WHAT IS CLAIMED IS:

~~1. A radio communications system comprising multiple satellites orbiting the earth in random orbits without attitude control for providing a radio route for data communications between transceivers at two ground station locations, each satellite and ground station comprising a node of the system, wherein each of a plurality of the satellites includes:~~

~~a plurality of satellite antennas for receiving radio signals from a plurality of other nodes and for transmitting radio signals;~~

~~antenna pairing circuitry for storing address information identifying another node from which the satellite received a routing signal and identifying the satellite antenna on which the satellite received the routing signal; and~~

~~route creation circuitry for transmitting routing signals from a plurality of the satellite antennas, wherein the routing signals include (i) linking information identifying the satellite, and (ii) a quality of the received routing signal indicating a suitability of the satellite and the other node as a radio link in the radio route between the two ground station locations.~~

~~2. A system as in claim 1, wherein the satellite antennas are directional antennas.~~

~~3. A system as in claim 2, wherein the satellite antennas are arranged to transmit and receive radio signals over substantially the entire spherical space surrounding each of the satellites.~~

~~4. A system as in claim 2, wherein the satellite antennas are arranged to transmit and receive radio signals over less than the entire spherical space surrounding each of the satellites.~~

~~5. A system as in claim 1, wherein the satellite nodes are designated as a first type and the ground station nodes are designated as a second type, and the two types of nodes do not communicate with each other.~~

~~6. A system as in claim 1, wherein the routing signals comprise packets of digital data transmitted from the nodes, each packet including;~~

~~a header containing the linking information and the quality of the received routing signal; and~~

~~a payload including a sample data stream used by another node receiving a routing signal to determine the quality of the routing signal received from the satellite.~~

~~7. A system as in claim 6, wherein the quality of the receiving routing signal is expressed as a quantitative figure of merit based at least in part on an error rate of the sample data stream.~~

~~8. A system as in claim 1, wherein each of the plurality of the satellites further includes a plurality of solar panels, wherein at least one solar panel is oriented to generate electricity regardless of satellite orientation when the satellite is exposed to solar radiation during its orbit.~~

~~9. A system as in claim 8, wherein each of the plurality of the satellites further includes a battery module for providing electrical power to the satellite antennas, antenna pairing circuitry, and route creation circuitry, the battery module being charged by the at least one solar panel when the satellite is exposed to solar radiation during its orbit.~~

~~10. A system as in claim 8, wherein the solar panels are constructed to cause the satellites to tumble in orbit.~~

~~11. A method for creating a radio communication route for data communications from a receiving ground station to a sending ground station, wherein the ground stations include a plurality of ground station directional antennas for transmitting and receiving radio signals, the method comprising:~~

~~(a) providing multiple satellites orbiting the earth in random orbits without attitude control, wherein each of a plurality of the satellites includes a plurality of satellite directional antennas for transmitting and receiving radio signals;~~

~~(b) receiving at a satellite antenna of at least one satellite an initial information signal transmitted from an antenna at a sending ground station;~~

~~(c) storing at any satellite receiving the initial information signal at least (i) address information identifying the ground station from which the initial information signal was received, and (ii) the satellite antenna on which the initial information signal was received;~~

(d) transmitting linking information signals from a plurality of the antennas of at least one satellite receiving the initial information signal, wherein the linking information signals include (i) linking information identifying the satellite, and (ii) a quality of the received initial information signal indicating a suitability of the satellite and the sending ground station as a radio link in a radio route between the ground stations; and

(e) storing at a receiving ground station receiving at least one linking information signal (i) address information identifying the satellite transmitting the linking information signal, (ii) the receiving ground station antenna on which the linking information signal was received, and (iii) a quality of the initial information signal received at the satellite transmitting the linking information signal; and

(f) determining a quality of a radio route for data communications from the receiving ground station to the sending ground station via a particular satellite based on (i) a quality of the received linking information signal indicating a suitability of the receiving ground station and the particular satellite as a radio link in a radio route between the ground stations, and (ii) the quality of the initial information signal.

12. A method as in claim 11, wherein the satellites are designated as a first type of node and the ground stations are designated as a second type of node, and the two types of nodes do not communicate with each other.

13. A method as in claim 12 further including sending a data transmission from the originating ground station to the destination ground station, wherein the first type of node only transmits radio signals in a first mode and only receives radio signals in a second mode that substantially eliminates interference with transmissions in the first mode, and the second type of node only receives radio signals in the first mode and only transmits radio signals in the second mode.

14. A method as in claim 11, wherein:

~~the initial information signal comprises packets of digital data including a header containing at least the sending ground station address information and a payload including a sample data stream used by the satellite to determine the quality of the received initial information signal; and~~

~~the linking information signal comprises packets of digital data including a header containing at least the linking information and the quality of the received initial information signal and a payload including a sample data stream used by the receiving ground station to determine the quality of the received linking information signal.~~

~~15. A method as in claim 14, wherein the qualities of the initial information signal received by the satellite and the linking information signal received by the receiving ground station are expressed as quantitative figures of merit based at least in part on an error rate of the respective sample data streams.~~

~~16. A method as in claim 15 further including communicating a data transmission comprising packets of digital data from an origin comprising a receiving ground station to a destination comprising a sending ground station, each data transmission packet including a header including the address information of the destination and a payload including a data stream representing the content of the transmission, wherein:~~

~~the origin transmits the packet of digital data to the particular satellite using the receiving ground station antenna on which the linking information signal was received; and~~

~~the particular satellite transmits the packet of digital data transmission to the destination using the antenna of the particular satellite on which the initial information signal was received.~~

~~17. A method as in claim 16, wherein the data transmission includes a plurality of packets and the header includes sequence information indicating the original order of the packets comprising the content of the transmission, the radio route from the origin to the destination uses different satellites during the data transmission, and the destination uses the sequence information to place the packets in the original order.~~

~~18. A method as in claim 11, wherein the satellite antennas are arranged to transmit and receive radio signals over substantially the entire spherical space surrounding the satellites and the ground station antennas are arranged to transmit and receive radio signals over substantially the entire spherical space above the surface of the earth surrounding the ground stations.~~

~~19. A method as in claim 11, wherein the satellite antennas are arranged to transmit and receive radio signals over less than the entire spherical space surrounding each of the satellites.~~

~~20. A method as in claim 11, wherein the determining step is performed by the receiving ground station without a central computer communicating with the satellites or other ground stations.~~

~~21. A method as in claim 11, further comprising deploying the satellites with a rotational velocity about an axis of rotation.~~

~~22. A radio communication route for data communication from an originating ground station to a destination ground station, the route comprising at least one of multiple satellites orbiting the earth without attitude control in random orbits that communicate with the ground stations, each including a plurality of directional antennas for receiving radio signals from multiple directions and transmitting radio signals in multiple directions, wherein the satellite includes:~~

~~a plurality of directional antennas for receiving radio signals from multiple directions and transmitting radio signals in multiple directions;~~

~~antenna pairing circuitry for storing address information identifying a destination ground station from which an initial information signal was transmitted and antenna information identifying the satellite antenna on which the initial information signal was received; and~~

~~route creation circuitry for transmitting linking information signals from a plurality of the satellite antennas, the linking information signals including linking information identifying the satellite to an originating ground station receiving the linking information signal on one of the ground station antennas, whereby data transmissions received at the originating ground station and designating a particular destination ground station are transmitted by the originating ground~~

station using the ground station antenna on which the linking information was received and the satellite transmits the data transmission using the satellite antenna identified by the stored antenna information.

23. A radio communication route as in claim 22 including plural satellites, wherein:

the antenna pairing circuitry in a first satellite stores address information identifying a destination ground station from which it received an initial information signal and first satellite antenna information identifying the antenna of the first satellite on which the initial information signal was received;

the route creation circuitry in the first satellite transmits intermediate linking information signals from a plurality of the antennas of the first satellite, the first linking information signals including first linking information identifying the first satellite to an n^{th} satellite receiving the first linking information signal;

the antenna pairing circuitry in the n^{th} satellite stores (i) address information identifying the first satellite, and (ii) n^{th} satellite antenna information identifying the antenna of the n^{th} satellite on which the first linking information signal was received;

the route creation circuitry in the n^{th} satellite transmits n^{th} linking information signals from a plurality of the antennas of the n^{th} satellite, the n^{th} linking information signals including n^{th} linking information identifying the n^{th} satellite, whereby data transmissions received at the originating ground station and designating a particular destination ground station are transmitted by the originating ground station using the antenna on which the linking information was received, the n^{th} satellite transmits the data transmission data using the antenna identified by the stored antenna information, and the first satellite transmits the data transmission data using the antenna identified by the stored first satellite antenna information.

24. A radio communication route as in claim 22, wherein:

~~a first predetermined number of the satellites are designated as a first type of node and the ground stations are designated as a second type of node, and the two types of nodes do not communicate with each other; and~~

~~at least one satellite is designated as the second type of node.~~

~~25. A method using the radio route of claim 22 to transmit data communications from the originating ground station to a destination ground station, the method comprising:~~

~~providing to the originating ground node a data transmission designating the address of the destination station in encrypted form and a payload including a data stream representing the content of the transmission; and~~

~~only destination ground stations in the geographic area include decryption keys enabling access to the data stream.~~

~~26. A radio communication route as in claim 22, comprising a first intermediate radio route between the destination ground station and an intermediate ground station via a first satellite and a second intermediate radio route between the intermediate ground station and the originating ground station via a second satellite.~~

~~27. A radio communication route as in claim 22, wherein:~~

~~the satellites rotate about a rotational axis; and~~

~~each of the plurality of the satellites further includes a plurality of solar panels constructed to impart a moment on the satellite about the rotational axis.~~

~~28. A method using the radio route of claim 27 to transmit communications from the originating ground station to a destination ground station, the method comprising:~~

~~providing a data transmission comprising packets of digital data to the originating ground node, each data transmission packet including a header designating the address of the destination station in encrypted form and a payload including a data stream representing the content of the transmission; and~~

~~only destination ground stations in the geographic area include decryption keys enabling access to the data stream.~~

~~29. A radio communication route as in claim 22, wherein the satellite antennas are arranged to transmit and receive radio signals over substantially the entire spherical space surrounding each satellite.~~

~~30. A radio communication route as in claim 22, wherein the satellite antennas are arranged to transmit and receive radio signals over less than the entire spherical space surrounding each satellite.~~

~~31. A method of transmitting data from an originating ground station to a destination ground station via a radio route including one or more rotating satellites orbiting the earth in random orbits, the method comprising forwarding a data communication for transmission by the originating ground station, wherein the data communication includes address information identifying the destination ground station.~~

~~32. A method as in claim 31, wherein the radio route includes only one satellite.~~

~~33. A method as in claim 31, wherein a predetermined plurality of the satellites rotate in a first direction about a rotational axis and a second predetermined plurality rotate in a second direction about a rotational axis.~~

~~34. A method as in claim 33, wherein predetermined pluralities of the satellites rotate at different angular velocities.~~

1. A radio communications system capable of providing a radio route for transmitting data between plural system nodes including multiple orbiting satellite nodes, wherein:

at least one of said multiple orbiting satellite nodes comprises a rotating satellite node that during each orbit rotates continuously through plural revolutions about a rotational axis passing through said orbiting satellite node;

each of a number of said orbiting satellite nodes includes a plurality of satellite antennas having separate identities for transmitting and receiving radio signals in a plurality of different

directions, route creation circuitry for transmitting routing messages to and receiving routing messages transmitted from other system nodes, and data transmission circuitry for transmitting data to other system nodes;

said route creation circuitry of a said rotating satellite node determines a value of a parameter associated with a routing message received by said rotating satellite node from another system node, the value of the parameter indicating the suitability of including said rotating satellite node as a link in a radio route for transmitting the data to the other system node; and

said data transmission circuitry of the said rotating satellite node transmits the data to the other system node using a satellite antenna selected by said route creation circuitry of the said rotating satellite node based at least in part on the value of the parameter associated with a routing message received on said satellite antenna.

2. The radio communications system in claim 1, wherein:

said other system node is an initiating ground node with at least one ground station antenna for transmitting and receiving radio signals;

the route creation circuitry of the said rotating satellite node transmits on at least one said satellite antenna a further routing message incorporating a parameter value associated with an initial routing message received from said initiating ground node; and

the route creation circuitry in a further system node that receives said further routing message determines the value of said parameter associated with said received further routing message and determines a combined parameter value based on said value and the parameter value incorporated in said received further routing message, said combined parameter value indicating the suitability of including said further system node and the said rotating satellite node as a radio link for transmitting the data to said initiating ground node; and

said data transmission circuitry of said further system node transmits the data to said rotating satellite node using a satellite antenna selected by said route creation circuitry of said

further system node based at least in part on the value of the combined parameter associated with a routing message received on said satellite antenna.

3. The radio communications system in claim 2, wherein:

said further system node is a receiving ground node, said receiving and initiating ground nodes including a plurality of directional ground station antennas having separate identities for transmitting and receiving radio signals in a plurality of different directions;

said receiving ground node includes antenna pairing circuitry for associating the identities of each of a plurality of said directional ground station antennas receiving a further routing message from one of said orbiting satellite nodes and for storing the identity of each ground station directional antenna associated with said value of the combined parameter of a corresponding further routing message; and

said data transmission circuitry of said receiving ground node transmits the data using the stored antenna associated with the highest value combined parameter.

4. The radio communications system in claim 3, wherein said value is a quantitative figure of merit, a higher value of which indicates a higher suitability as a radio link comprising a system node receiving a routing message and a system node sending the routing message.

5. The radio communications system in claim 4 wherein:

said combined parameter value is determined by an algorithm from the figures of merit of said received further routing message and the figure of merit incorporated in said received further routing message; and

said antenna pairing circuitry only stores antenna identities associated with figures of merit higher than a predetermined threshold.

6. The radio communications system in claim 3, wherein:

said orbiting satellite nodes are designated as a first type of node and said ground nodes are designated as a second type of node; and

nodes of the same type cannot communicate with each other.

7. The radio communications system in claim 3, wherein:

said route creation circuitry of said initiating ground node sends from a plurality of said ground station antennas initial routing messages including an address uniquely identifying a particular said initiating ground node;

said route creation circuitry of each orbiting satellite node receiving an initial routing message associates the address of the initiating ground node with the satellite antenna that received the initial routing message and transmits from a plurality of its antennas said further routing messages including the address of the initiating ground node that sent the initial information signal;

said antenna pairing circuitry of a said receiving ground node associates each said further routing message and said initiating ground node address included therein with the stored identity of the receiving ground antenna that received the further routing message; and

said data transmission circuitry of said receiving ground node transmits data addressed to a particular ground node using the stored ground station antenna associated with said particular ground node.

8. The radio communications system in claim 1, wherein the parameter is one of signal strength, signal-to-noise ratio, and an error rate of a sample data stream included in a said routing message.

9. The radio communications system in claim 1 wherein said satellite antennas comprise directional antennas for transmitting and receiving radio signals in a plurality of directions.

10. The radio communications system in claim 9, wherein said satellite antennas comprise parabolic antennas with the mouths thereof recessed below a surface of said orbiting satellite node surrounding said mouth.

11. The radio communications system in claim 9, wherein said satellite antennas are constructed to transmit and receive radio signals in multiple directions around at least some of the spherical space surrounding the orbiting satellite nodes.

12. The radio communications system in claim 11, wherein the orbiting satellite nodes travel in orbital paths located randomly relative to each other without attitude control.

13. The radio communications system in claim 1, wherein said system nodes are designated as one of a first type for transmitting data on a first set of frequencies and receiving data on a second set of frequencies and a second type for transmitting data on the first set of frequencies and receiving data on the second set of frequencies.

14. The radio communications system in claim 1, wherein each of a plurality of said multiple orbiting satellite nodes comprises a said rotating satellite node that during each orbit rotates continuously through plural revolutions about a rotational axis passing through said satellite node.

15. The radio communications system in claim 14 wherein said orbiting satellite nodes travel in orbital paths located randomly relative to each other without attitude control.

16. The radio communications system in claim 14, wherein a first number of the plurality of orbiting satellite nodes rotates at a first predetermined angular velocity and a second number of the plurality of orbiting satellite nodes rotates at a second predetermined angular velocity.

17. The radio communications system in claim 14, wherein at least some of said plurality of rotating satellite nodes rotate through plural revolutions in opposite directions about substantially parallel rotational axes passing through said rotating satellite nodes.

18. The radio communications system in claim 1, wherein said at least one rotating satellite node rotates at a predetermined angular velocity.

19. A radio communications system capable of providing a radio route for transmitting data between plural system nodes including multiple orbiting satellite nodes that travel in uncontrolled orbital paths, wherein:

at least one of said multiple orbiting satellite nodes comprises a rotating satellite node that during each orbit rotates continuously through plural revolutions about a rotational axis passing through said orbiting satellite node;

each of a number of said orbiting satellite nodes includes a plurality of satellite antennas having separate identities for transmitting and receiving radio signals in a plurality of different directions, route creation circuitry for transmitting routing messages to and receiving routing messages transmitted from other system nodes, and data transmission circuitry for transmitting data to other system nodes;

said route creation circuitry of a said rotating satellite node determines a value of a parameter associated with a routing message received by said rotating satellite node from another system node, the value of the parameter indicating the suitability of including said rotating satellite node as a link in a radio route for transmitting the data to the other system node; and

said data transmission circuitry of the said rotating satellite node transmits the data to the other system node using a satellite antenna selected by said route creation circuitry of the said rotating satellite node based at least in part on the value of the parameter associated with a routing message received on said satellite antenna.

20. The radio communications system in claim 19, wherein:

said other system node is an initiating ground node with at least one ground station antenna for transmitting and receiving radio signals;

the route creation circuitry of the said rotating satellite node transmits on at least one said satellite antenna a further routing message incorporating a parameter value associated with an initial routing message received from said initiating ground node; and

the route creation circuitry in a further system node that receives said further routing message determines the value of said parameter associated with said received further routing message and determines a combined parameter value based on said value and the parameter value incorporated in said received further routing message, said combined parameter value indicating the suitability of including said further system node and the said rotating satellite node as a radio link for transmitting the data to said initiating ground node; and

said data transmission circuitry of said further system node transmits the data to said rotating satellite node using a satellite antenna selected by said route creation circuitry of said further system node based at least in part on the value of the combined parameter associated with a routing message received on said satellite antenna.

21. The radio communications system in claim 20, wherein:

said further system node is a receiving ground node, said receiving and initiating ground nodes including a plurality of directional ground station antennas having separate identities for transmitting and receiving radio signals in a plurality of different directions;

said receiving ground node includes antenna pairing circuitry for associating the identities of each of a plurality of said directional ground station antennas receiving a further routing message from one of said orbiting satellite nodes and for storing the identity of each ground station directional antenna associated with said value of the combined parameter of a corresponding further routing message; and

said data transmission circuitry of said receiving ground node transmits the data using the stored antenna associated with the highest value combined parameter.

22. The radio communications system in claim 21, wherein said value is a quantitative figure of merit, a higher value of which indicates a higher suitability as a radio link comprising a system node receiving a routing message and a system node sending the routing message.

23. The radio communications system in claim 22, wherein:

said combined parameter value is determined by an algorithm from the figures of merit of said received further routing message and the figure of merit incorporated in said received further routing message; and

said antenna pairing circuitry only stores antenna identities associated with figures of merit higher than a predetermined threshold.

24. The radio communications system in claim 21, wherein:

said orbiting satellite nodes are designated as a first type of node and said ground nodes are designated as a second type of node; and

nodes of the same type cannot communicate with each other.

25. The radio communications system in claim 21, wherein:

said route creation circuitry of said initiating ground node sends from a plurality of said ground station antennas initial routing messages including an address uniquely identifying a particular said initiating ground node;

said route creation circuitry of each orbiting satellite node receiving an initial routing message associates the address of the initiating ground node with the satellite antenna that received the initial routing message and transmits from a plurality of its antennas said further

routing messages including the address of the initiating ground node that sent the initial information signal;

said antenna pairing circuitry of a said receiving ground node associates each said further routing message and said initiating ground node address included therein with the stored identity of the receiving ground antenna that received the further routing message; and

said data transmission circuitry of said receiving ground node transmits data addressed to a particular ground node using the stored ground station antenna associated with said particular ground node.

26. The radio communications system in claim 19, wherein the parameter is one of signal strength, signal-to-noise ratio, and an error rate of a sample data stream included in a said routing message.

27. The radio communications system in claim 19, wherein said satellite antennas comprise directional antennas for transmitting and receiving radio signals in a plurality of directions.

28. The radio communications system in claim 27, wherein said satellite antennas comprise parabolic antennas with the mouths thereof recessed below a surface of said orbiting satellite node surrounding said mouth.

29. The radio communications system in claim 27, wherein said satellite antennas are constructed to transmit and receive radio signals in multiple directions around at least some of the spherical space surrounding the orbiting satellite nodes.

30. The radio communications system in claim 29, wherein the orbiting satellite nodes travel in orbital paths located randomly relative to each other without attitude control.

31. The radio communications system in claim 19, wherein said system nodes are designated as one of a first type for transmitting data on a first set of frequencies and receiving data on a second set of frequencies and a second type for transmitting data on the first set of frequencies and receiving data on the second set of frequencies.

32. The radio communications system in claim 19, wherein each of a plurality of said multiple orbiting satellite nodes comprises a said rotating satellite node that during each orbit rotates continuously through plural revolutions about a rotational axis passing through said satellite node.

33. The radio communications system in claim 32, wherein said orbiting satellite nodes travel in orbital paths located randomly relative to each other without attitude control.

34. The radio communications system in claim 32, wherein a first number of the plurality of orbiting satellite nodes rotates at a first predetermined angular velocity and a second number of the plurality of orbiting satellite nodes rotates at a second predetermined angular velocity.

35. The radio communications system in claim 32, wherein at least some of said plurality of rotating satellite nodes rotate through plural revolutions in opposite directions about substantially parallel rotational axes passing through said rotating satellite nodes.

36. The radio communications system in claim 19, wherein said at least one rotating satellite node rotates at a predetermined angular velocity.