Estuarine ecosystems show regulatory feedback at different levels. An important flow of freshwater increases the opposite flow of denser sea water. A strong exchange means a heavy loss in suspended organisms, but introduces more nutrients in the system and selection is active in favour of fixed species or planktonic species with a high rate of increase, capable of supporting important losses. When flow decreases and, with it, the nutrients supply, floating organisms with a lower rate of increase can maintain themselves. An estuary is not a closed system: often it exports food to neighboring systems. Such contribution is more important when flow of energy (primary production) per unit biomass is high, a condition usually fulfilled when flow and exchange of water remains at a high level. In populations organized under such conditions there is usually a dominance of one or a few species.

Such kind of relations pose problems of a level that cannot be approached through the customary experimental way of letting selected organisms develop in cultures of such and such water composition and temperature, and observe the differences in the rate of growth. The continuous flow culture proves to be a more stimulating experimental device. The culture vessel receives a constant input of medium of definite composition; growth of the population, of one or more species, is balanced by loss of part of the population through the outflow and, in a properly shaked vessel, this loss is density dependent, at least in the beginning. The system is, thus, self regulating: a chemostat. One chemostat and, much better, a row of chemostats connected in the way that the outflow of the first is the inflow of the second, and so on, is an excellent analogue of any ecosystem of running waters and of oestuaries. Experiments have been carried on using one row of chemostats, and also with two rows that, at the end, converge and mix in a final series. The first purpose of the last approach was to study interaction between different species and is an excellent model of two water masses with corresponding populations that meet and mix in a boundary, as happens in estuaries. It is expected to develop further this experimental approach, constructing new systems with a high number of culture vessels, interconnected according to a given topological pattern, by means of rubber tubing, and regulating by means of peristaltic pumps the exchange, one way or both ways.

The compound chemostat was intended to study planktonic populations. Simplification of structure (= drop in the diversity) of such populations when flow (= exploitation) is sustained, is easily demonstrated. Nevertheless, from the point of view of plankton biology, the system developped soon a flaw, a fortunate flaw: Species able to remain attached to the walls of the containers were successful in competition. With a much lower ratio production/biomass , such fixed organisms competed successfully with true planktonic species. In the quantitative evaluation of the results of the experiences, not only rates of increase of organisms, and rates of flow of water, but also the specific probability of being carried away by the flow has to be introduced and can be calculated. In natural estuarine systems, reduction of the probability of being washed away can be achieved through benthic mode of life (in fact, fixed plants are prevalent in some situations), but also by means of special forms of behavior, as by migration of euryhaline animals between layers flowing in opposite directions. The populations compete with advantage or exploit with success the less stable, truly planktonic and drifting populations. A higher organisation is linked with higher homeostasis and with a lower flow of energy (primary production) per unit biomass. The fixed or quasi fixed subsystems gather and preserve information more efficiently than vagant subsystems. Heavy exploitation (increased flow) leads to restructuration with simplification of the system, and the new structures are more stable or resistent to further exploitation. Studies with compounds chemostats can facilitate the quantitative approach to the problems of correlate metabolism and structure in ecosystems or in parts of ecosystems, and identify responsible feedback circuits.

Actual measurements of a number of parameters in mixed populations in the compound chemostat have been made under different conditions of flow. There is a significant positive correlation between the ratio production/biomass and the average probability of being carried away by the flow. Both parameters are negatively correlated with the ratio, D_{430}/D_{665}, of the absorbancies, at the stated wavelengths, of acetonic extracts of plant pigments, and also with species diversity when available. On the other hand, pigment concentration, number of cells, and counts given by an electronic particle counter, are positively correlated between them, but uncorrelated with the synthetic characters of the ecosystems to which reference has been made previously. These synthetic characters are the most important in the consideration of the ecosystem as a cybernetic system. They include some reference to time (as time rates, as structures result of historical processes) and are esenstially dynamic.