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SOME BIOCHEMICAL ECOLOGICAL ASPECTS CONCERNING THE MARINE GELATINOUS ORGANISMS: THE JELLY FISH *Aurelia aurita* AND THE CTENOPHORE *Mnemiopsis leidyi*

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Abstract. The paper presents some biochemical comparative observations between two gelatinous organisms from the Black sea: the medusa *Aurelia aurita* and the ctenophore *Mnemiopsis leidyi.* The experimental works had in view making evident the dynamics of decomposition of these organisms in marine water and the behaviour of algal cultures inoculated with the extracts of gelatinous organisms.

Keywords: ctenophores, jelly fish, *Mnemiopsis leidyi, Aurelia aurita,* biochemical composition.

AIMS AND BACKGROUND

In recent decades, in the Black sea ecosystem occurred many changes associated with the effect of anthropogenic pollution; but a significant number of these changes are due to the introduction of exotic species[1]. Among the catastrophic introduction were the soft shell clam *Mya arenaria*, the gastropod *Rapana thomasiana* and the gelatinous ctenophore *Mnemiopsis leidyi*[1].

The exotic species – in the case of the Black sea – act detrimental and destructive on the marine biocenosis and may be considered as biological pollution[2,3].

The way of the penetration of marine environment ranges this phenomenon in the category of transboundary pollution.

Four species of gelatinous animals are common in the Black sea:

– two scyphozoans – *Aurelia aurita* and *Rhyzostoma pulma*,

– two ctenophores – *Pleurobrachia pileus* and *Mnemiopsis leidyi*[4-6].

At the beginning of the 1980th the accidental introduction of the north-western Atlantic ctenophore *Mnemiopsis leidyi* radically affected the entire pelagic fauna of the Black Sea. As the *Mnemiopsis leidyi* inhabits the same depth range and utilizes the same food resources as *Aurelia aurita,* a large population of *Aurelia*

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aurita was nearly replaced by *Mnemiopsis leidyi.* It appears that the mass development of *Mnemiopsis leidyi* caused the biomass of medusa *Aurelia aurita* to drop to less than 1/20 of the level observed in the last 20 years. There was also a sharp drop in the biomass of the zooplankton on which *Mnemiopsis leidyi* feeds. In general the natural structure of the marine plankton communities was disrupted[4,5].

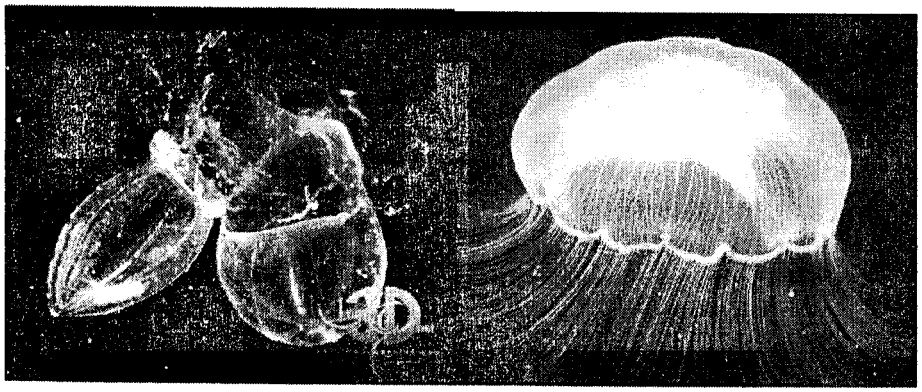
The particular aspects of this pollution result from the capacity of this invader organisms *Mnemiopsis leidyi* to deteriorate the environment in the life time but also after dying by the contribution with the organic substances. Thus, part of the gelatinous organisms decompose in the surface layer after dying, forming a large film that alters the transparency of the water and affects the normal conditions for the phytoplankton[7].

The adding to this description of the biochemical decay of these organisms contributes to the complexity of the phenomenon.

These two species, *Aurelia aurita* and *Mnemiopsis leidyi* (Fig. 1) were studied in the last time comparatively concerning their biological and ecological characteristics[4,6,,8,9]. According the available literature[10] the concentration of the biogenic elements in the bodies of *Mnemiopsis leidyi* is smaller than the concentration of the same elements in the body of *Aurelia aurita.* As a result of chemical analysis it is established that the mass development of *Mnemiopsis leidyi* has a negative effect on the hydro-chemical structure of the Black sea[10].

When recalculated in terms of total dry weight, the bodies of these "gelatinous organisms" contain an order of 10 t of these elements C, N, P, Si (Ref. 7). In this meaning the same order of quantity results for the biochemical components existing at a given moment.

The referees material does not include data concerning the biochemical composition of these organisms or about their contribution to the general flow of organic substances in marine waters or sediments.



Beroe eathing Mnemiopsis *Aurelia aurita*

Fig. 1. Gelatinous organisms living in the Black sea

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The aims of this work are to present:

– some chemical and biochemical comparative characteristics of these organisms making evident the biological active potential;

– the estimate in the laboratory conditions of the transformation degree of the organic substances outcome after dying and in the same conditions of the influence of the decomposition on the life of some plankton organisms.

EXPERIMENTAL

The investigations were performed in the summer of 1996-1997 and 1998, in the inshore zone of Mamaia bay – Constanta. The gelatinous organisms were collected from a prier with a dip net and from fishing tools. For our works we used the liquid mass of gelatinous organisms and the lyophilized extract of the crude extract.

The chemical and biochemical analysis included:

– the content of dry substance and ash by the heating at 105 and 550°C, respectively;

– the pH and electrical conductivity with the RADELRIS OK-104 instrument;

– the salinity expressed in NaCl % by the Mohr's method[11];

– content of microelements flam photometric[12];

– contents of proteins[13], lipids[13], sugars[13], uric acid[14] and uronic acid[15];

– the enzymatic activities of amylase according to Metais-Bieth[15], lipase according to Wilbbter[15], alkaline phosphalase[15], protease[15] and unease[15];

– the influence on the activity of some standard enzymes by incubation in the same conditions in a ratio 1:1 enzyme (Merck-extract);

– the co-stimulating effects of the mitosis of human lymphocytes stimulated with PHA[16].

Other tests had in view the kinetics of the decomposition of gelatinous organisms in marine water and the influence of this phenomenon on the algal proliferation as follows:

– in an experiment in the stationary conditions of the laboratory the gelatinous organism was introduced in marine filtrate water, in a ratio of 1:20g/ml; the samples were draw periodically and analyzed;

– in laboratory cultures of *Prorocentum minimum* and *Diatomeae* (*Bacillariophyta*) the liquid mass and liophilisated extracts were introduced in a ratio of 1% liquid and 100 μg/ml lyophilysated extract; the effects were established by the algal density measurement and compared with a control.

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RESULTS AND DISCUSSION

The biochemical data confirm the biological superiority of the invader *M.leidyi* against the resident *A. aurita* in the competition for the food and habitat Thus, to the bigger accumulating of biogenic elements in medusa[10] the ctenophore opposites a more efficient enzymatic equipment and biological activity[7,16,17] (Figs 2 and 3).

Characteristics of the homogenous liquid samples		
	Aurelia aurita	*Mnemiopsis leidyi*
Appearance	liquid opalescent with a typical marine organisms smell	
pH	8.1-8.4	7.5-7.9
Electrical conductivity (mS)	20.5-24.5	19.0-23.0
Salinity NaCl (%)	16.8-18.8	14.3-18.1

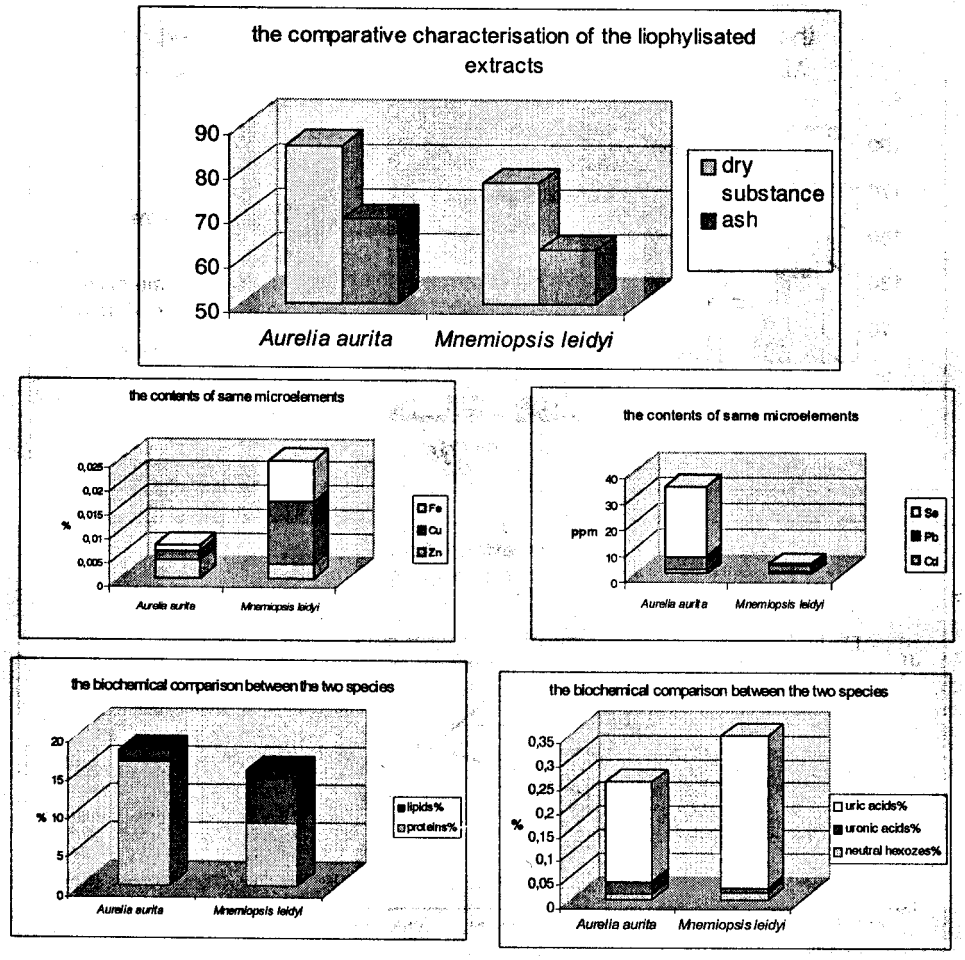

Fig. 2. Physico-chemical and biochemical comparative characterisation of the two species *A. aurita* and *M. leidyi*

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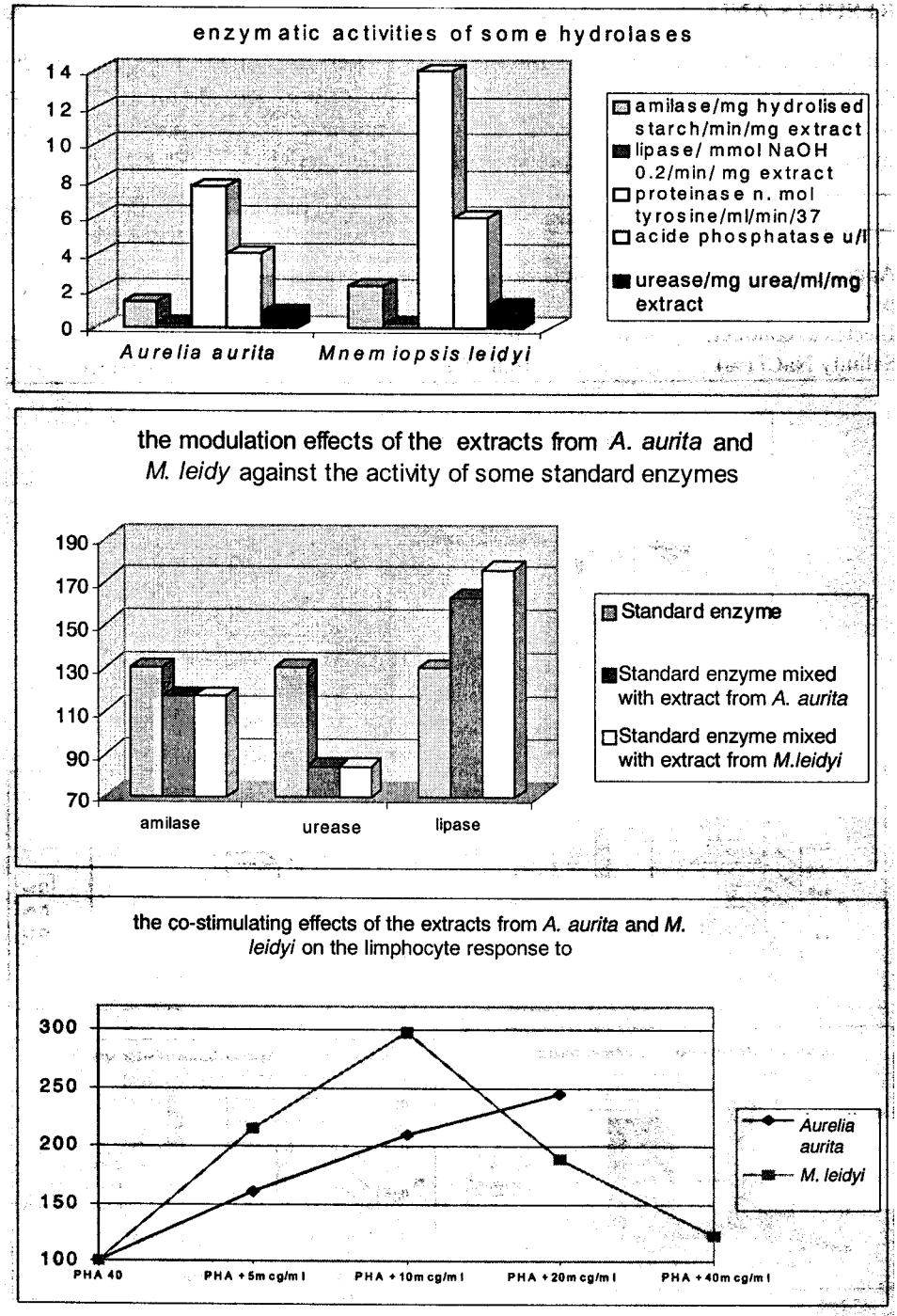

Fig. 3. Enzymatic activities of some hydrolases

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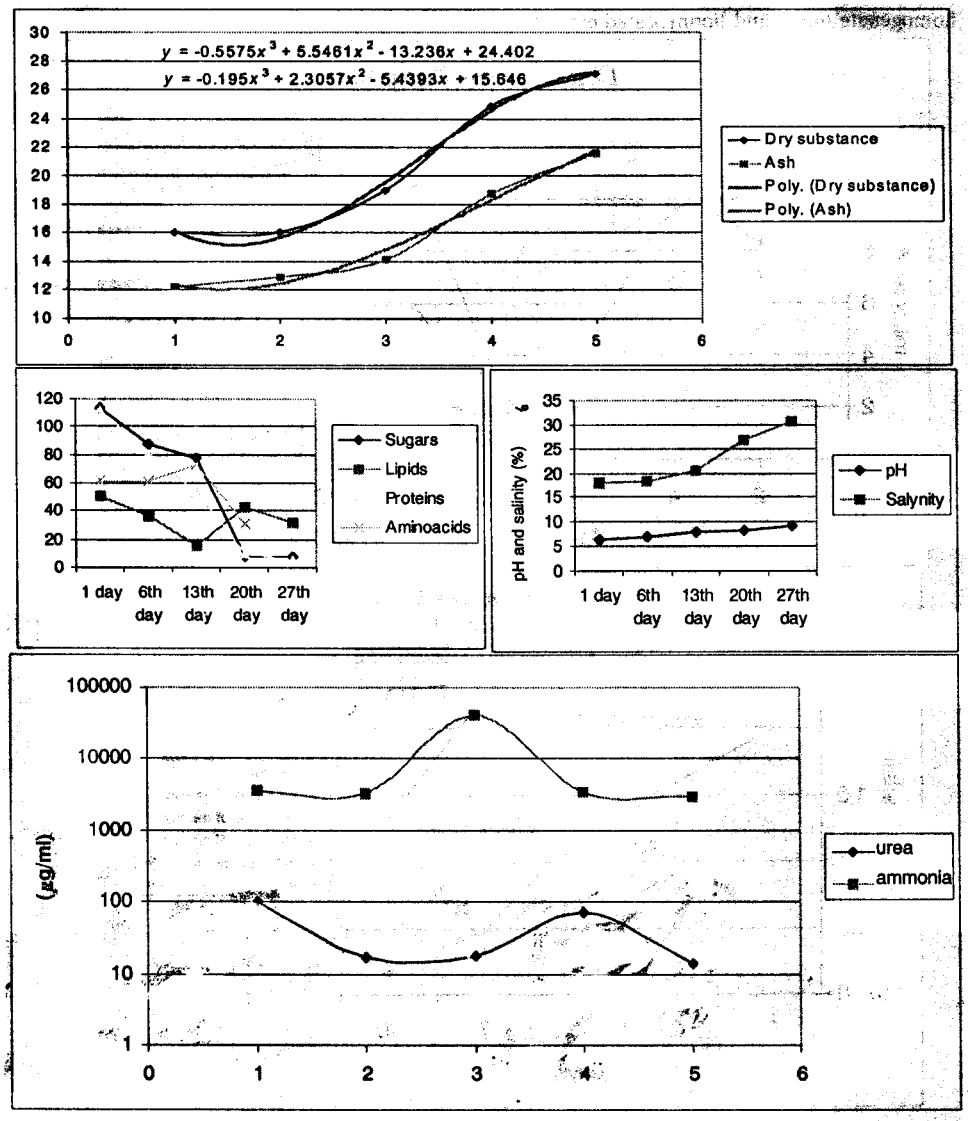

Fig. 4. Experiment of the decomposition of gelatinous organisms in marine water

The blastic stimulation capacity, typical for both organisms[16] may have an ecological meaning of a modelling potential to the cellular growth in the natural environment of marine waters.

The results of laboratory works contribute with some data to the ecological information as follows:

– by comparison with the transfer of substances mentioned in the papers[10] we note that this transfer takes place with different kinetics for different type of com-

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homogenate liquid and liophylisated extracts

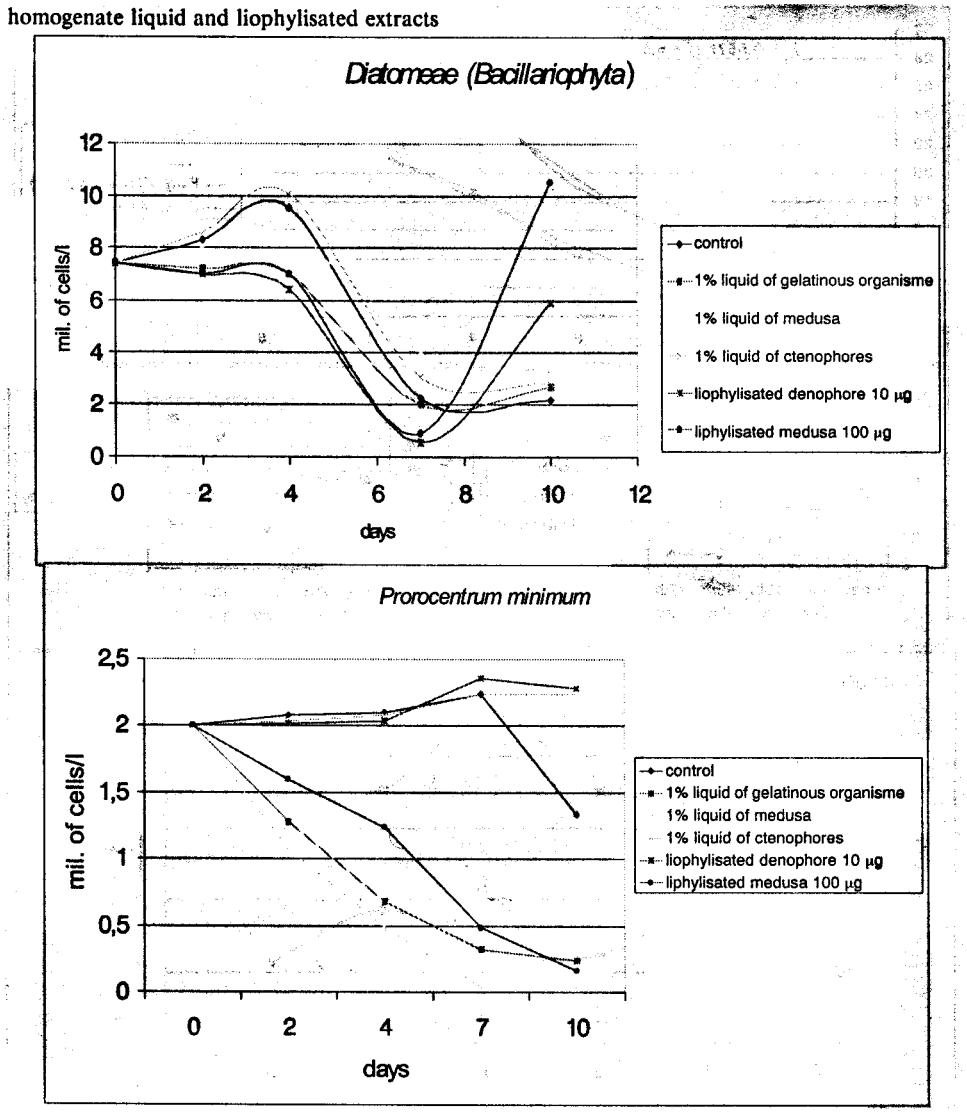

Fig. 5. Experiment of the growth of the algal cultures mixed with gelatinous organisms

ponents; these specificities suggest the presence of a bacterial association attached to this organic decomposition process and which contributes additionally to the natural content of organic substance in marine waters (e.g. see the variation of the concentration of urea and ammonia, Fig. 4);

– the algal planktonic evolution in the culture experiments showed the dependences on the type of algal species and the preparation introduced in the environment;

– the lyophylised extracts had a different influence than homogenous liquids from the same organisms in the case of *Diatomeae* (*Bacillariophyta*) (Fig. 5);

– the ctenophores extracts did not affect the natural evolution of *Prorocentrum minimum.*

Our data can not be extrapolated in the natural environment but emphasise the complexity of these modelling operations, which require the consideration of the physical factors – temperature, streams, etc.

Besides the ecological aspects connected to the natural or undesirable presence of these organisms, we believe that the gelatinous organisms could be of great interest as sources for immuno-active or/and enzymatic modulator substances.

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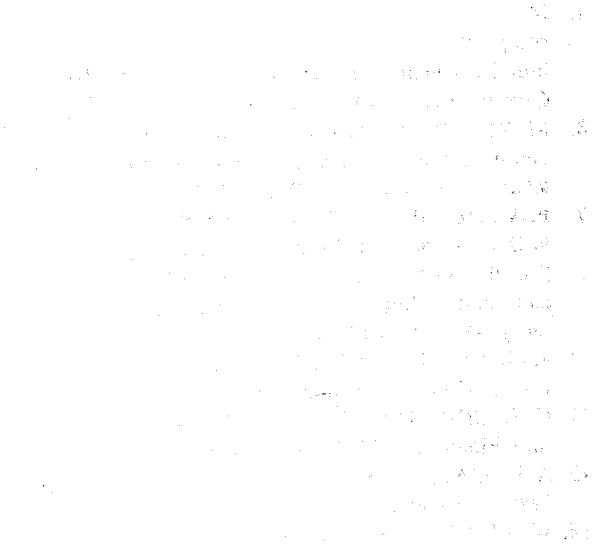

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