station 120 and the receiver 250 is in one-way wireless communication with the satellite 130. The use of the transceiver 220 and the receiver 250 is advantageous in that the portable unit 100 generally consumes less energy. GPS frequencies tend to be relatively high and sending information over such frequencies by the portable unit 100 via the transceiver 220 can be energy intensive. This embodiment contemplates the receiver 250 being adapted for receiving at high frequencies and the transceiver 220 being adapted for receiving and sending at lower frequencies. The sending of information over lower frequencies by the transceiver 220 results in less energy consumption by the portable unit 100.

The at least one sensor 240 is adapted to monitor acoustic, thermal, mechanical, chemical, electrical and/or electromagnetic parameters, for example, related to human biological parameters including, for example, temperature, heart rate, blood flow rate, muscular activity, respiratory rate, and/or brain activity of the person being monitored. The conversion of acoustic, thermal, mechanical, chemical, electrical and/or electromagnetic parameters into electrical signals, for example, is understood by one of ordinary skill in the art and is not detailed further.

The microchip 210 includes the processing unit 260 and the information storage device 270 in an embodiment according to the present invention. The processing unit 260 may include, for example, a microprocessor, a cache, input terminals and output terminals. The processing unit 260 may include an information storage device which includes an electronic memory which may or may not include the cache of the processing unit 260.

In operation, according to at least one embodiment of the present invention, the receiver 250 receives GPS data from the satellite 130. The GPS data is received by the microchip 210 and, in particular, the processing unit 260. Although the GPS data is continuously received by the receiver 250, the processing unit 260 may periodically or aperiodically (i.e., via manual intervention or as a function of circumstance, for example) receive the GPS data. The GPS data may then be processed in the processing unit 260 which may include determining the physical location of the person 110 being monitored. The GPS data and/or the determined physical location are stored in the information storage device 270.

The at least one sensor 240 senses biological parameters of the person 110. These biological parameters are converted into electrical signals by the at least one sensor 240 and received by the processing unit 260. The sensing of biological parameters by the at least one sensor 240 may be a periodic or an aperiodic function (i.e., triggered by a request from the processing unit 260 or as a function of circumstance, for example). The processing unit 260 may process the electrical signals by converting them into information relating to, for example, a measure of temperature, heart rate, blood flow rate, muscular activity, respiratory rate, and/or brain activity. The processing unit 260 stores the processed and/or unprocessed electrical signals in the information storage device 270. The transceiver 220 receives the interrogation signal, for example, from the ground station 120. The transceiver 220 then sends the interrogation signal to the microchip 210, in particular, to the processing unit 260. Upon receiving the interrogation signal the processing unit 260 uploads the information stored in the information storage device onto the transceiver 220. The transceiver then sends the uploaded information to the ground station 120.

In another embodiment according to the present invention, the microchip is activated only when the transceiver 220 receives the interrogation signal from the ground station 120. This embodiment has an advantage in that energy consumption is minimized. Upon receiving the interrogation signal, the processing unit 260 accepts data from the receiver 250 and the at least one sensor 240. The processing unit 260 may accept the data over a time interval to achieve more precise data or to develop a history of data. Such data may be processed and/or stored in the information storage device 270. Upon completion of the processing and/or storing of the data, the information contained in the information storage device is uploaded onto the transceiver 220 and transmitted to the ground station 120. After completing the transmission of the uploaded data via the transceiver 220, the processing unit 260 is no longer active in receiving, processing and/or storing information until the next interrogation signal is received from the ground station.

In another embodiment according to the present invention, the transceiver 220, without the optional receiver 250, is adapted to receive the GPS data from the satellite 130 and the interrogation signal from the ground station 120. Furthermore, the transceiver 220 transmits information from the processing unit 260 to the ground station. Operation is similar as described above.

The information storage device 270 may also store preset information relating to identification, personal information or special medical information, for example. This information may have been programmed before the coupling of the portable device 100 to the person 110. Alternatively, the information may have been transmitted to the portable device 100 after the portable device 100 was coupled to the person 110. Such information may include the person's name, home address, phone number and/or a listing of relatives to contact in case of emergency. Furthermore, the information permanently stored in the portable device 100 may relate to special medical information such as allergies to medication or that the patient is diabetic or asthmatic, for example. All of this information may be uploaded onto the transceiver 220 and transmitted to the ground station 120. Such information may be of special significance to medical personnel when the person is disoriented or unconscious and unable to communicate.

FIGS. 3–8 illustrate exemplary embodiments of the self-recharging battery 230 according to the present invention. A self-recharging battery 230 is advantageous in a method and a system for remote monitoring.

FIG. 3 illustrates an embodiment of the self-recharging battery 230 according to the present invention. The self-recharging battery 230 includes a photocell 310, a recharging cell 320 and a battery cell 330. The photocell 310 is disposed proximately to a skin surface 340 of the person 110. In the illustrated example, the photocell 310 is just under the skin surface 340. The photocell 310 is coupled to the recharging cell 320. In one embodiment, the recharging cell is a capacitor. The recharging cell 320 is coupled to the battery cell 330. The battery cell 330 is coupled to and powers the microchip 210.

In operation, ambient light 350 (e.g., environmental light, natural light) penetrates the skin surface 340. The ambient light 350 is absorbed by the photocell 310. In response to the ambient light 350 being absorbed by the photocell 310, the photocell 310 generates a potential difference (e.g., a voltage) across the recharging cell 320. The recharging cell 320 stores charge which, in turn, is used to recharge the battery cell 330.

FIG. 4 illustrates another embodiment of the self-recharging battery 230 according to the present invention. The self-recharging battery 230 includes a transducer 410,