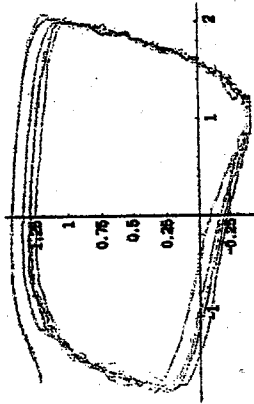
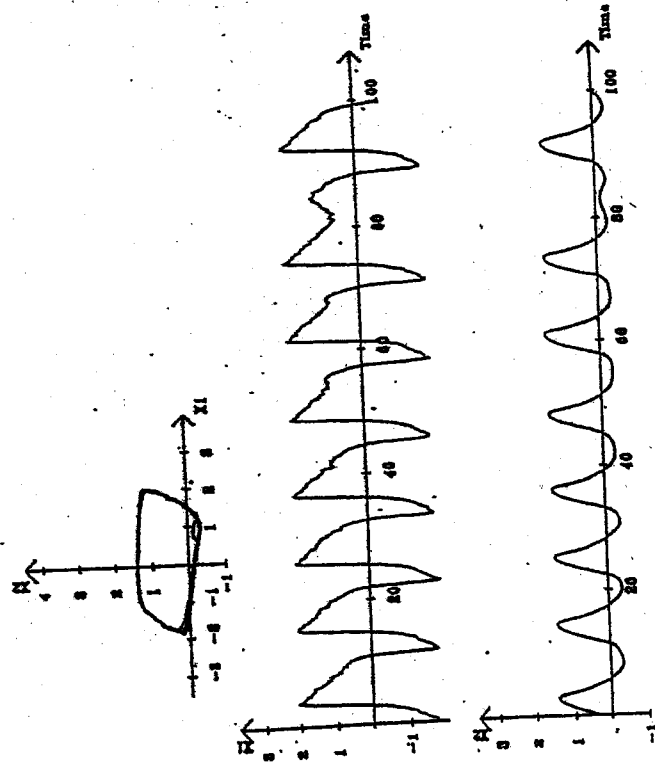


NOISY BONHOEFFER-VAN DER POL OSCILLATOR

- **BONHOEFFER-VAN DER POL MODEL**
 - 2-dimensional simplification of 4-dimensional Hodgkin-Huxley system of ordinary differential equations for modeling firing of a single neuron
 - effects of membrane imperfections and firing of nearby neurons can be simulated by the addition of low intensity noise in the voltage dynamics



KLEPGEN - PLATEN - SCHWIZ, p. 220



Bonhoeffer-Van der Pol oscillator, weak noise $\sigma = 0.1$

NOISY BONHOEFFER-VAN DER POL OSCILLATOR

X^1 = -membrane voltage X^2 = membrane permeability

$$dX_t^1 = c(X_t^1 + X_t^2 - \frac{1}{3}(X_t^1)^3 + z)dt + \sigma dB_t$$

$$dX_t^2 = -\frac{1}{c}(X_t^1 + bX_t^2 - a)dt$$

- **Parameters:** $a = 0.7$, $b = 0.8$, $c = 3.0$, $z = -0.34$
- **Limit cycle with $\sigma = 0$**

Effect of increase in noise

