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## Solar eclipse and animal behaviour

Total eclipse provides an opportunity when the sun's external layers, usually lost in the brilliant glare of the shining surface, can be studied in great detail. This is of great interest to astronomers and astrophysicists. The value of such observations is lucidly described by Prof. M.K.V. Bappu in the Science Today of February, 1980.

The unusual masking of the sun also affects plants and animals. Plants that close up after sunset do so during the eclipse. "Pigeons go to roost, owls and bats come out of hiding and cocks may crow". Personally I do not believe there is a great deal to be learnt by observing such effects. None of it is surprising and similar behaviour might be evoked by a sudden cloudy patch before the sun. Other than the fairly obvious, and perhaps some not so obvious ways in which changes in daylight or temperature might affect plants and animals, there is not much to be gained from such observations. Yet there is a thriving lore of real and supposed effects of solar eclipse on living organisms which seems to attract scientists.

The eclipse of 16th February, 1980 generated a spate of reports on this subject. I have before me a file of news items describing terrestrial effects of solar eclipse and numerous letters and articles sent to Science Today. Most claim to be results of "scientific investigations". A good scientific experiment is designed to test a specific hypothesis and its result either strengthens the hypothesis or excludes it. What if the hypothesis in question is a fear or a superstition? The results of such experiments seem to invariably follow the attitude of the experimenter. Experiments and observations inspired by prejudices and apprehensions are just as likely as not to confirm these in the minds of the observer. This



last point is amply borne out by the material before me. The following U.N.I. report on the 12th of February illustrates the fearful state of mind in which a credulous observer of the eclipse might approach this phenomenon.

"Astro-Tautrik Ramesh Chandra Bhattacharya, President of the All India Astrological and Astronomical Society (AIAAS) said, natural calamities including earthquake and deluge might imperil different parts of the world as the aftermath of the solar eclipse.

A permanent president of the Varanasi Pandit Mahasabha, Mr. Bhattacharya told U.N.I. that India's south, north and north-eastern parts might be rocked by earthquakes followed by storm and heavy floods .... ... the aftermath of the eclipse might trigger off political conflicts and instability in the country besides bloodshed. He said, the effect of the solar eclipse would remain operative for 14 years and the first seven and a half years might be a phase of turmoil and trauma. Under its influence, different diseases specially those relating to lung cancer and asthma might be pronounced!.

Mr. N.K. Agarwal is an engineer working on a new theory of earthquake prediction based on planetary movements. He sent to the Times of India the following rules enjoined by Hindu scriptures.

1. A man should not eat for a few hours before or after the eclipse.
2. A man should take bath in a river during the eclipse.
3. A man not able to take bath in a river should remain indoor and should not be exposed to radiation during the eclipse.  
A pregnant lady should strictly observe this rule.
4. Prayer meetings should take place on the river banks during the eclipse.
5. Needy and disabled people should be helped.
6. Cooked food, exposed to radiation of the eclipse should not be taken.



Mr. Agarwal believes these rules are meant to protect mankind from "some type of waves" coming to the earth and this matter needs investigation. On his own theory a solar eclipse is normally preceded or followed by a major earthquake. It is quite possible, according to Mr. Agarwal, that our ancestors knew about this and they laid down the rule about going to riverbanks to attract masses to open areas. "A man taking bath will be naturally protected from injurious waves coming out at the time of the eclipse and fasting was advised probably to keep the masses active and face any eventuality that might arise".

The bit about the pregnant lady in rule 3 is not an aside. It is widely believed that pregnant women are specially endangered by the eclipse. Derryl D'Monte of Indian Express interviewed a number of gynaecologists. He found that eminent medical men are about evenly divided on this issue. According to a well known Bombay gynaecologist the eclipse could harm a pregnant woman particularly during the first ten weeks of pregnancy. The gynacologist had an explanation.

"The radiation from the sun during the eclipse is not direct and the different strata between the sun and the earth get highly ionised. This is particularly so for the layer directly in contact with the earth. The net result is that the rays emitted are deep penetrating ones like gamma rays and can penetrate the uterus and harm the foetus".

The effects of solar eclipse on earth's atmosphere are described in an article by Dr. A.P. Mitra in Science Today of February, 1980. The eclipse actually cuts down, rather drastically, ionising radiations from the sun. Clearly the eminent gynaecologist did not check up on the physics implied by his theory.

A wild life warden at Udaipur Zoo wrote to say that he had carefully



observed the effect of eclipse on pregnant females of four different species, Neelgai, spotted deer, hare and guinea pigs. There were no effects. "All pregnant animals littered normally and the litters were perfectly healthy". The warden also studied the behaviour of 33 species of birds and mammals during the eclipse and found no change in general behaviour. He noticed that "the animals enjoyed their food during the eclipse".

A scientist at the All India Medical Institute examined the effects of eclipse on the cardiovascular system. He measured heart beat and blood pressure in 74 subjects including foetal heart-beat in two pregnant women and found no significant effect on any of the parameters. In a few persons the heart beat and blood pressure went up a little just before the eclipse and went down just after it, an effect attributable to the expectation that "something is going to happen" and a relaxation after the event. Somewhat similar results were obtained in a study of 38 patients in Kohima but these are described in a press report as "significant changes in the nervous system".

A 20-member medical team in Bangalore announced their plans to conduct intelligence tests "on a group of youth to find out whether the intellectual level of human beings was affected during the period of eclipse". This particular experiment was undertaken because "it was customary to initiate young students in Vedic studies on an eclipse day". The Bangalore doctors also planned to study the gastric secretions of people in the hope that this might throw light upon the common belief about eating during eclipse. We do not know what came of these studies but Dr. Badrinarayan of the Mental Hospital in Dharwar found that "disorderly behaviour among mental patients increased 24 hours before the eclipse". Dr. Badrinarayan



believes that disorderly behaviour among mental patients increases on full moon days but the eclipse-effect was very much stronger.

The numerous reports on the effects of solar eclipse on animal behaviour are often contradictory and nearly always somewhat <sup>ant</sup> ~~grabled~~ and pointless with pretentious emphasis on the electrical or biochemical equipment that was employed to make measurements. Rabbits are said to have developed rashes, guinea pigs gained white <sup>blood</sup> carpuscles and quails were blinded when the sun went into eclipse. Insect cocoons changed colour. An egg resembling a partially eclipsed sun was laid by a hen on 17th February and duly exhibited on Delhi television. According to "scientists" in Bhubaneswar "the little ants were the only living things that remained unaffected" all others including humans, animals and plants experienced the traumatic effects of the eclipse.

Not to be left behind by their colleagues in animal sciences, the botanists made comparable observations on plants. Experiments at the Bose Institute in Calcutta "revealed a considerably higher rate of transpiration and "pulsation" in Gardenia florida and Desmodium gyrans. These "surprising scientific data" according to Indian Science News Association "are expected to lead not only to an understanding of pulsation and ascent of sap but also to fundamental knowledge of plant physiology".

A group at Calcutta University Cytogenetics Department found that "the chromosomes of reproductive and somatic cells of some horticultural and leguminous plants behaved abnormally during the solar eclipse. These <sup>researchers</sup> ~~researches~~ feared that if the irregularities found in the reproductive cells persisted, the plants might produce non-viable seeds". Mercifully the botanists at the Central Arid Zone Research Institute came to the conclusion that the eclipse has no significant effect on plant metabolism and biochemistry.



One might argue that the sample of 'solar eclipse biology' that I have presented is biased and gives undue importance to newspaper versions of amateurish activity. True enough. The only printed material available to us consists of newspaper reports. Several important institutions and organisations were involved in studies on biological effects of solar eclipse. The Bombay Natural History Society, for instance, sent a team to Bastar to observe the behaviour of animals during the eclipse. Several newspaper reports on the work of this team have appeared but one does not yet know, scientifically speaking, what the team learnt. A few research papers on the effects of eclipse have come to me from Indian scientific journals for refereeing. The level of science in these papers does not rise much above that of the newspaper accounts.

In his article <sup>pl?</sup> superstition around eclipse Derryl de Monte (Indian Express 16-2-80) quotes Vivek Montar<sup>eiro</sup>io as follows:

"Most superstitions are based on fear and ignorance - all the more so in poor countries. Superstitions are based upon incorrect inferences from partial information. Superstition is only a small part of irrationality. Illogical beliefs arise out of psychological needs and therefore cannot be studied outside these needs. Giving accurate information is only a part of the fight against superstition. People have to be taught to gain confidence in themselves, in their own ability to think and reason. Superstition can only be eliminated when people begin to laugh at the irrational fears that gave rise to them".

Dr. Montar<sup>eiro</sup>io is very right but the scientific superstitions described here are not those of poor people. No doubt these too arise from fears, insecurities and other psychological needs. One hopes scientists will learn to laugh at their fears. But the nagging question remains, how much of such "fearful science" must we have?