Virtually all available objects within a reasonable weight and size range were tried and the success rate did not seem to depend on the materials. There is some suggestion that Kulagina has more difficulties with plastic objects above 19 gm. as compared with metallic objects in the same weight range.

A large number of the objects were made from non-magnetic (that is, non-ferromagnetic) materials, such as glass, plastic, aluminium, copper, bronze, silver, ceramic, paper, fabric, water, wood and other organic materials, including bread. Rejdak (1969) reported that gold objects moved somewhat faster. This statement does not seem to be based on measurements and may be based on expectations. Kulagin felt that gold objects moved more easily but did not come to any conclusion because no comparison between objects of a similar size was possible (Kulagin, 1971).

No obvious temperature change was noticeable when objects were picked up which had just been moved. It is not certain, though, whether the temperature was measured by a sensitive thermometer to detect very slight changes.

Herbert (1973b) measured the force necessary to produce a sliding movement of a compass case which Kulagina had moved by PK. It was estimated that Kulagina had exerted a force of 8340 dynes acting upon a mass of 22.3 grams in a horizontal direction (Herbert, 1973b). While the coefficient of friction may have been different on other occasions, it is obvious that Kulagina had managed to exert force many times higher when she moved objects weighing several hundred grams.

A Russian film screened during the 1968 meeting in Moscow indicated that in addition to EEG recordings a probe placed near the objects being moved by Kulagina registered a change whenever movement occurred. These changes were automatically recorded by Sergeyev along with other physiological changes. It is not clear what Sergeyev measured, but it seems likely that some energy changes were recorded which are difficult to account for if Kulagina had moved the objects by mechanical means, such as strings and so on. Kulagin (1971) reported that in a number of cases leaf electroscopes were placed near the moving objects but

that no change was observed in this device to indicate the presence of electrical charges.

SUCCESS RATE IN RELATION TO PSYCHOLOGICAL, PHYSIOLOGICAL AND OTHER CONDITIONS

No exact figures are available, but there is no doubt, that Kulagina was able to produce PK phenomena during most sessions when she tried. An estimate of 80% success, meaning that she succeeded in moving some objects during 80 out of 100 sessions, does not seem too high a figure. However, within a single session (which may last from a few minutes to several hours) the success rate with respect to identified movements of specific objects may vary considerably. Psychological conditions seem to influence the required warm-up time until the first PK phenomena can be observed. This period can be as short as one or more minutes and as long as several hours (Kulagin, 1971). It is not clear how far Kulagina, with or without awareness, carries out some preliminary preparations. At any rate, once she agreed to try, Pratt and Keil (1973), as well as Keil and Fahler (1975) observed the first phenomena within minutes after deliberate efforts began. During these two observation sessions Kulagina was not initially expecting to demonstrate PK; and even if she prepared herself in some way for the task without being aware of it herself the time involved was of the order of 30 minutes, during most of which Kulagina was busy with household matters.

Ullman (1971) observed a practice period of about 10 minutes during which no movements took place.

Psychological conditions with a bearing on her PK abilities are not dissimilar to those often mentioned for other sensitives. Hostile observers inhibit the abilities. However, apparently if Kulagina persevered long enough she was usually able to demonstrate PK under the eyes of unfriendly observers. Under such conditions it could take several hours before she succeeded. She found it also helpful at times if the hostile observers left her surroundings and only returned after she had succeeded on her own or in the company of sympathetic observers. She was usually then able to continue with the hostile observers present (Kulagin, 1971).

Her psychological strategy to overcome physical barriers seems similar. She finds it usually more difficult to start moving a screened object; but once she has succeeded, screens do not seem to interfere with the movements. Screens made from paper, wood, sheet metal, plexiglass and glass were used with little effect on Kulagina's success rate. When various covers were used she had to exert more

effort at the beginning (Kulagin, 1971). Although objects were seldom hermetically sealed, covers made from glass and plexiglass in conjunction with the table top screened the objects from all sides. The available films show numerous examples of movements while the objects are covered with a rectangular plexiglass hood (Herbert, 1970a; 1970b). Kulagin reported only one successful case when a little ball floating on water in a fused glass vessel was moved.

Kulagina has not been successful when objects were placed in a vacuum. The vacuum was regarded as the barrier (Kulagin, 1971; Sergeyev, 1971b) but in conjunction with her difficulties in moving objects in hermetically sealed containers it is possible that the hermetic seal is mainly responsible for the substantial reduction in success (Pratt and Keil, 1973). Kulagina was also unable to change the position of the leaves of an electroscope (Kulagin, 1971).

Kulagina has indicated that she finds it difficult if not impossible to demonstrate PK during hot weather (Herbert, 1973b). Even if conditions were generally favourable storms still seemed to inhibit her abilities. Sergeyev (1971a) mentioned that the level of humidity also has a bearing on the success rate, high levels presumably being detrimental. Failures also occurred when there was no identifiable reason for it (Kulagin, 1971). On the present evidence it does not seem possible to exclude unfavourable psychological factors as the cause of some or all of these failures.

Kulagina's heart rate goes up during demonstrations, sometimes to as high as 240 beats a minute. Sergeyev (1971b) indicated in discussions that this increase in pulse is almost a necessary condition for her PK demonstrations. However, Kulagin (1971) stated that under good psychological conditions, particularly while practising on her own, PK was demonstrated without a noticeable change in her heart rate. Ullman (1971) found that her pulse rate was 132 during a session as compared to 86 previously during rest. In earlier demonstrations Kulagina did not place her hands near the objects. At that stage she felt she assisted the movement of the object with a swinging movement of her body. Later she found that moving her hands near the objects made PK easier. She has in recent years, especially in the initial stage of a demonstration, usually employed her hands in this way (Kulagin, 1971). However, she has also recently demonstrated PK without any noticeable movements of her hands or body (Herbert, 1973b). Kulagina may hold her hands fairly close to the object to be moved, that is, within a few centimetres but once the movement has started it may continue even if her hands are moved back 20 centimetres or more. In this typical situation the distance between Kulagina's body and the object is

approximately 50 centimetres. Occasionally longer distances were tried and success was reported for distances up to 2 metres (Kulagin, 1971). More recently a movement was also observed when Kulagina was approximately one metre away (Herbert, 1973b).

Kulagina is usually seated at a table during demonstrations. Tables of different sizes were used including low ones (about 30 cm high) and movements were also demonstrated with objects resting on chairs or on the floor (Rejdak, 1969). Standing up did not seem to result in a difference in her ability to demonstrate PK (Kulagin, 1971). Kulagina has successfully moved objects on a table behind her back. However, she finds this more strenuous and she usually faces the object. During her early experiments Kulagina usually moved objects away from her. Later she was able to move them towards her as well as in other directions (Kulagin, 1971). Movements towards her now predominate.

PHYSIOLOGICAL CONDITIONS MEASURED OR OBSERVED DURING PK

Most Western visitors only had the opportunity to form superficial impressions as their observations could only give indirect information about Kulagina's physiological state. Russian scientists, however, were able to carry out a number of careful measurements. Until now their published data are limited, and reports based on private discussions must again be regarded with caution because of the language barrier and the use of unskilled interpreters.

It is rather unsatisfactory to list measurements when details about procedures and the exact conditions under which these measurements were carried out are not available. However, as it is unlikely that such details will be published in the near future it seems desirable to include here all material that may have a bearing on the case.

There is little doubt that Kulagina's heart rate goes up considerably. Rates of 150 to 240 beats per minute were mentioned by Kulagin (1971) and Sergeyev (1970a, 1971b). As mentioned previously, there is some disagreement whether the high rate is a necessary condition (as was suggested by Sergeyev) or whether the high rate is at least partly associated with the psychological conditions; e.g., in connection with important visitors or a hostile group of observers as Kulagin suggested. Even if Kulagina is sometimes able to perform relatively simple PK tasks without an increased heart rate under ideal psychological conditions, it is possible that under the same conditions more difficult PK tasks cannot be accomplished without an increased heart rate.

Loss of body weight has been measured by Russian scientists and

reported to be as high as up to 2000 grams after one session. No clear indications of the total time period is available. Usually sessions seem to have lasted from ten minutes to two hours (Sergeyev, 1971a); occasionally longer (up to five hours) if Kulagina had difficulties (Kulagin, 1971). Kulagin mentioned a loss of weight of 700 to 800 grams after one hour. Rejdak (1969) mentioned a loss of 800 to 1000 grams during a 30 minute session. These figures are several times higher than the weight loss that would occur over this period due to strenuous physical activity unless there was excessive water loss (urination and/or heavy perspiration), which was not mentioned.

Fatigue and sometimes extreme exhaustion were reported after the completion of some sessions and the blood sugar level had increased (Rejdak, 1969). Dizziness and reduced coordination were experienced, as well as pain in the upper part of the spine and the back of the neck. Kulagina also felt pain in her legs and feet, as well as in her muscles generally. Taste seemed to be diminished as well as becoming "suggestive of iron or copper." She felt thirsty and found it difficult after long sessions to go to sleep (Kulagin, 1971; Rejdak, 1969). It is not clear whether these after-effects were only experienced after long sessions lasting for several hours. It is possible that some of the pains occurred because Kulagina remained seated in a similar position for a long period and thus they may not necessarily be due to her PK efforts. Depending on the severity of these effects Kulagina sometimes requires rest pauses within one session as well as breaks from PK activities between sessions of from one to several days. Some of these interruptions may have been initiated on medical advice and not so much because of a subjectively felt need for them.

Electroencephalographic and other automatic recordings indicate interesting physiological changes. Unfortunately the only published reference does not provide a very clear or detailed indication of what changes were measured:

"At the moment of occurrence of [the PK] phenomena, registrations were observed, by means of several electrodes, in EEG and cardiographic apparatus, and also recordings were obtained by an apparatus at a distance without direct contact, indicating an electrostatic fluctuating field;[2] the latter appeared in the moment of brain tension" [i.e., increased EEG intensity]. (Rejdak, 1968, pp. 69-70.)

From the film showing Sergeyev's EEG work with Kulagina

[2] The term "electrostatic fluctuating field" may be regarded as unsatisfactory from a physicist's point of view. Senkowski (1974) suggested "slowly varying electric field" as more appropriate.

there is no doubt that exceptionally large EEG changes were recorded. However as neither the EEG records nor the films are available for analysis it is difficult to know how far ordinary muscular activity could have been responsible for some of the recorded changes. Sergeyev (1970c) indicated that characteristic changes occurred during the activated state but these could only be determined by a complex analysis and were not obvious on visual inspections. Rejdak (1969, pp. 66-67) referred to these measurements as follows:

"An analysis of the electrical signals on the skull surface indicated that the energy level of the signals was considerably lower than the energy level of electrostatic field fluctuations recorded from a distance. At the same time however there existed a significant correlation . . . between the parameters of the electrical bio-turbulence[3] and the electrostatic turbulence. It appeared that at the instant of appearance of telekinetic phenomena there was a marked correlation between these informational characteristics, and at the same time there was a concentration of energy in the direction in which the subject's gaze was fixed. It was further found that the frequency of the heart pulse [rate] could be increased fourfold under these conditions. The modulation rhythm of the intermittent electrostatic field was associated with heart and brain frequencies, suggesting the heart can influence the frequency-function of the space-field modulator."

In the film electrodes were shown attached to Kulagina's head as in normal practice.

Sergeyev (1970a; 1971b) also reported that he used an EEG recording technique which did not require direct contact and Kulagina was placed between large condensor plates as much as 3 m apart. With this arrangement it was possible to measure changes which took place during PK attempts more freely and conveniently than with the usual EEG hookup. It seems unlikely that the information which can be recorded in this way is as detailed as in an ordinary EEG setup. Nevertheless, in connection with PK work it may very well be a better method of detecting and recording changes. It is not certain whether this recording technique is sensitive enough to register effects from ordinary subjects or whether it is limited to some special massive changes only associated with Kulagina's PK efforts. Although Sergeyev reported the use of EEG recording equipment it is not clear whether the recorded changes can be classified under the category of EEG.

[3] For this term and others in the following pages no clear definitions are available.

In the same film referred to above, Sergeyev also used a probe which was situated on the table near the objects Kulagina was shown to move. When movements occurred the film also showed changes which were apparently picked up and automatically recorded by this instrument. Presumably some energy changes in that region were measured. It is difficult to know whether these changes should be included under physiological measurements of Kulagina.

More directly related to physiological changes were effects on sensitive filmstrips in opaque containers which were placed around Kulagina's head. The film was left around Kulagina's head during the whole experimental session of about 35 to 40 minutes. The effects were strongest on the section of the film which had been at the back and at the sides of her head. The film around her forehead remained almost completely unexposed (Rejdak, 1970). The film used was ordinary black and white 35 mm negative film with a 21 DIN rating. There is no indication whether such effects can be obtained on a filmstrip when Kulagina tries but does not succeed in moving objects or during other states or activities not associated with PK attempts. There is also no indication whether any such effects can be recorded with other subjects.

RELATED CASES OF RECENT DATE

Is Kulagina the only living human being able to move objects at will? Or are her abilities at least related to other cases and phenomena?

There is little doubt that Kulagina has been and probably still is the most successful subject with respect to directly observable PK but there is also increasing evidence that many more human beings than was formerly suspected are able to move objects in a similar fashion to some degree.

During the last three years or so Alla Vinogradova in Moscow has demonstrated her ability to roll objects weighing up to 100 grams and to slide objects weighing up to 30 grams on a horizontal surface. The phenomena are different in various aspects, especially in the respect of being strongly dependent on static electricity. Yet there is also an indication that these movements cannot be explained through static electricity alone (Adamenko, 1972; Herbert, 1972b), and they seem to include a substantial paranormal component. Ullman (1974) compared Vinogradova's demonstrations with those carried out by Kulagina and also discussed physiological and other differences and similarities. At this stage, however, it is somewhat difficult to separate the clearly paranormal aspects of the movement of objects by Vinogradova from those which may be due

to normal although highly skilled usage of static electricity (Herbert, 1972c).

Of considerable interest also is the case of Felicia Parise. Among the authors of this paper, Pratt and Ullman have made first hand observations of apparently paranormal movements of objects by her and they as well as Keil viewed a ciné film of some of these phenomena and discussed with her various aspects of her PK work. Honorton (1974) summarized her achievements and Watkins and Watkins (1974) discussed physiological and other variables which were monitored during one session.

Parise is a sensitive with a variety of parapsychological abilities. She has no experiences of spontaneous PK. She had become aware of many of her psi talents in spontaneous situations. In a controlled setting she had been highly successful in her blind judging of dream-target pairs (Honorton, 1974). Her participation in psi research at the Maimonides Medical Center certainly increased her awareness of and interest in her own abilities, aroused her interest in scientific parapsychology, and eventually led to her deep involvement with directly observable PK of the kind shown by Kulagina.

Parise became inspired by a Kulagina film to attempt to produce similar movements, primarily for her own satisfaction. However, her road to success was not a simple one. Working quietly with great determination on her own, she spent two to three months in concentrated effort before the first unmistakable movement of an object took place. Earlier movements may have occurred, but they were disregarded by Parise since she was not prepared to accept anything unless she was really sure. Early attempts to create favourable conditions by practising progressive relaxation and other meditative techniques did not succeed at all. Parise is now convinced that such techniques are (at least for her) quite unsuitable for directly observable PK, and she has come to the conclusion that only concentrated effort, when she was really working hard at the task, finally met with success. During the period of time when occasionally small movements of objects may have occurred which were not accepted by Parise, her life was centred on the one hand around those attempts and on the other around the unhappy experience of seeing her grandmother slowly dying in the hospital in which she is employed. The PK attempts, as exhausting as they were, nevertheless provided a kind of activity which enabled her to forget the stressful experience in the hospital. Her first clear success occurred just after she had received the news of the death of her grandmother: a small plastic bottle which she had previously been trying to move without success finally made a definite sliding movement when, without being aware of the fact, she may still have been

wishing it would move but was not really trying.

Some parapsychologist may attach importance to this event as a psi phenomenon that may have been triggered in some way directly by the dying grandmother. Parise's interpretation is that the sad news changed her own state of mind in some way which released her PK energy. She assumes that this movement would not have taken place without her previous efforts over a period of weeks, her desire to succeed, and her belief in the reality of the Kulagina phenomena (Parise, 1974). The latter interpretation seems more likely in view of the fact that Parise was indeed able to produce a similar movement with the same plastic bottle several days later. Gradually thereafter she was able to produce sliding movements (mainly away from her) more and more frequently and with a variety of objects.

The ciné film was made by a non-professional magician who wrote a statement attesting to the reality of what he had seen and recorded (Moses, 1972). It shows, among other clearly observable effects, the movement of a plastic bottle half filled with water and weighing several grams. It seems certain that such a movement could not be attributed to normal electrostatic forces. Although most of her demonstrations were carried out in her home, some of them were carefully observed (Honorton, 1974) and Parise also demonstrated some of her abilities under laboratory conditions (Watkins and Watkins, 1974).

Critics of parapsychology are likely to derive some satisfaction from the fact that Parise decided after a period of successful demonstrations to discontinue with her directly observable PK work. This decision may at first appear puzzling, but it can be readily understood if it is realised that the only way Parise managed to remain successful was to dedicate virtually all her spare time to the practice of PK. She found that any days without practice made it much more difficult to return to her previous level of success. The effort remained a very real one even after she had succeeded. Her well being from a physiological point of view also seemed to be adversely affected; and since she was unable to continue with PK at a lower level of involvement, her decision to stop altogether should not be criticised too severely. After all, she had demonstrated that it is possible to do it; and (at least as far as she was concerned) it was not possible to continue without making unreasonable personal sacrifices. Parise also found it difficult to live under circumstances where most of her acquaintances displayed critical disbelief and where even her friends in parapsychology felt obliged to be critical in order to make sure that their claims about Parise's PK were justified.

There has been at least one occasion in addition to the relatively spontaneous first clear movement referred to above, when Parise was able to demonstrate PK without making a very hard effort and without much agitation (Honorton, 1974). This suggests, in connection with what was reported earlier in this paper, that both Kulagina and Parise may occasionally obtain results under relatively relaxed conditions. However, Parise was not able to rely on such conditions to a sufficient degree to practise PK without considerable agitation. Comparing the film of Parise with direct observations of Kulagina, one finds there is a clearly noticeable difference. Parise seemed to operate under far more stress than Kulagina. No doubt for Kulagina stress may have been higher on other occasions, but she seems to be able to carry out at least a substantial part of her PK work under relatively relaxed conditions. Moreover, Kulagina did not find it difficult to produce some movements after long periods of inactivity, although she mentioned that more difficult tasks which she had been able to carry out previously required a longer period of practice.

While Parise's PK phenomena are similar to those produced by Kulagina, they never reached the same level of strength with respect to the weight of objects and the complexity of movements. Parise was able to move small non-magnetic objects weighing several grams. The movements were slow, but clearly observable, sliding movements in a direction away from her. Parise has moved pieces of cork and aluminium foil under a heavy jar. Under conditions which appeared to rule out normal explanations she has also moved a compass needle. On one occasion this was done while the compass was placed on unexposed black and white film (ASA 1000). Similar film was also placed at varying distances around the compass. Her success in turning the needle was limited as compared to other demonstrations she gave, and the needle only turned approximately 15 degrees. However, it was found that the film placed under the compass was almost totally exposed and that the other films were partially exposed. The exposure diminished with increasing distance from the compass (Watkins and Watkins, 1974). Parise's movement of the compass needle also appeared to be weak compared to the fast movements and rotations Kulagina has demonstrated. However, some interesting after-effects were observed which lingered on for periods of up to 25 minutes and which apparently had not been noticed in connection with Kulagina's PK. Watkins and Watkins (1974) report that a compass needle turned 15 degrees by Parise remained in this position after Parise had stopped concentrating and that this after-effect continued only in the area in which the compass was located when Parise had succeeded in moving the

needle:

> "About five minutes after the first indication of compass needle movement, Parise was disconnected from the polygraph. She walked to a far corner of the room. The compass needle, however, remained 15 degrees off north, and was found to be totally unresponsive to either the knife blade or the bar magnet. We thought that perhaps the needle was jammed. To test this, the compass was moved to a position about four feet away from the point of concentration, and during the movement the needle gradually returned to north. In this position it was easily affected by the knife blade. The compass was then returned to the original spot on the chair, and again the needle moved 15 degrees off north, and was incapable of being influenced by the metal blade. This procedure was repeated several times with the same results. The needle gradually returned to north over a period of about 25 minutes, and also gradually became more responsive to the knife blade" (Watkins and Watkins, 1974, p. 133).

As reported earlier some short term after-effects lasting several seconds were noticed by Keil and Fahler (1975) when an object continued to move after Kulagina ceased to make an effort. After-effects (metal continuing to bend) lasting several minutes apparently also occurred during Geller's and similar demonstrations. Geller's performances, though, must be evaluated with great caution as will be indicated later. At times Parise was able to produce movements almost instantaneously, while on other occasions she tried for hours without success. She believes that there is an optimal level of concentration and involvement, and the PK effect is reduced if this level is either not reached or exceeded. Her attitudes and some further details are well described by Honorton:

> "She describes herself during attempted PK as trying to develop rapport with the target object. Before she begins, she says she focuses her attention on the object until 'that's the only thing there.' She usually picks a spot on the object and fixates on it until everything else—including the kitchen working surface—seems to disappear. She speaks of 'pitching,' that is, working up excitement to the point where, in her own words, 'I want to make it move more than anything else.' After a successful session, Parise experiences difficulty [in] speaking for a few moments. She says that she understands what is being said to her and knows what she wants to say, but that 'it doesn't come out right.' She perspires freely during the session, which is unusual for her. Other physical after-effects include running eyes and nose and trembling. Her only unusual physical characteristics we are

aware of are chronic phlebitis in the left leg (which, coincidentally, has also been reported in Kulagina) and hyperacute vision" (Honorton, 1974, p. 131).

Parise has also reported that an opportunity to see the Kulagina film again (or better still, she supposes, seeing a direct demonstration of such PK) would greatly increase her chance of success.

Herbert (1974) has described work that is still in progress at the Paraphysical Laboratory with Suzanne Padfield serving as subject. Over a period of a year apparatus was devised and checked out for generating a polarised beam of light that could be registered upon a suitable metering device and was adapted to the needs of the research. Padfield was then told to place her hands near the tube through which the beam passed and attempt to affect the beam. Success in the task would be shown by a decrease in the amount of light registered. She was consistently successful in lowering the meter reading, in one series of tests accomplishing this result without fail in 24 successive trials. A number of other subjects who undertook this task in the same overt manner were consistently unable to influence the reading on the meter. The work is continuing with a view to gaining an understanding of the nature of the influence Padfield exerts on the polarised light beam.

The following case is entirely based on observations by Keil of a subject who wishes to remain anonymous. The case is included less in order to present evidence for PK than it is to show the circumstances and limitations under which directly observable PK may occur.

Discussing with the subject (S) PK effects demonstrated by Kulagina, Keil was surprised to find that S was quite sure that PK of this kind can happen but he declined to give an explanation as to why he felt so certain. Keil was surprised because S is a scientist and he usually shows a more cautious attitude towards exceptional parapsychological claims.

The following event occurred after S and Keil had viewed a Kulagina film and during an excited discussion that followed. S was somewhat primed by a moderate consumption of alcohol, while Keil had consumed virtually none of his drink. Unexpectedly, Keil saw a substantial water glass approximately 15 cm high move slowly approximately 50 cm towards S and then stop approximately 10 cm away from him, without touching him. S inquired excitedly whether Keil had seen it, and S put the glass back in its previous position. The movement occurred again in a similar way. Keil immediately examined the glass and the surface and attempted to put the glass into a sliding motion by pushing against it. The surface was a wooden built-in table top which could not be moved. The

wood was only lightly lacquered and the grain of the wood could still be felt. The surface was dry. It required a clearly noticeable and continuous force to move the glass. There was no conceivable way in which the glass could have been moved by normal means except by trickery, which seemed extremely unlikely.

After the two movements S revealed that similar movements of objects had occurred previously, perhaps at the rate of two to five times per year. However, S was not really able to produce these movements at will. S recognised a raised level of excitement as a necessary condition but said that it was not sufficient to bring about such movements. Usually the movement of objects occurred in some relation to his general intentions even though when it happened S did not consciously attempt to produce the movement. That is, typically a glass on a table would move closer when he intended to use the glass, or similarly movement would occur for a box of matches or other objects. Occasionally he was able to repeat the movement by returning the object immediately to its previous position, but beyond this he had not been able to control the phenomenon. This was the reason why he wished to remain anonymous. S had not spent a great deal of time trying to produce the movements at will. His wife had also observed the phenomenon on a few occasions and confirmed S's statements when questioned by Keil.

This case seems to be particularly interesting inasmuch as it suggests that below the level of successful subjects such as Kulagina and Parise there are others who have the ability but have not learned to control it sufficiently for demonstrations with a reasonable likelihood of success. S is familiar with parapsychology and recognised the movements as relatively spontaneous PK produced by himself. It is not unreasonable to speculate that if other people have abilities to a similar degree they would reject any direct experience of it and build up inhibitions to a point where their abilities are completely suppressed. There may also be others who are aware of having such PK ability who have not let this fact become known. We hope the publication of this paper will encourage such persons, if they exist, to make contact with the writers.

In this connection the recent influence of Uri Geller is relevant. Uri Geller, an excellent showman, can convince his audience that he is able to perform PK to a remarkable degree, often by bending spoons, keys, or other metal objects by apparently paranormal means. Recent publications by Joel (1974) and Weil (1974) suggest that Geller may use trickery. There is also some evidence that at least some of his PK phenomena may be genuine (Cox, 1974;

Owen, 1974b). It would be foolish to assume that a showman will not revert to trickery if given an opportunity, and to date it is difficult to evaluate the phenomena which Geller asserts are due to PK.

Of considerable interest, however, is his appeal via the mass media to wide sections of the general public in many countries. In particular he has been able to convince many people that his PK is genuine and that he can demonstrate PK in their own homes in what he calls mass experiments. Thousands in Europe have spontaneously communicated with papers and TV stations indicating that similar PK phenomena occurred in their homes when Geller was active. As became clear from interviews (Keil and Hill, 1975) most of them believed that the PK phenomena (usually bent spoons) were due to Geller and that they only gave him an opportunity to "tune in." They did not believe (which seems a reasonable point of view under the circumstances) that they could produce these PK phenomena by themselves.

It is of course difficult to estimate after the event how many of the bent spoons were bent by normal means. But even if we assume that the vast majority of the reported PK phenomena were due to normal forces, it seems unlikely that this is true of all the cases, particularly if we take into account that at times initially critical observers had to admit that they saw them quite clearly under circumstances where trickery was unlikely. It also seems reasonable to speculate that Geller succeeded most effectively in reducing inhibitions by first convincing the public that he himself really has the ability and in the second place by not directly asserting that this ability is widespread but by suggesting that he can be successful in many places provided they concentrate and help him to "tune in."

If we assume that only one case in a hundred is genuine we still end up with more cases of directly observable PK in Europe than was previously thought possible. Yet if we assume that Kulagina's and Parise's PK is genuine and if we further assume that there is a relatively normal distribution of ability (even though threshold levels, inhibitions, and expectations may complicate the picture) then we should expect that far more people can produce directly observable PK than we have previously assumed to be the case.

The controversy that has raged around Geller's claims for metal bending might be settled in favour of paranormality if further investigations are conducted with him that yield successful results under rigorously controlled conditions. But it might be effectively stilled if one or more other subjects with a similar gift are discovered and tested with good results under satisfactory conditions. The first report on work with a new subject of this kind, Matthew Manning,

seems to be a promising development in the second category (Owen, 1974).

Manning visited the New Horizons Research Foundation in Toronto from 18 June to 5 July, 1974, to attend the First Canadian Conference on Psychokinesis. The preliminary report states: "Matthew bent several keys and forks in full view of witnesses. In one case a stainless steel knife being held by someone else at about 10 foot distance from Matthew was seen to be in process of bending, and did in fact become permanently bent." (Owen, 1974a.) Other observations are also presented which, taken all together, make it difficult to conceive of a normal explanation of the effects, given that the test conditions were as described.

Taking stock of these cases of recent date, we find ourselves reaching the optimistic conclusion that Kulagina has served the purpose that Zdenek Rejdak assigned to her in a personal opinion expressed in 1972. He said that parapsychologists asked of her only that she should work long enough for the investigators to learn how to continue research successfully along the same line with other persons. It seems fair to say that this goal is within our reach if we may judge from the number of subjects already available who can demonstrate directly observable PK.

THEORETICAL CONSIDERATIONS AND SPECULATIONS[4]

SUMMARY OF THEORETICAL WORK IN RUSSIA

The aim of this section is to provide a summary of theoretical considerations and speculations which have been developed in Russia and to add some comments which may help to evaluate them.

The same difficulties that were mentioned earlier apply to this section with even greater pertinence. That is, the theoretical considerations characterised in this summary are based on brief discussions and, to a larger extent, on indirect secondhand publications. Translation difficulties are further confounded by many new terms which have at present little meaning and which are not presented within a sufficiently detailed framework to be properly evaluated.

[4] B. H., the author of this survey who is best informed on questions pertaining to physics, has assembled the information presented in this section on the views of Russian scientists relevant to the Kulagina PK performance, and he has made the major contribution to the additional theoretical considerations tentatively stated here. We express our appreciation of two German physicists, Prof. Dr. E. Senkowski (Fachhochschule Rheinland-Pfalz-Abteilung Bingen) and Prof. Dr. W. Peschka (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt E. V. Stuttgart), who read this section critically and offered valuable suggestions for its clarification, and to the former for valuable comments on other sections of the paper as well.

It seems nevertheless desirable to present this summary. On the one hand, it may serve as the initial exploratory steps in a labyrinth in the hope that further clues will be forthcoming in the future which may indicate which of these steps lead in the right direction. On the other hand, it seems also desirable to point out how wide the gap is which exists between the accepted physical framework and some of these speculations. Unfortunately in recent years popular publications gave rise to expectations that theoretical work on parapsychology in Russia is far more advanced than seems to be justified on the basis of the available evidence.

V. G. Adamenko: Adamenko draws a distinction between thermodynamics of organic and of inorganic matter, and likewise between "living" and "technical" fields, e.g., he cites fruitless efforts to simulate psychic healing by artificial electrical fields. Thus he speaks of "psychic energy" as a form of energy differing in kind from others, also of "psi-fields". He makes the interesting suggestion that PK is best achieved upon systems in a state of unstable equilibrium, citing as an analogy the Geiger counter in which a very small influx of energy triggers off a large-scale reaction; and qualifies the assumption that psychic energy can transform itself into other forms of energy by pointing out that an experimenter cannot cause luminescence of a screen, but can increase the luminescence only if the luminophor has been previously excited. (He refers to work of a Dr. Kotic in 1912.) His paper describes training in electro-PK in which trainees commence by producing artificial charges by friction, then gradually accustom themselves to operating without such artificial induction; he relates these phenomena to Kirlian photography and Iniushin's "bioplasm" theories, i.e., emission of "cold plasma" in the form of electrons or ions. Adamenko further suggests that an entirely new range of elementary particles may be discovered, resulting from the quantisation of the psychic field.

Comments: Physical fields are defined by specifying the field generator or the source of the field and by measuring specific consequences. While it is reasonable to introduce fields into speculations about psi, it must be kept in mind that at present there are no clear measurements possible which would provide a definite justification for the field concept in the context of psi. It is also reasonable to extend thermodynamics to living matter as long as some important differences are realised. Thermodynamics was developed for inanimate matter which changes in agreement with entropy. This may not be the case for animate matter. It is doubtful whether terms such as cold plasma can be said to have any meaning at this stage.

G. A. Sergeyev: He endeavours to explain all PK in terms of known bioelectric and magnetic fields of an oscillatory nature (in contrast to Adamenko, most of whose work concentrates upon relatively static fields). These fields produce "magnetic-acoustic resonance" which vibrates objects, thereby reducing friction and facilitating translatory motion. He invokes radiation in the ultra-violet region of the spectrum which he suggests produces ionisation in saline solution to explain movements of floating eggs as well as of the hydrometer. In the same way he accounts for burn marks on the arm produced by Kulagina either by contact or (in the case of Cassirer) with a camera held between her hand and his arm (Herbert, 1973b). Sergeyev supposes that the effort of concentration causes a synchronicity or phasing of the neural cerebral oscillations which are somehow focused by the brain acting as a kind of lens in the direction of the gaze. (*Note:* Geller, Kulagina, Padfield and Parise all normally gaze intently at the object to be affected. Indeed, this is a general characteristic of subjects while they are attempting to demonstrate PK, but the intense gaze may be no more than the outward sign of concentration.)

Comments: The speculations do not relate in a meaningful way to contemporary physical theories. The magnetic acoustic resonance which after all is supposed to move non-ferromagnetic objects is difficult to accept even on a speculative basis. How ultra-violet radiation is supposed to have penetrated the camera is also difficult to comprehend.

A. Dubrov: At the 1973 Prague Psychotronics Conference Dubrov announced his theory of "pseudo-gravitation", recently reported in a Soviet popular newspaper plainly as "gravitation". (Still more recently in a Soviet science journal this was referred to by Pushkin as "quasi-graviation".) The force of PK can scarcely be what is ordinarily understood by "gravity". It appears Dubrov has in mind "gravity-like" forces, resembling gravity only in the sense that they can operate unaffected through screens of various materials. The term bio-gravitation was also used to suggest that living organisms can generate gravitational waves. Kulagina's "burn" effect perhaps suggests electrical oscillations which would produce rapid particle rotation in human tissue due to dipole moments.

Comments: To search for similarities with and/or relationships to gravity seems to be a reasonable approach. However, at present it cannot even be said that the PK psi force operates unaffected through screens of various material. Kulagina has had little success when objects were placed in a vacuum and even a sealed container seems to create a substantial barrier, though it is not yet clear whether the barrier is physical or psychological.

B. Bunin: He supports the hypothesis that high-frequency coherent oscillation of ions or electrons can produce a laser-like effect. Excessive EEG activity during PK (observed with Kulagina and Padfield) may support this concept. Perhaps the degree of phase-coherence could be taken as an objective measure of the degree of mental concentration. It is curious to note here that laser beams used at Alma-Ata, the capital of Kazakhstan, are employed medicinally to alleviate precisely the same types of disease (e.g., arthritis) as are commonly claimed to be most easily cured by psychic healers.

Comments: PK phenomena do not seem to agree with the high frequency coherent oscillation because only reflected or absorbed radiation can produce an impulse on an object. That is, only metallic objects or objects which absorb high frequencies should move, and (for example) glass should not move at all. The high frequencies would also have to be extremely powerful. No details are available to evaluate the possibility of measuring phase-coherence, or to describe the procedures on the basis of which comparisons between psychic healing and laser-assisted healing can be assessed.

Other Theoretical Considerations

General Remarks: The existence of many different known forms of radiation (e.g., Alfvén waves) should alert us to the possibility of further as yet unknown forms. The interesting phenomena of Felicia Parise in which sealed photofilm was found to be exposed while located in the neighbourhood of a compass needle (the object of a PK attempt) but to a diminishing extent as distance from the compass increased appears strikingly similar to the case of Alla Vinogradova in which a neon lamp lights near the object of PK concentration yet no appreciable field gradient is found at points further away from the moved object. This peculiar localisation of energy at a particular point in space needs explaining somehow. We also have the observations that Padfield can turn a particular mobile system without affecting nearby mobiles, and can create turbulence in one solution yet not in another adjoining. (Dye crystals dropped into water descend vertically in the control bottle but in sinuous curves in the bottle concentrated upon (Herbert, 1973a).) Are we to suppose that radiational energy from two sources (e.g., the two halves of the brain) can converge at a particular point and create an interference pattern causing local disturbance? The plane of symmetry dividing the two semibrains is vertical, and this fact could be associated with the claims that

Kulagina can most easily move tall vertical objects (cigar cases, hydrometers) and that Padfield can obtain best results when her head is on the same horizontal level as a horizontally-suspended mobile.

The Variety of Phenomena to be Explained: We must attempt to correlate a variety of phenomena which at first glance appear totally unrelated and even contradictory to each other:

(1) Padfield: a temporary deflection of plane-polarised light is produced in aqueous solutions, ceasing as soon as the PK session is over.

(2) Uri Geller's metal-bending phenomena. While research on this claim is still in an early and inconclusive stage, supporting evidence is accumulating and already justifies further research attention.

(3) Long-term effects of the bent objects lasting up to 24 hours and consisting of an odd sensation when such objects are handled.

(4) The spontaneous movements of small objects (usually dielectrics) that are sometimes observed while the PK subject is concentrating upon another object.

(5) Sergeyev's experiment in which Kulagina apparently delayed the freezing of water when its temperature was being steadily lowered beyond 0°C. by artificial means. No details of the experimental procedure are available. (This may not be an example of PK as some delay occurs under normal conditions.)

If we wish to include in our scope Geller phenomena of disappearance of objects from closed boxes, etc., and general spontaneous "poltergeist"-type effects, then we may well feel overwhelmed. At first glance the only feature all these phenomena have in common is that they are all anomalous. This fact provides no logical reason for connecting them, until we realise that some people are involved in more than one of the above categories.

Suggested Mechanisms: It appears naive to suppose that the manifold varieties of PK are explicable by one simple concept, whether it is a psi-field, bioelectricity, bioplasm, etc. PK and psychic healing appear to involve a complex process involving several factors reacting together in various ways depending upon conditions. Several experiments appear to eliminate electromagnetic effects, yet in others they predominate. So it is something other than electromagnetism which none the less can interact with it. This of course is the customary rule; alter one physical parameter and you are likely to alter several others at the same time. In this line of reasoning we have already implied the existence of some unknown field; Dubrov's expression "bio-" or "quasi-gravitation" appears

advantageous as it is descriptively useful and also devoid of "loaded" implications. It possesses another attractive feature, for if the phenomena are "gravity-like" then one would expect a close association with space-time functions; and the gravity analogy hints at the possibility of embracing in its conceptual scope anomalies in space-time such as are apparently found in telepathy, precognition, poltergeists and so on—phenomena and relations that are beyond the scope of this paper.

Let us suppose that a focused biogravity wave could induce changes in other physical parameters at the point of focus, a transformation of energy from one kind to another. Differing conditions could yield differing secondary effects: the "gravity-like" force could move objects without electrostatics; or, at the other extreme, it could produce the localised electrostatic effects of Alla Vinogradova and the possible high-frequency oscillations suggested by Kulagina's "burns". One may find more than one type of secondary effect at the same time in two or more sections of a room with different conditions. Thus Padfield may move small dielectric objects at a distance of several feet while at the same time influencing a shielded polarimeter. The suggestion of Adamenko that one can train oneself in PK and healing by beginning with electrostatic-type exercises may thus make sense.

The case of Uri Geller is perhaps the most bizarre and difficult. Assuming that the metallic object is identifiable and sleight-of-hand and other kinds of illusion are eliminated, it may bend normally in three ways: (1) concealed manual bending; (2) heat; (3) application of suitable chemicals. Many observers, including J. Taylor and B. Herbert, have observed bending in the absence of all the above causes. A metal object may be regarded as rigid on account of bonding electrons between the metal crystals. As long as there are no intensive investigations carried out it is only possible to argue speculatively that Uri has released biogravitational energy into the metal and excited the bonding electrons to a higher energy level in which they become quasi-stable, thus reducing the bonding effect and temporarily rendering the metal plastic (to such an extent that it sometimes thins out into a strip which finally snaps). The excited electrons would gradually discharge to lower levels until the metal ceased to be plastic, after which moment they would continue to discharge, possibly at an exponential rate, for some hours before returning to their normal state. In this intervening period, the residual energy may be sufficient to be sensed by someone picking up the object.

To this we must add the many hundreds of cases reported in various countries of Geller-type phenomena, often involving

children. (One is here irresistibly reminded of the statistical connection between poltergeist-type phenomena and young people.)

The experiments previously described raise innumerable complex problems and we can deal here only with a few of the more outstanding questions. Firstly, why should plane-polarised light apparently prove to be in the case of Padfield a good form of PK detector (with the advantage of precise registration)? Why not ordinary light? It is simply that plane-polarised light is anisotropic, and if passed through an anisotropic medium (i.e., one containing turbulence or density gradients, however caused) one would expect increased absorption, i.e., optic-thermal coupling; whereas if the light is randomly polarised ("normal" light) the probability of part of the focused beam missing the photodiode eye would be greatly reduced.

Separate control experiments have shown that the psychic subject does not in fact rotate the plane of polarisation, which leaves only deflection or absorption. Other experiments indicate turbulence by an independent method. We can therefore safely assume that turbulence creates the deflection by changes in refractive index taking place mainly at the surface of each vortex, in the case of distilled water with no suspended particles. Now by Kolmogoroff's Principle, a tendency exists for turbulence to become isotropic; energy is transferred from larger eddies to smaller eddies and the system will quickly revert to isotropy unless more energy is pumped into the vortices. The effect therefore ceases within half a minute or so after conclusion of the experiment, as observed.

No sharp distinction is to be drawn between the electro-PK of Alla Vinogradova and the Kulagina-type PK. Indeed, every degree of combination between these two extremes may occur. Adamenko's method of training by starting with artificial electrostatic charge is a good one that provides immediate visual feedback and thus can build confidence and gradually activate the biogravitational function.

The attempt to describe psi phenomena within the framework of physics is, strictly speaking, illegal. Physicists are concerned with phenomena of inanimate matter. However, in spite of its complex problems biophysics has made important contributions. PK consists of a peculiar interaction between man as a biological system and the physical environment. Consequently it is not surprising that a confusing variety of phenomena occur which seem to defy physical explanations. It is not to be expected that the contemporary framework of physics can now completely enclose and describe psi phenomena. Physics as a relatively late structure created by human experience is limited to some extent to the outer layer of appearances

and does not take into account deeper associations which are likely to exist between its own structure on the one hand and life and human consciousness on the other (Senkowski, 1974).

It is conceivable that physics may be extended. In the light of the phenomena discussed in this paper, it may not only be desirable but even necessary to do so.

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