PRISON DISTURBANCES

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This talk described a catastrophe model for prison riots. Since the material is to be published elsewhere [1], I will comment here mainly upon the procedure adopted. For, although it is easy enough to use the cusp-catastrophe to trot out models of human behaviour by the dozen, which may be both illuminating and entertaining, it is however quite another matter to test such models with data. And if catastrophe theory is going to be of any use in the human sciences, then its models must not only offer qualitative insight, but must also be susceptible to quantitative testing. The prison riot model is one of the first to be fitted to data, and although the results are not conclusive - indeed it is only the first crude test - nevertheless it is perhaps worthwhile discussing the procedure, because this might help in other applications, and perhaps stimulate better procedures.

1. Firstly it takes time; we have been discussing this model on and off for about 5 years.

2. Secondly it needs a partnership between a mathematician and a scientist; in this case I was the mathematician and Peter Shapland was the psychologist, and we meet regularly through our families.

3. Thirdly it needs motivation; Shapland is the chief psychologist of the Midland region of the Prison Department, and has some 25 institutions under his care. He was keen to explore any avenue that might help to explain why an institution sometimes explodes, and at other times remains at peace, be

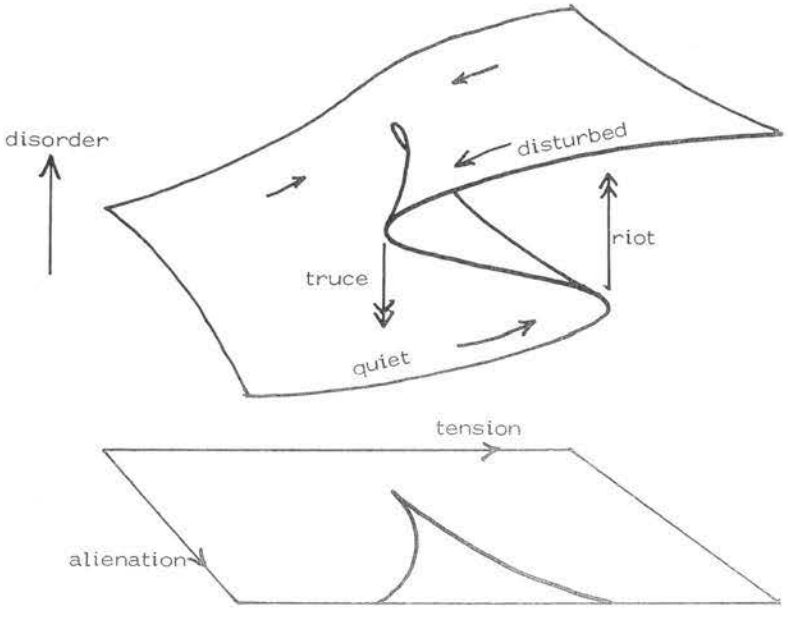
it a prison, a university, or what have you. An explosion is a catastrophic jump in the level of disorder, and so we began to look for a catastrophe model. What are the causal factors?

4. It needs patience to collect data. Shapland decided to look at Gartree prison, which experienced an escalating sequence of incidents during 1972. He asked one of his staff, Chris Hall, to collect as much likely-looking retrospective data as possible. Hall found about 25 indices, such as the numbers of prisoners reporting sick, etc., and collected the 52 weekly totals of each during the year, standardised them, and did a computerised factor analysis. The factor analysis threw up two main factors, which it seemed reasonable to call "tension" and "alienation". The tension factor arose from correlations between sickness, numbers of welfare visits, and numbers of applications to see the governor. The alienation factor arose from a correlation between the numbers of prisoners in the punishment wing, and those who requested segregation (to avoid other prisoners).

5. It needs statistical skill to handle rough data, knowing what weight to attach to various analyses, knowing when to smooth, and when not to despair; for this we called in the expertise of a statistician, Jeff Harrison, who quickly detected the oscillatory nature of the tension compared with the steady growth of alienation (see Figure 2).

6. Then came the building of the model. For this purpose we all assembled together for a day, joined by a third prison psychologist, Hugh Marriage, who had experience of different types of prison populations in other regions. It was very important for us all to meet together for a whole day, because a great many ideas were tried out and rejected, and relatively few passed the stringent test of being acceptable to all the disciplines represented. The psychologists were essential because they could judge from

their expertise which hypotheses were plausible, and which unrealistic, which conclusions were valuable, and which surprising, and they chose carefully the right words to use. The mathematician was essential because frequent questions arose as to what exactly the classification theorem implied, what restrictions it placed, what freedom it permitted, and what predictions would be expected from it - difficult questions to answer without discussing at some length the context in each case. The conclusion of this session was the somewhat innocent looking cusp-catastrophe shown in Figure 1.



Tension was chosen as a normal factor because more tension normally means more disorder. Alienation was chosen as a splitting factor, because the more alienation, the more sudden and violent are likely to be the outbreaks of disorder.

7. The data was plotted in the context of the model, and somewhat to our surprise appeared quite suggestive : see Figure 2. For an analysis see [1]. Let me hasten to add that the cusps drawn in Figure 2 are largely guesswork, because there is insufficient retrospective data to plot a

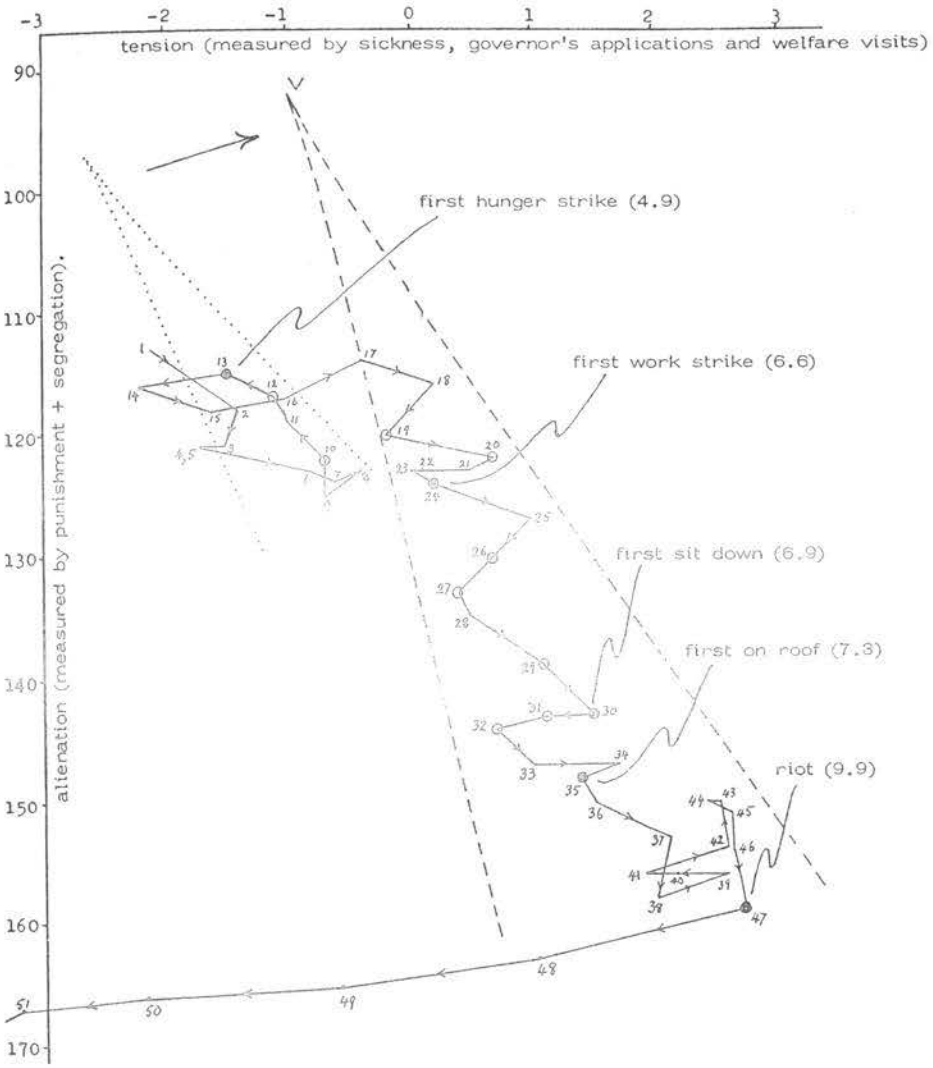


Figure 2. Analysis of Gartree data for 1972. Time path of tension and alienation is plotted weekly throughout the year (numbers indicate weeks). The serious incidents are indicated by circles. The solid circles indicate those incidents involving nearly all the inmates in a new form of mass protest; the numbers in brackets indicate an assessment of seriousness (out of 10). A possible initial position of the cusp is shown dotted and a possible subsequent position is shown dashed; the movement of the cusp may represent a higher tolerance level of tension in the institution after the first mass protest.

3-dimensional graph. Indeed the only measurements of disorder available were the catastrophic jumps, in the escalating sequence of incidents during the year.

8. The rest can be imagined : drafts circulating and being tinkered about with. Another long day together, questioning, reassessing, and polishing What are the conclusions?

9. The model helps to explain the internal dynamics of an institution; and understanding helps one to cooperate with, rather than fight against, the dynamics. For example it suggests why the policy of playing it cool is generally likely to be successful, because a disturbance may cause a gradual release of tension, and therefore suddenly become spent.

10. An on-going monitoring system has been instituted at Gartree, using better measures of the variables, and the information will be used to assist in decision making. Only in this way can the model be tested for predictive accuracy.

REFERENCE

1. E.C. Zeeman, C.S. Hall, P.J. Harrison, G.H. Marriage and P.H. Shapland, A model for institutional disturbances, British Jour. Math. and Stat. Psychology (to appear).