the
biopump
solution

Man's inventive mind masters all material problems.

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The world of science, like the world in general, has been plagued in recent years by shortages of energy, funding, and respectable employment for those of little education and few skills, as well as by excesses of bureaucrats. Expensive, energy-intensive research is now more difficult than ever to perform, partly because costs are higher now than ever before and partly because few foundations are now conspicuous consumers; the scientific amateur has gone the way of the dodo; and both problems are complicated by the proliferation of local, state, and federal agencies and their requirements that would-be researchers show degrees, certificates, permits, licenses, and funding before being either allowed to work or allowed to publish.

It is, however, possible to avoid all these problems. The human race is beginning to realize that the key to an ecologically sound future is the concept of *zero growth.* That of *progress* must be abandoned, at least in the sense that it means an ever-growing strain on our resources. We must make better use of our present resources by recycling materials, increasing the efficiencies of our machines, and exploiting hitherto neglected sources of energy.

One of the latter, and one whose exploitation could ease all of the above-mentioned problems, is the phenomenon of *peristalsis.* This phenomenon is used by all the higher members of the animal kingdom for the movement of liquids, slurries, and small solid fragments, but it has so far been tapped commercially only in the design and use of small peristaltic pumps for biomedical applications. These mechanical pumps, however, suffer from two drawbacks in that they (1) handle only small quantities (a maximum of less than three liters per minute as, for example, the pumps produced by Harvard Apparatus), and (2) require a continuous energy supply apart from that required to maintain their operators.

Each of these drawbacks may now be defeated with a new device, henceforth called the Biopump. (It has not yet been built, but anyone who wishes to try may feel free to do so, and patent it as well, if he wishes, as long as he makes the proper acknowledgements.) It can achieve flow rates of well over three liters per minute (estimate based on the observation that I can swallow 200 milliliters in four seconds), and it requires no external energy input. The latter benefit is of particular significance during these days of an energy shortage and means that use of the Biopump will not be affected by brownouts, blackouts, or strikes. It also means that use of the Biopump will not adversely affect the ecology of any region in which it is used.

The Biopump consists of a flexible, thin plastic tube, one end of which is equipped with an input hose-fitting and one end of which expands into a bulbous reservoir with a second hose-fitting placed to one side. The latter fitting couples the reservoir to a tube of a heavier-gauge plastic which ends in an output hose-fitting. Each of the components is made of biologically inert materials.

To prepare the Biopump for use, the thin plastic tube is threaded through the human esophagus and the input fitting is mounted through the cheek in such a way that an input hose may be coupled to it. The reservoir is placed in the stomach with its hose-fitting traversing the stomach wall in such a way and position that the second, more rigid hose may connect the reservoir to the last hose-fitting at the navel, where an output hose may be attached. Once in place, as shown in the figure, the Biopump forms a continuous path from cheek to navel by which the operator can propel—by swallowing and the consequent esophageal peristalsis and stomach churnings—liquids, slurries, and small solids from one vessel or level to another, while backflow is prevented by the natural valving of the esophagus. Several Biopumps arranged in parallel can transport virtually any quantity of material. Arranged in series, they can transport material over virtually any distance. And, if their operators stand on their heads, they can even be used to transport materials uphill, for peristalsis is indifferent to gravity.

The only constraints on the Biopump arise from its need for impermeability, for the Biopump must effectively isolate its operator from toxic or corrosive substances. The only influence allowed to cross the plastic barrier of the Biopump must be that of the muscles of the operator's alimentary system.

If the Biopump is properly made of a thin, flexible plastic, when not in use the esophageal tube and the reservoir will collapse into a thin layer against the walls of the esophagus and stomach. It will then not interfere in any way with its operator's ingestion of food and drink, although its operator must, as a simple safety precaution, refrain from all those foods, such as popcorn, nuts, and bony fish, which might tear, puncture, or otherwise impair the integrity of the Biopump. The operator should also, of course, have those teeth nearest the Biopump's input removed.

The applications of this device should be immediately obvious. Eminently portable, it will allow motorists, at a moment's notice, to siphon gasoline into their automobiles, and scientists to experiment anywhere on Earth. Inexpensive to produce, and virtually maintenance-free, it will give graduate students new assistantship opportunities as their professors seek new ways to eliminate their dependence on outside energy supplies and equipment suppliers for moving their solutions about. It will give industry new ways to employ persons of little education or skill. And it will allow ecologically disruptive pipelines to be replaced by lines of thousands of government bureaucrats and oil company executives, each one equipped with a Biopump.