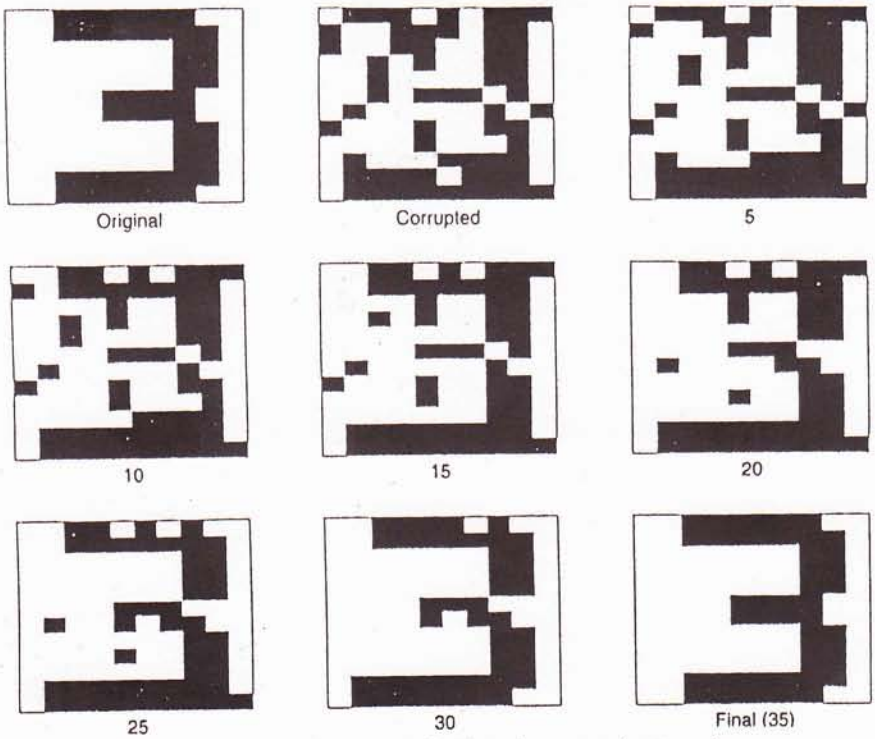

FIGURE 14.18 Correct recollection of corrupted pattern 3.

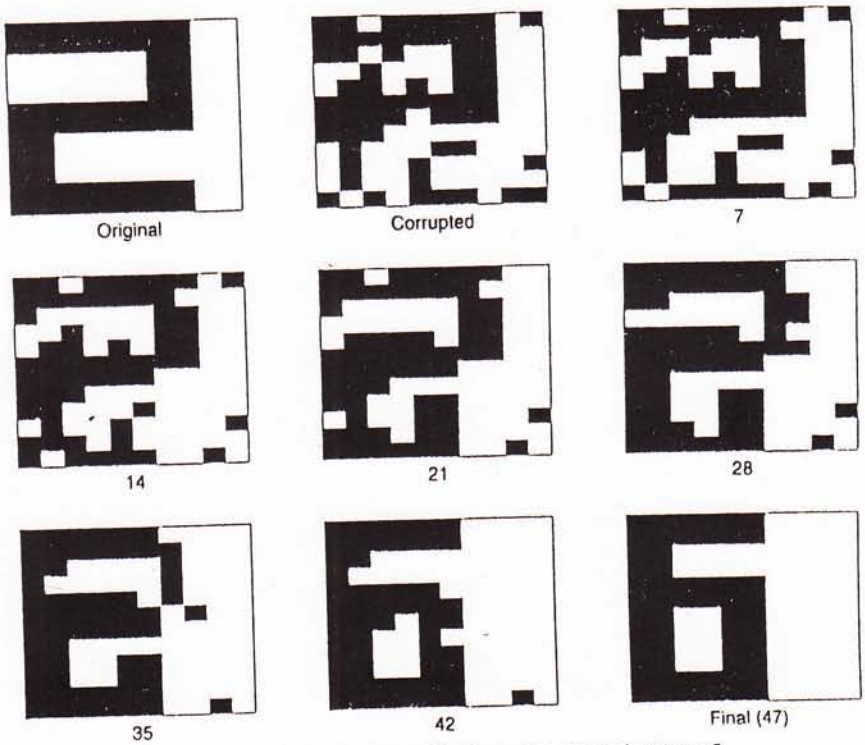

FIGURE 14.19 Incorrect recollection of corrupted pattern 2.

```
To get started, type one of these commands: helpwin, helpdesk, or demo.
For information on all of the MathWorks products, type tour.

» help nnet/nnet

Neural Network Toolbox.
Version 2.0.4  02-Jun-1997

This file displays the commands in the toolbox grouped
by subject or function.  See help for the following
to see the commands in the toolbox grouped by paradigm:

  percept  - Perceptrons.
  linnet   - Linear networks.
  backprop - Backpropagation feed-forward networks.
  elman    - Elman recurrent networks.
  radbasis - Radial basis networks.
  assoclr  - Associative learning rules.
  compnet  - Competitive layers.
  selforg  - Self-organizing maps.
  lvq      - Learning vector quantization networks.
  hopfield - Hopfield recurrent networks.

NETWORK INITIALIZATION FUNCTIONS.
---------------------------------
  initc    - Initialize competitive layer.
  initelm  - Initialize Elman recurrent network.
  initff   - Initialize feed-forward network.
  initlin  - Initialize linear layer.
  initlvq  - Initialize learning vector quantization network.
  initp    - Initialize perceptron layer.
  initrb   - Initialize radial basis network.
  initsm   - Initialize self-organizing map.

NEURAL LAYER LEARNING RULES.
---------------------------------
Backpropagation learning rules.
  learnbp  - Backpropagation learning rule.
  learnbpm - Backpropagation learning rule with momentum.
  learnlm  - Levenberg-Marquardt learning rule.

Associative learning rules
  learnh   - Hebb learning rule.
  learnhd  - Hebb learning rule with decay.
  learnis  - Instar learning rule.
  learnk   - Kohonen learning rule.
  learnlvq - Learning vector quantization learning rule.
  learnos  - Outstar learning rule.

Other learning rules.
  learnp   - Perceptron learning rule.
  learnpn  - Normalized perceptron learning rule.
  learnwh  - Widrow-Hoff learning rule.

MATRIX FUNCTIONS.
---------------------------------
Normalization functions.
  normc    - Normalize columns of matrix.
  normr    - Normalize rows of matrix.
  pnormc   - Pseudo-normalize columns of matrix.

Summing functions.
  sumsqr   - Sum squared elements of matrix.

Neighborhood matrix functions.
  nhdist   - Neighborhood matrix using vector distance
```

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```
  nbgrid   - Neighborhood matrix using grid distance.
  nbman    - Neighborhood matrix using Manhattan distance.

Other functions.
  combvec  - Create all combinations of sets of vectors.
  delaysig - Create delayed signal matrix from signal matrix.
  dist     - Distances between vectors.
  errsurf  - Error surface.
  ind2vec  - Transform indices into single-value vectors.
  quant    - Discretize value as multiple of a quantity.
  vec2ind  - Transform single-value vectors into indices.

PLOTTING FUNCTIONS.
-------------------------------
Plotting errors.
  barerr   - Plot bar chart of errors.
  plotep   - Plot weight and bias position on error surface.
  plotes   - Plot error surface.
  ploterr  - Plot network sum-squared error vs epochs.
  plottr   - Plot error and learning rate over epochs.

Plotting weights and biases.
  hintonw  - Plot graph of weight matrix.
  hintonwb - Plot graph of weight matrix and bias vector.
  plotsm   - Plot weights vectors of self-organizing map.

Plotting vectors.
  plotpv   - Plot input vectors with 1/0 targets.
  plotpc   - Add perceptron classification line to existing plot.
  plotvec  - Plot vectors with different colors.

LAYER WEIGHT AND BIAS RANDOM GENERATORS.
---------------------------------------
General random generators.
  rands    - Symmetric random generator.
  randnc   - Normalized column random generator.
  randnr   - Normalized row random generator.

Transfer function specific random generators.
  nwlog    - Nguyen-Widrow random generator for LOGSIG neurons.
  nwtan    - Nguyen-Widrow random generator for TANSIG neurons.

Not so random generators.
  midpoint - Midpoint value generator.

NETWORK SIMULATION FUNCTIONS.
-------------------------------
  simuc    - Simulate competitive layer.
  simuelm  - Simulate Elman recurrent network.
  simuff   - Simulate feed-forward network.
  simuhop  - Simulate Hopfield network.
  simulin  - Simulate linear layer.
  simulvq  - Simulate learning vector quantization network.
  simup    - Simulate perceptron layer.
  simurb   - Simulate radial basis network.
  simusm   - Simulate self-organizing map.

NETWORK DESIGN FUNCTIONS.
-------------------------------
  solvehop - Design Hopfield network.
  solvelin - Design linear layer.
  solverb  - Design radial basis network.
  solverbe - Design exact radial basis network.

NEURAL NETWORK TRAINING FUNCTIONS.
-------------------------------
```

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```
  trainbp  - Train feed-forward network with backpropagation.
  trainbpa - Train feed-forward network with BP and adaptive learning.
  trainbpm - Train feed-forward network with BP and momentum.
  trainbpx - Train feed-forward network with fast backpropagation.
  trainlm  - Train feed-forward network with Levenberg-Marquardt.

Other training functions.
  trainp   - Train perceptron layer with perceptron rule.
  trainpn  - Train perceptron layer with normalized perceptron rule.
  trainwh  - Train linear layer with Widrow-Hoff rule.
  trainelm - Train Elman recurrent network.
  trainc   - Train competitive layer.
  trainlvq - Train learning vector quantization network.
  trainsm  - Train self-organizing map.

Adaptive training functions.
  adaptwh  - Adapt linear layer with Widrow-Hoff rule.

NEURAL LAYER TRANSFER FUNCTIONS.
--------------------------------
Hard limit transfer functions.
  hardlim  - Hard limit transfer function.
  hardlims - Symmetric hard limit transfer function.

Linear transfer functions.
  purelin  - Linear transfer function.
  satlin   - Saturated linear transfer function.
  satlins  - Symmetric saturated linear transfer function.

Sigmoid transfer functions.
  logsig   - Logistic sigmoid transfer function.
  tansig   - Hyperbolic tangent sigmoid transfer function.

Other transfer functions.
  compet   - Competitive transfer function.
  radbas   - Radial basis transfer function.

Delta functions for calculating derivatives of error.
  deltalin - Delta function for PURELIN neurons.
  deltalog - Delta function for LOGSIG neurons.
  deltatan - Delta function for TANSIG neurons.

OTHER
-------------------------------
  nwaffle  - Neuro-waffle.

»
```

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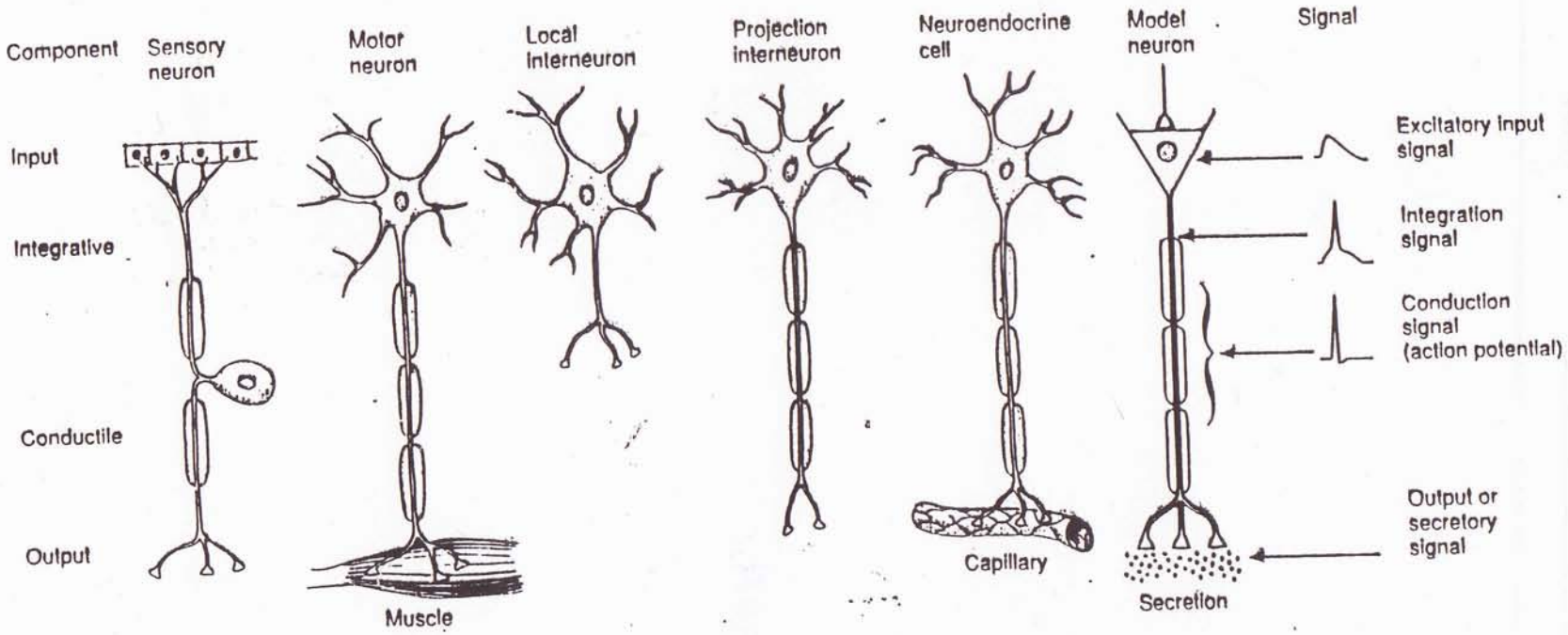
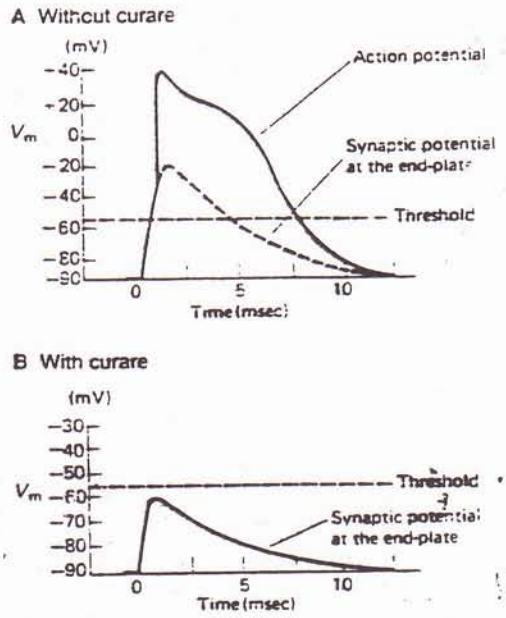
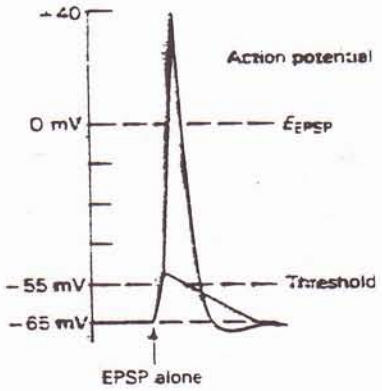

Component
Sensory neuron
Motor neuron
Local interneuron
Projection interneuron
Neuroendocrine cell
Model neuron
Signal
Input
Integrative
Conductile
Output
Muscle
Capillary
Secretion
Excitatory input signal
Integration signal
Conduction signal (action potential)
Output or secretory signal

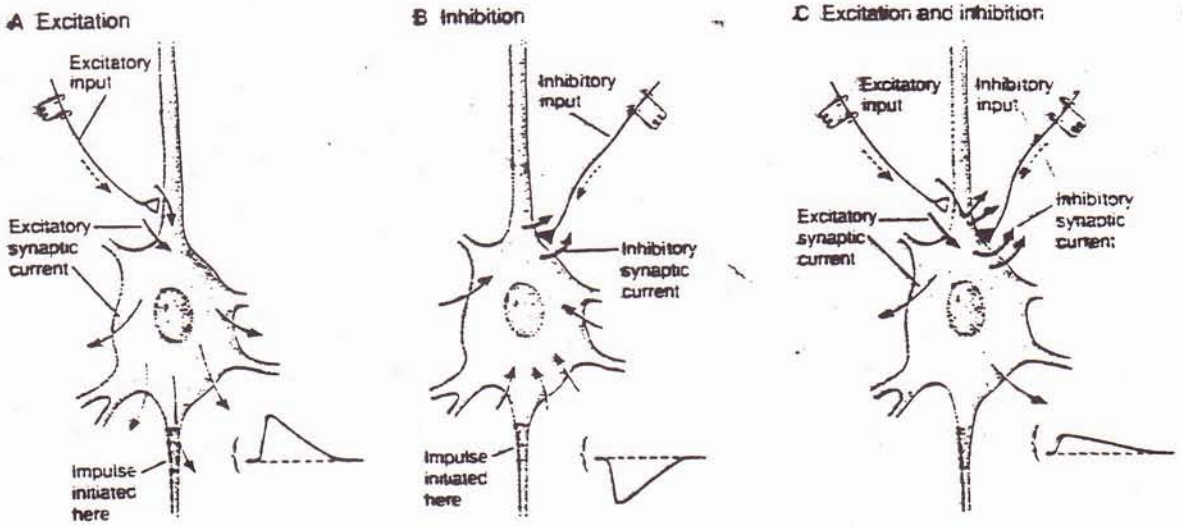
Fitzhugh-Nagumo Denklemleri

$$\frac{dv}{dt} = I - v(v-a)(v-1) - w$$

$$\frac{dw}{dt} = \varepsilon(v - \gamma w)$$







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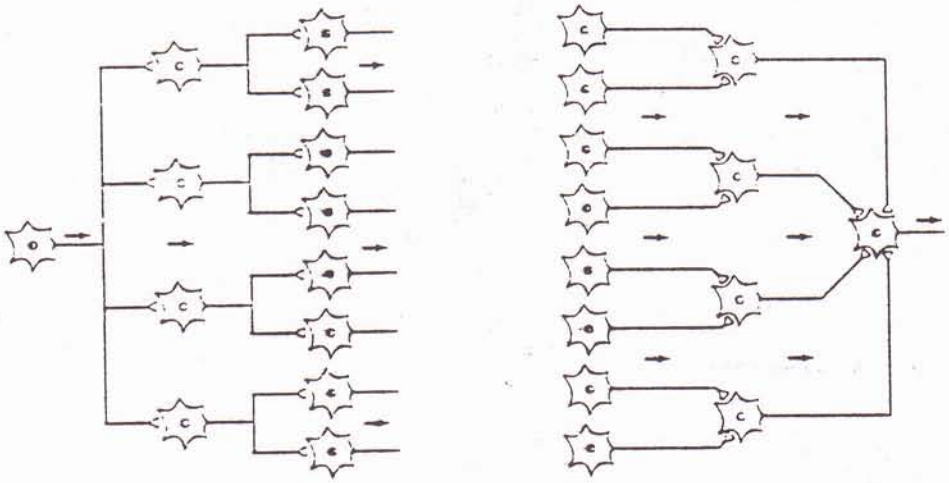
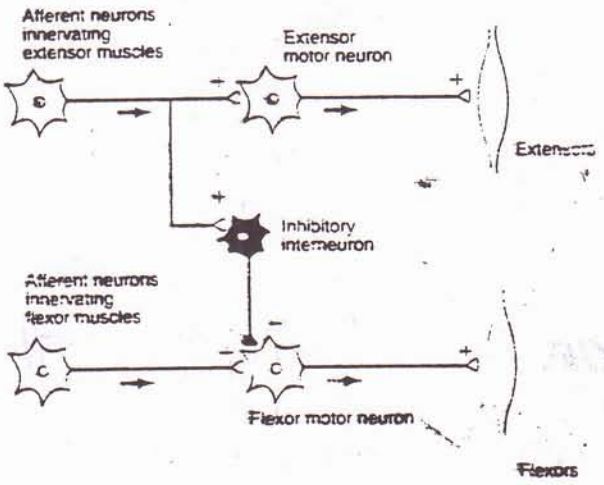
Sinir Hücrelerinin Organizasyonu

A Divergence

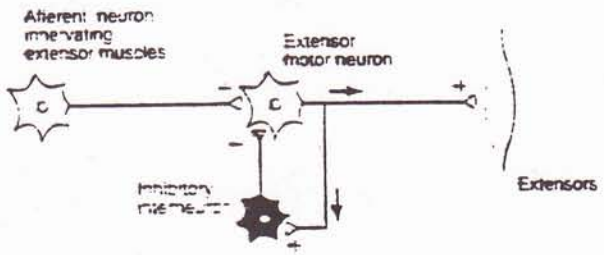
B Convergence



A Feed-forward inhibition



B Feedback inhibition



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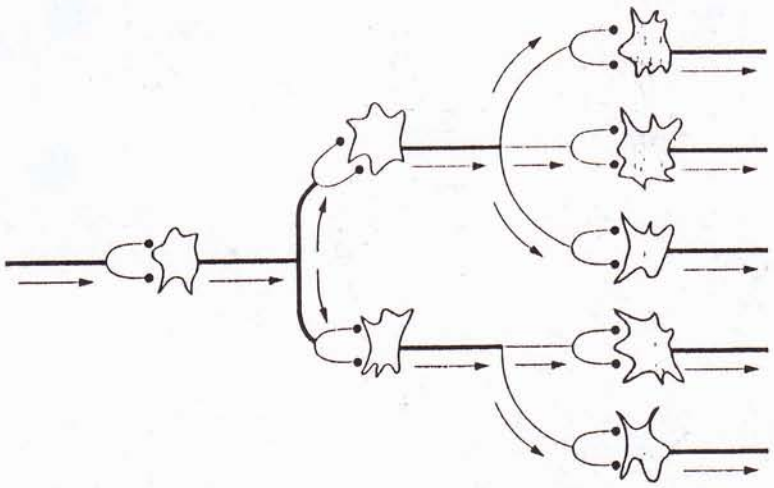


FIGURE 1.8
Divergent connections.

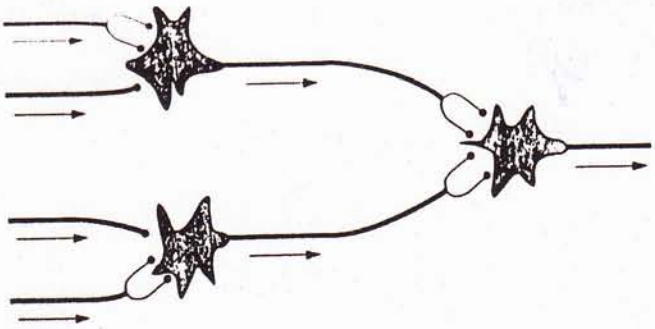
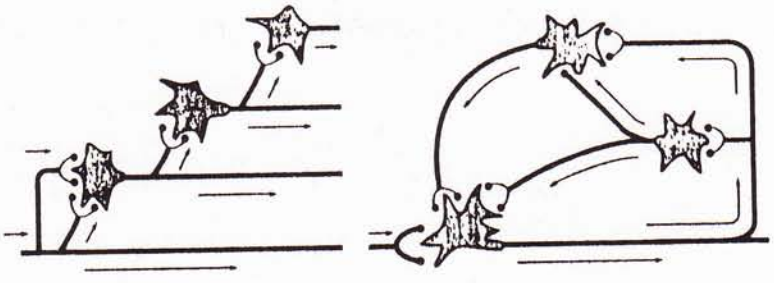


FIGURE 1.9
Convergent connections.



(*a*) (*b*)

FIGURE 1.10
(*a*) Chain and (*b*) loop connections.