CONCRETIZATION AND ENTAILMENT

/Comments on L. Nowak's article on «Idealizational Laws and Explanation»/

1. The aim of the paper is to make some critical comments on the concept of concretization presented by Leszek Nowak in his article on «Idealizational Laws and Explanation»/Logique et Analyse, 59-60, 1972, pp. 527-545/. His model of explanation includes two steps: that of idealization /elimination of secondary factors and formulation of an idealizational law revealing the influence of principal factors on a magnitude investigated/, and that of concretization /removing idealizing conditions and correcting the law in question/. This model is, I believe, more adequate model of explanation than the famous Hempel's — Popper's model of explanation. But, unfortunately, the author's characteristics of the second step of explanation is inapropriate. I shall try to show that and to propose such a modification of Nowak's model that seems to me to be a more strict and adequate than original Nowak's formulations.

2. Basic Nowak's idea is that idealizational laws can be applied to real phenomena due to concretization only [1]. According to his opinion ,concretization of an idealizational law:

$$/1/\ \mathbf{U/x/} \wedge \mathbf{p}_1\mathbf{/x/} = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}\mathbf{/x/} = 0 \wedge \mathbf{p}_k\mathbf{/x/} = 0 \rightarrow \mathbf{F/x/} = \mathbf{f(H/x/)}$$

is a statement in the form:

$$/2/\ \mathbf{U/x/} \wedge \mathbf{p}_1\mathbf{/x/} = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}\mathbf{/x/} = 0 \wedge \mathbf{p}_k\mathbf{/x/} \neq 0 \rightarrow \rightarrow \mathbf{F/x/} = \mathbf{g}\,[\mathbf{f(H/x/)}\,,\,\mathbf{h(p}_k\mathbf{/x/)}].$$

As can be seen, /2/ is a less abstract statement than /1/ and shows how the secondary factor $\mathbf{p}_k$ affects **F**.

Up to now, everything is in order. What is wrong with this conception of concretization reveals with Nowak's claim that

/2/ is a logical consequence of /1/ and a special premiss saying how $\mathbf{p}_k$ affects $\mathbf{F}$:

$$/1'/\ \mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}/\mathbf{x}/ = 0 \wedge \mathbf{p}_k/\mathbf{x}/ \neq 0 \rightarrow \\ \rightarrow \mathbf{F}/\mathbf{x}/ = \mathbf{g}\left[\mathbf{F}^k_x \ \ \mathbf{h}(\mathbf{p}_k/\mathbf{x}/)\right]$$

where «$\mathbf{F}^k_x$» stands for the value of $\mathbf{F}$ for such an object which fulfills all the idealizing conditions $\mathbf{p}_1/\mathbf{x}/ = 0, \ldots, \mathbf{p}_k/\mathbf{x}/ = 0$.

At this point seems to be very doubtful. Firstly, this conception of concretization leads to inconsistency in the author's views. According to his own definition, each idealizational statement is referred to an appropriate domain of ideal types and one domain of the kind only ([2]). But the statement /1'/, so-called principle of co-ordination, cannot be interpreted from this point of view univocally. Due to its assumptions, it should be referred to the domain of ideal types of the $\mathbf{k}$—1th order $\mathbf{D}^{p}_{0}1, \ldots, \mathbf{p}_{k-1}$. But due to the definition of the magnitude $\mathbf{F}^k$, /1'/ should be interpreted in the domain of the $\mathbf{k}$th order $\mathbf{D}^{p}_{0}1, \ldots, \mathbf{p}_k$. Secondly, it is not true that /2/ follows from both /1/ and /1'/. The equation:

$$/3/\ \mathbf{F}^k/\mathbf{x}/ = \mathbf{f}(\mathbf{H}/\mathbf{x}/)$$

holds on the condition that assumptions $\mathbf{U}/\mathbf{x}/$, $\mathbf{p}_1/\mathbf{x}/ = 0, \ldots, \mathbf{p}_k/\mathbf{x}/ = 0$ are fulfilled. But this condition is not satisfacted in the statement /1'/, hence one cannot replace «$\mathbf{F}^k_x$» with the aid of «$\mathbf{f}(\mathbf{H}/\mathbf{x}/)$» in /1'/.

Both two objections seem to be important ones. Especially the latter proves that Nowak's characteristics of concretization is inadequate from the logical point of view. What is more, it follows from that that idealizational laws cannot be testified, if their concretization does not consist in entailment.

3. Now I shall try to present such a modification of the concept of concretization discussed above which does not lead to consequences shown here.

The main idea of that correction is: concretization consists in deducing /2/ from /1/ and a **coordinating body** which includes the **strict principle of co-ordination:**

$$/3'/ \quad \bigwedge_{\mathbf{l}} \{[\mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}/\mathbf{x}/ = 0 \wedge \mathbf{p}_k/\mathbf{x}/ = 0 \rightarrow \rightarrow \mathbf{F}/\mathbf{x}/ = \mathbf{l}] \equiv \equiv [\mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}/\mathbf{x}/ = 0 \wedge \mathbf{p}_k/\mathbf{x}/ \neq 0 \rightarrow \rightarrow \mathbf{F}/\mathbf{x}/ = \mathbf{g}\left(\mathbf{l}, \mathbf{h}(\mathbf{p}_k/\mathbf{x}/)\right)]\}$$

and the **degenerated** one:

$$/3''/ \quad \bigwedge_{\mathbf{l}} \{[\mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}/\mathbf{x}/ = 0 \wedge \mathbf{p}_k/\mathbf{x}/ = 0 \rightarrow \rightarrow \mathbf{F}/\mathbf{x}/ = \mathbf{l}] \equiv \equiv [\mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}/\mathbf{x}/ = 0 \wedge \mathbf{p}_k/\mathbf{x}/ \neq 0 \rightarrow \rightarrow \mathbf{g}\left(\mathbf{f}(\mathbf{H}/\mathbf{x}/), \mathbf{h}(\mathbf{p}_k/\mathbf{x}/)\right) = \mathbf{g}\left(\mathbf{l}, \mathbf{h}(\mathbf{p}_k/\mathbf{x}/)\right)]\}$$

I shall prove that from /1/ and /3'/ and /3''/ follows the statement /2/.

It follows from /1/ that

$$/4/ \quad \bigwedge_{\mathbf{l}} \mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_k/\mathbf{x}/ = 0 \rightarrow \mathbf{F}/\mathbf{x}/ = \mathbf{l} \equiv \mathbf{f}(\mathbf{H}/\mathbf{x}/) = \mathbf{l}].$$

According to the schema $(\mathbf{p} \rightarrow /\mathbf{q} \equiv \mathbf{r}/) \rightarrow (/\mathbf{p} \rightarrow \mathbf{q}/ \equiv /\mathbf{p} \rightarrow \mathbf{r}/)$,

$$/5/ \quad \bigwedge_{\mathbf{l}} \{\mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_k/\mathbf{x}/ = 0 \rightarrow \mathbf{F}/\mathbf{x}/ = \mathbf{l} \equiv \equiv [\mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_k/\mathbf{x}/ = 0 \rightarrow \mathbf{f}(\mathbf{H}/\mathbf{x}/) = \mathbf{l}]\}$$

is a logical consequence of /4/. The conjunction of /2'/, /3''/ and /5/ will be termed /6/:

/6/ $3' \wedge 3'' \wedge 5$.

The statement /6/ leads to the following sentence:

$$/7/ \quad \bigwedge_{l} \Big\{\{[U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_k/x/ = 0 \rightarrow F/x/ = l] \equiv$$
$$\equiv [U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_k/x/ = 0 \rightarrow f(H/x/) = l]\} \wedge$$
$$\wedge \{[U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ = 0 \rightarrow F/x/ = l] \equiv$$
$$\equiv [U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ \neq 0 \rightarrow F/x/ = g\big(l,\ h(p_k/x/)\big)]\} \wedge$$
$$\wedge \{[U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ = 0 \rightarrow f(H/x/) = l] \equiv$$
$$\equiv [U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ \neq 0 \rightarrow g\big(f(H/x/),\ h(p_k/x/)\big) = g\big(l,\ h(p_k/x/)\big)]\}\Big\}$$

According to the tautological schema $/p \equiv q/ \wedge /p \equiv r/ \wedge /q \equiv s/ \rightarrow /r \equiv s/$, the following statement:

$$/8/ \quad \bigwedge_{l} \{[U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ \neq 0 \rightarrow F/x/ = g\big(l,\ h(p_k/x/)\big)] \equiv$$
$$\equiv [U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ \neq 0 \rightarrow g\big(f(H/x/),\ h(p_k/x/)\big) = g\big(l,\ h(p_k/x/)\big)]\}$$

is a logical consequence of /7/. The latter, on the basis of the schema $(/p \rightarrow q/ \equiv /p \rightarrow r/) \rightarrow (p \rightarrow /q \equiv r/)$ leads to:

$$/9/ \quad \bigwedge_{l} \{U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ \neq 0 \rightarrow (F/x/ = g\big(l,\ h(p_k/x/)\big)] \equiv [g\big[\big(f\ (H/x/),\ h(p_k/x/)\big) = g\big(l,\ h(p_k/x/)\big)\big]\}$$

It follows from /9/ that

$$/10/ \quad U/x/ \wedge p_1/x/ = 0 \wedge \ldots \wedge p_{k-1}/x/ = 0 \wedge p_k/x/ \neq 0 \rightarrow$$
$$\leftarrow \bigwedge_{l} \{F/x/ = g\big(l,\ h(p_k/x/)\big) \equiv g\big(f\ (H/x/)\ h(p_k/x/)\big) = g\big(l,\ h(p_k/x/)\big)\}$$

And, at last, the concretization /2/ is a consequence of /10/:

$$/2/\ \mathbf{U}/\mathbf{x}/ \wedge \mathbf{p}_1/\mathbf{x}/ = 0 \wedge \ldots \wedge \mathbf{p}_{k-1}/\mathbf{x}/ = 0 \wedge \mathbf{p}_k/\mathbf{x}/ \neq 0 \rightarrow$$
$$\rightarrow \mathbf{F}/\mathbf{x}/ = \mathbf{g}\Big(\mathbf{f}\,(\mathbf{H}/\mathbf{x}/),\ \mathbf{h}(\mathbf{p}_k/\mathbf{x}/)\Big)$$

The concretization /2/ is, then, a consequence of the idealizational law /1/ and coordinating body /3'/, /3''/. The modification of Nowak's concept of concretization proposed here proves that the relation of concretization can be in fact conceived as a special case of the relation of entailment.

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NOTES

(1) The notions of the idealizational laws, of concretization and so on are explained larger in article, L. Nowak, Idealizational Laws and Explanation, «Logique et Analyse», 59-60, Septembre-Décembre 1972, p. 529-530, 532-533.

(2) L. Nowak, ibidem, p. 531.