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The reductionism of genopolitics in the context of the relationships between biology and political science

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Abstract

The past two decades have seen an increase in the use of theories, data, assumptions and methods of the biological sciences in studying political phenomena. One of the approaches that combine biology with political science is genopolitics. The goal of the study was to analyse the basic ontological, methodological and epistemological assumptions for the reductionism of genopolitics. The results show that genopolitics assumes methodological reductionism but rejects ontological and epistemological reductionism. The key consequences of the findings are the irreducibility of political science to biology and the complementarity of genopolitical explanations and political science explanations based on culturalism. If my findings prove to be correct, they give rise to the formation of a hypothesis regarding the anti-reductionist orientation of the contemporary links between political science and biology. An important step towards confirming or falsifying such a hypothesis will be exploring the reductionism of contemporary biopolitical approaches such as neuropolitics or evolutionary political psychology.

Keywords: reductionism, genopolitics, biology, political science, political attitudes and behaviours

Introduction

The dynamic development of the biological sciences has not been without impact on the social sciences. It has given social scientists hope for new explanatory potential. Consequently, various biopsychosocial approaches have begun to emerge, providing economists, psychologists, sociologists, and political scientists with the opportunity to identify existing research problems by taking into account more complex dependencies and a multidimensional perspective. One such approach, emerging at the intersection of biology and political science, is genopolitics, which studies the genetic foundations of political attitudes

and behaviours.[1] The breakthrough moment for genopolitics was the study of Alford, Funk and Hibbing, the results of which were published in 2005 in the *American Political Science Review*. American political scientists were the first to publish an article based on a study conducted using the methods and data of behavioural genetics in a political science journal. They hypothesised that political attitudes are conditioned not only by the environment but also by genes. The results of their analysis confirmed their assumptions. They showed that conservative and liberal attitudes are heritable, while in most cases, the effect of genetic factors on the variability of analysed attitudes was higher than the effect of upbringing (Alford, Funk, & Hibbing, 2005).

After the study by Alford, Funk and Hibbing, which gave rise to numerous discussions and controversies both in academia and beyond it,[2] the development of genopolitics accelerated. In the following years, genetic conditions were analysed for: voter preferences and behaviours (Aarøe et al., 2021; Deppe, Stoltenberg, Smith, & Hibbing, 2013; Fowler & Dawes, 2008; Hatemi, Medland, Morley, Heath, & Martin, 2007), partisanship (Dawes & Fowler, 2009), attitudes towards homosexuality and abortion (Eaves & Hatemi, 2008), the transmission of political attitudes in different stages of one's lifetime (Hatemi et al., 2009; Hufer, Kornadt, Kandler, & Riemann, 2020), political and religious beliefs (Ksiazkiewicz & Friesen, 2019; Ludeke, Johnson, & Bouchard, 2013), psychological traits and political attitudes and engagement (Dawes, Settle, Loewen, McGue, & Iacono, 2015; de Vries,

[1] I will assume that a political attitude is an individual's tendency to form opinions relating to a political nature's specific issues. On the other hand, political behaviour refers to mental and physical activity affecting political processes and phenomena (Araujo, 2011; Gabriel, 2020).

[2] In the 2006 American Political Science Review report, Sigelman wrote: 'The articles that appeared in the APSR during 2004–2005 represented a wide variety of theoretical, analytical, and methodological approaches and a rich array of subject matters; and although only time will tell whether it will emerge among the most important articles the APSR has ever published, one article in particular—Alford, Funk, and Hibbing's "Are Political Orientations Genetically Transmitted?"—has set a new standard for political science in terms of the media attention and public discussion that its publication has provoked' (Sigelman, 2006, p. 172).

Wesseldijk, Karinen, Jern, & Tybur, 2021; Hatemi & Verhulst, 2015; Kleppestø et al., 2019; Weinschenk, Dawes, Klemmensen, & Rasmussen, 2023; Weinschenk, Dawes, Kandler, Bell, & Riemann, 2019), political ideologies and political extremism (Ksiazkiewicz & Krueger, 2017; Ksiazkiewicz, Ludeke, & Krueger, 2016; Verhulst, Eaves, & Hatemi, 2012) and political violence (McDermott, Dawes, Prom-Wormley, Eaves, & Hatemi, 2013; McDermott, Tingley, Cowden, Frazzetto, & Johnson, 2009).[3]

Genopolitics is one of many attempts to link social sciences with the biological sciences. Apart from the best-known examples, such as Spencer's social evolutionism (Spencer, 1885), sociobiology (Wilson, 1975), memetics (Dawkins, 1976) and evolutionary psychology (Barkow, Cosmides, & Tooby, 1992), we can also distinguish such examples of the application of biology in the social sciences as biosocial criminology (Walsh & Ellis, 2003), neurosociology (Bogen, De Zure, TenHouten, & Marsh, 1972), sociogenomics (Guo & Stearns, 2002), neuropolitics (Schreiber, 2017), evolutionary political psychology (Petersen, 2015), genoeconomics (Taubman, 1976) and neuroeconomics (Camerer, Loewenstein, & Prelec, 2005). The common feature of these links is reductionism—a research directive covering a set of ontological, epistemological and methodological assumptions regarding the relations between different fields of knowledge. The studies by Remisiewicz (2017a, 2017b) have shown that the assumptions and mechanisms of reduction in the links between biology and sociology differ significantly. For example, Wilson's sociobiology is characterised by strong epistemological assumptions, which postulates sociology's total reducibility to biology.

[3] Genopolitical studies differ not only in the type of attitudes and behaviours analysed, but also in the applied methodology or the age and gender structure of the study sample. Regardless of the differences, they show that political attitudes and behaviours are most likely influenced to some extent, by genetic factors. Genopolitical research suggests that the effect of genes on attitudes is subject to change over the life cycle of individuals. In addition, they provide knowledge regarding the mechanisms that may link genes to attitudes and behaviours. See Ksiazkiewicz and Friesen (2017), Dawes and Weinschenk (2020), and Wajzer and Dragan (2023) for overviews of the state of research on genes and politics.

Wilson believed that culture, religion and ethics could be explained in depth by the laws of biology alone. Such a provocative declaration, which, it must be noted, had not found sufficient confirmation in empirical data, was met with loud protests from social scientists fearing that the autonomy of their disciplines would be violated. Neurosociology—an approach seeking a neural basis for social phenomena—has a completely different nature. Its goal is not to replace sociological theories with neurobiological theories, but to supplement selected sociological theories with hitherto unknown aspects and conditions.

The findings concerning the reductionism of neurosociology led Remisiewicz (2017b) to a hypothesis regarding the anti-reductionist orientation[4] of contemporary links between biology and sociology. Can the analysis of the reductionism of genopolitics provide a basis for a similar hypothesis regarding the relationship between biology and political science? What, then, are the characteristic features of the reductionism of genopolitics? I will answer these questions in the following sections. In this paper, I will focus only on the reductionism of genopolitics and will not address other equally important issues, such as the degree of methodological justification for researching the genetic foundations of political attitudes and behaviours or the possible social consequences of linking political science and genetics. These are problems that have already been analysed, to some extent, in other publications (Charney & English, 2013; Hatemi, Byrne, & McDermott, 2012; Hatemi & McDermott, 2012; Ksiazkiewicz & Friesen, 2017; Weiss, 2016). My findings should by no means be equated with the unconditional affirmation of genetic reductionism, nor are they, in any case, the expression of a view that allows for the possibility of purely genetic explanations of political attitudes and behaviours. Research carried out within the field of various behavioural sciences suggests highly complex relationships between genotype and environment in the process of

[4] Anti-reductionism rejects the assumption of the epistemic and/or metaphysical privilege of some explanations' categories.

political phenotype emergence and formation. Thus, they point to the possibility of revising and supplementing conceptions that emphasise the importance of isolated environmental or genetic influences.

The text structure is as follows: in the next section, I describe the typology of reductionism adopted in the study; further, I present the main methodological assumptions of genopolitical studies, then I discuss the most important characteristics of the reductionism of genopolitics. In the last section, I summarise the presented considerations.

On reduction and reductionism

The English verb 'to reduce', like the German 'reduzieren' and the French 'réduire', comes from the Latin '*reducere*', which literally means 'to bring back' (Kluge & Seebold, 1995; Wailly & Wailly, 1822; Weekley, 1967). The statement that element *x* reduces to element *y*, thus, means that *x* can be brought back to *y*. In scientific discourse, the concept of reduction has a slightly different meaning and refers mainly to the relations between different fields of knowledge. For example, by saying that classical genetics is reduced to molecular genetics, we state that the former boils down to the latter. The reductionist approach in empirical sciences was already proposed in the seventeenth-century mechanical philosophy. The mechanistic explanatory model assumed a reduction of macroscopic phenomena to the level of interaction between the particles of matter. With the development of physics, early mechanical philosophy has been transformed into more advanced physicalism, implying the notion of the reducibility of sciences. Expectations, however, that reductionist programmes will make a decisive contribution to the progress of science and that, in addition to reductions within physics itself, it will be possible to reduce sociological and psychological theories to biological theories and those, in turn, to chemical and physical theories, have not yet been met (Sarkar, 1992).

In addition to the conceptualisation of the reduction in terms of the transformation of some laws and theories to another, we can also find in the literature a conceptualisation that sees reduction as an element of the research procedure, the essence of which is to focus on some characteristics of the analysed phenomena while permanently and temporarily omitting others. The latter is reflected, for example, in the idealisational theory of science (ITS) (Nowak, 2000). From the point of view of the ITS, scientific theories are not formed by generalising facts, and they are far from hypothetical/deductive systems. They are a deformation of reality, rather than a faithful representation of it. ITS rejects the phenomenalist conception of science, according to which the distinction between what is principal and what is secondary in the analysed phenomena is ontologically unjustified. In its view, this distinction has an ontological value that is independent of our take on reality. In accordance with the above, the basic cognitive procedure used in science is an idealisation, which focuses on the factors principal for the analysed phenomenon while reducing the factors with no impact on the matter and temporarily ignoring secondary factors' influence. With the emergence of new cognitive needs and methodological development, the influence of secondary factors can be gradually taken into account through concretisation. Conceptualisations of reduction in the sense of transformation and idealisation are reflected in the typologies of reductionism.

In addition to the elements of reduction, the reduction process also assumes the plane on which the reduction takes place. The elements and plane of reduction imply a specific type of reduction and, in perspective, a specific type of reductionism. There are many different typologies of reductionism. For example, Nagel (2012) proposes a two-part distinction between psychophysical reductionism and physicochemical reductionism. Bickle (1998) examines classical reductionism and ‘new wave’ reductionism. Sarkar (1992) argues that there are three kinds of reductionism: theory reductionism, explanatory reductionism, and

constitutive reductionism. A more elaborate typology is proposed by Murphy (2009). It lists the following types of reductionism: methodological, epistemological (theoretical), ontological and causal. Malim and Birch (1998) also argue that there are four kinds of reductionism, i.e. physiological reductionism, biological reductionism, experimental reductionism and machine reductionism. My research did not require the adoption of an extensive typology of reductionism. In order to determine the key features of the reductionism of genopolitics, I applied the typology proposed by Ayala (1974). He distinguishes three basic types of reductionism: ontological, epistemological and methodological.

Ontological reductionism states that objects of a higher order may be reduced to more elementary objects. The differences between the former and the latter are quantitative, not qualitative. Generally speaking, two variants of ontological reductionism can be distinguished: 'weak' and 'strong'. According to the former, each perceivable item is a sum of items at a lower level of complexity, while according to the latter, each perceivable type of item is a sum of types of items at a lower level of complexity.

Epistemological reductionism assumes that knowledge of higher-order phenomena can be derived from the knowledge of lower-order phenomena without any loss. This assumption applies both to reductions within a single field and between fields. The second case is particularly interesting as it entails significant epistemological consequences. The possibility of deriving sociological or psychological theories from biological theories, and those, in turn, from physical and chemical theories without loss would be one of the key arguments for the reductive unity of science.

Methodological reductionism implies the division of the examined objects into small components. However, it does not determine the ontic status of the research subject; it is merely a research strategy that greatly facilitates the exploration of complex systems. Methodological reduction may result from ontological reduction, but this relation does not

occur in the opposite direction. Radziszewska-Szczepaniak (2016, p. 380) notes: 'The fact that some aspect of reality from a higher level can be explained within categories belonging to a lower, more basic level, may not lead to the conclusion that all reality can be reduced to this same elementary level.'

We can, therefore, consider reductionism following at least three different paths: (1) as a collection of philosophical postulates concerning the nature of the studied entities; (2) as a collection of guidelines and mechanisms for unifying theories and, in a broader perspective, science in general; and (3) as a methodological directive defining the level of analysis.

Genopolitics

One of the characteristics of modern science is a clear asymmetry between the development of individual disciplines and fields and the development of problems posed to researchers by nature and society. As an effect of progressing specialisation and atomisation of science and strong attachment of part of the scientific community to historically determined disciplinary frameworks, there is a high risk of insufficient recognition or omission of problems that require inter-field integration for analysis. This results in the relevance of creating approaches that do not conform to the rigid framework of nineteenth- and twentieth-century classifications of sciences and do not fit within the organisational structures of the academy, which are not very flexible and often slow down the progress of knowledge, as emphasised by numerous researchers and philosophers of science. Inter- and transdisciplinary approaches enable us to view the analysed problems from an entirely new perspective, which may result not only in an increase in the cognitive value of the formulated conceptions but also in significant practical recommendations (Carrier & Mittelstrass, 1990).

Generally speaking, inter-field integration can occur on two levels: theoretical, in which intra-field theories are linked together, and non-theoretical, when methods or data from

one field are applied to another field. Grantham (2004), for example, among theoretical interconnections, distinguished: explanatory dependencies, ontological relationships, and other conceptual relationships, such as conceptual refinement; he also distinguished the following as non-theoretical (practical) interconnections: heuristic dependencies, confirmational dependencies and methodological dependencies. The degree of integration of two fields increases as the variety of connections increases or as a consequence of the increase in the significance of existing connections.

An analysis of genopolitical research points to non-theoretical connections between political science and biology. These manifest themselves in applying the assumptions and methods used by behavioural geneticists in studying political attitudes and behaviours. According to one of the key assumptions of behavioural genetics research, differences in attitudes and behaviours in a studied population are dictated by both genetic and environmental factors. Attitudes and behaviours are phenotypic traits—the source of their variability is polygenic in nature. For example, it is unlikely that mutations in a single gene are responsible for electoral participation or political violence. Genetic factors may be additive or non-additive. Additive influence is connected with the parent-child genetic transmission, while non-additive influence is connected with the interaction processes between alleles in the chromosomes of the child organism. Environmental factors are also divided into two sub-types: shared environmental factors and non-shared environmental factors. The shared environment is responsible for the similarities between members of one family, while the non-shared environment differentiates the members of the same family. Genes and environment are not fully independent of one another, as they can interact and correlate. Genotype-environment interaction (GxE) means genetic susceptibility to the environment, while genotype-environment correlation (rGE) means the genetic effect on the exposure to environmental influences. Studies of the genetic components of behavioural traits

can be roughly divided into two types: classical heritability studies and more sophisticated molecular studies. The former show what part of the variation in the studied trait can be explained by genetic variation. The twin, family and adoption methods are usually used for this purpose. Molecular studies also provide information on heritability and enables the identification of genetic variants associated with the analysed trait. Methods used in the molecular approach include candidate gene association studies (CGAS) and genome-wide association studies (GWAS) (Mayhew & Meyre, 2017; Sesardic, 2005).

Applying the research methods and assumptions used by behavioural geneticists in studying political attitudes and behaviours generates much scientific and non-scientific controversy. The critiques of genopolitics focus mainly on its methodology. Reservations are raised about the conceptualisations of basic notions (Shultziner, 2013), genopolitics researchers are accused of using 'naive statistics' (Charney & English, 2013), and partial failures of replication of voter turnout surveys using CGAS are emphasised (Fowler & Dawes, 2008, 2013). The weak point of genopolitical studies, particularly those using molecular techniques, is the small sample sizes. As a result, the likelihood of identifying specific genetic variants decreases, while the risk of obtaining false-positive results increases. Another problem the researchers must face is the lack of representativeness of the samples. As in other behavioural sciences (mainly psychology), genopolitical research is based on WEIRD (western, educated, industrialized, rich, and democratic) samples (Henrich, Heine, & Norenzayan, 2010). In addition, several objections of social nature are raised against genopolitics, e.g., fear of the biologisation of politics (Weiss, 2016) and philosophical objections, e.g., biological determinism or excessive reductionism (Charney, 2008; Engelmann, 2010; Weiss, 2016).

Genopolitics has much in common with other contemporary approaches seeking a biological basis for various types of social phenomena. Genoeconomics, sociogenomics,

neuropolitics, neuroeconomics, and neurosociology also emerged due to inter-field integration. These approaches, like genopolitics, are not very popular among social scientists, but the results they bring are published in highly regarded journals. This is why the presence of biosocial research in the scientific world is clearly visible. The feature that distinguishes genopolitics from other approaches combining life sciences with social sciences is the high level of methodological and social controversy mentioned above. After an initial period of dynamic development, accompanied by numerous discussions and debates both inside and outside the scientific community, the dynamics of genopolitical research have clearly slowed down. This observation applies mainly to molecular studies, which generate much higher costs than classical heritability studies. Obtaining reproducible results, linking specific genetic variants with the analysed traits, requires the use of very large sample sizes, which is equivalent to the involvement of international research consortia.[5]

Reductionism of genopolitics

As I indicated in the previous section, one of the objections to genopolitics is excessive reductionism (other terms used by critics: unreflective, destructive, illicit or greedy reductionism) (e.g. Charney, 2008; Engelmann, 2010; Weiss, 2016). However, this allegation is characterised by high heterogeneity, making analysis and any possibility of a polemic much more difficult. It usually appears in the context of the following arguments: the lack of adequacy between the phenomenon explained and the adopted level of analysis; the incompleteness of genopolitical explanations; the low explanatory utility of genopolitical research (Wajzer, 2021). However, in none of the above contexts of meaning do critics of

[5] Molecular approaches that focus on phenomena of interest to representatives of multiple different disciplines simultaneously are developing more rapidly. One such approach is sociogenomics, whose scope of research interest includes, for instance: fertility, educational attainment, well-being, addiction, intergenerational social mobility, risky behaviour or longevity (see Mills & Tropf, 2020).

genopolitics indicate what type of reduction is being negated and what is the reason for it. Consequently, the essential components of the allegation of excessive reductionism all too often are formed on the basis not of factual arguments but the eristic and/or emotional load. Given the above, in the next three subsections I will describe the key features of the reductionism of genopolitics. For this purpose I shall apply the three-part typology of reductionism proposed by Ayala (1974) and described in section 2. The analysis will shed more light on the nature of the relationship between political science and biology assumed by genopolitics.

Ontological reductionism

In formulating the metaphysical assumptions of the reductionist program of the unity of science, Oppenheim and Putnam (1958) assumed that material composition is hierarchical and consists of well-defined and interrelated levels, beginning with elementary particles and atoms, through molecules and cells, to multicellular organisms and social groups. In this approach, entities occupying higher levels in a hierarchical structure and their properties are micro-reducible to entities in the levels immediately preceding them. The assumption regarding the existence of part-whole composition and mereological supervenience, and in a much broader sense, the attempt to capture the complex variability of our world within a simple theoretical construct, became the subject of a debate that continues to this day.

Some philosophers, questioning Oppenheim and Putnam's classification, have pointed out the relevancy of realisation relationships in complex systems since it turns out that certain non-physical properties at a lower level of organisation may be subject to realisation in multiple different ways (Fodor, 1974). For example, the state of being an heir to an asset of a certain value at a lower level may be realised through different configurations of the components of the asset, i.e., cash, real estate, securities, and so on. In addition to multiple

realisation, complex realisation challenges compositional hierarchy. It describes the situation when not only properties of parts participate in realising a certain property of the whole (Potochnik, 2017). Examples include phenotypic traits that enhance the hunting efficiency of predators (speed, sharp fangs and claws), the formation of which is influenced by a complex combination of properties that can be attributed not only to the predators themselves but also to the environment in which they live and the population of their prey.

The organisational scheme, whose essence are the realisation relationships, is only one of the alternative conceptions that try to avoid the issues implied by the assumption of compositional relationships among parts and whole. Other theoretical proposals that modify the traditional view of levels of organisation have used mechanistic composition (Craver & Bechtel, 2007), spatial scales (Potochnik & McGill, 2012) and temporal scales (DiFrisco, 2017) as ontological levels-criteria. The mechanistic conception of levels emphasises the importance of the components of mechanisms that not only exist as material parts but also contribute to the functioning of the whole. The relationship between the acting components of a mechanism can be analysed either in terms of intralevel relations or in terms of interlevel relations. In spatial scale hierarchy, the level occupied by an entity is determined by its size: entities of similar size are on the same level, and conversely, entities that differ greatly in size occupy different levels in the hierarchical structure. In the temporal scale hierarchy, on the other hand, the distinguishing factor between levels is the rate or frequency with which the studied processes occur. Faster (shorter) processes occupy lower levels, while slower (longer) processes occupy higher levels.

The briefly discussed conceptions of levels of organisation are usually motivated by specific scientific theories, which limits their applicability only to well-defined fields and cases. This was accurately pointed out by Potochnik (2021, p. 16): ‘Evolved levels should not be expected to have significance for present structural organization, development, nor even

for what entities are now subject to evolutionary forces. Similarly, a conception of levels based on spatial scale will give rise to very different levels systems for different phenomena, and levels in the temporal scale of homeostatic processes have no implication for any other kinds of processes.' What is the reason for the lack of a universal conception of levels of organisation with a high cognitive value? It is most likely a consequence of the dynamic structure of complex systems (see Ladyman & Wiesner, 2020). Imposing rigid hierarchical structures on a world in which: disorder and diversity are common, numerous non-linear processes occur, random events and emergent properties play an important role, and many spontaneous interactions and self-organisation occur may prove cognitively counter-effective (high risk of overlooking essential properties), particularly if it goes beyond strictly defined aspects of selected types of entities, processes or phenomena.

The dominant interpretations of genopolitical findings in the literature are examples of the 'local' use of the organisational levels conception in discovering the nature of complex systems. Genetic influences on political phenotype are usually interpreted in terms of the nondirect difference-making relationships typical, for example, for mechanistic interlevel relationships. A biological hierarchy of levels of organisation with some features of a mechanistic composition was outlined, among others, by Hatemi et al. (2012, pp. 313–314); in doing so, the researchers pointed out the extraordinary complexity of relationships that ultimately lead to a particular political behaviour:

> The finding that a single genetic marker has some influence on a trait, may implicate a particular biological pathway consisting of hundreds or thousands of genetic and neurobiological mechanisms that result in hormonal release and cognitive and emotive changes, which in turn influence behaviour. Thus, it is important to recognize that, like complex organisms in a moving social world,

> genes operate in an equally complex world within complex mechanisms that function in a living thinking person. In this way one can use the word ‘gene’ in much the same way as one might use ‘culture’, or ‘parenting’. Thus, while it is not possible to find a single gene or a small group of genes ‘for’ any given social or political behavior, a single gene might nonetheless have a significant influence on a given trait by representing the operational system helping to drive the pathways which influence the behavior of interest.

A similar statement was made by Smith et al. (2011, p. 374), clearly emphasising the indirectness of the relationships between genotype and behaviour:

> For most phenotypes (observable characteristics) that interest social scientists, a large number of different genes are likely to interact with the environment and with other genes and epigenetic markers to shape the behavior of interest. Genetic influence is more about differential vulnerability than direct causation, and the influence of environmental circumstances, and variation elsewhere in the genome can mitigate or even negate any predicted effect tied to the original gene of interest.

In this account, genetic factors form the lowest level of organisation of matter at which effective research into political attitudes and behaviours is possible. This, however, does not imply a simple, linear causal relationship in this case: from genes to politics. It is rather a multi-stage, non-linear process in which genes are only one of the components. Genetic factors form the basis for the development of an organism. Genes code proteins and these interact with hormones and neurotransmitters. As a result, physiological mechanisms of

behaviour are created, the final form of which will depend on interacting biological and environmental factors. This approach excludes the ontological reductionism inherent in the traditional conceptions of levels of organisation.[6]

The processes occurring within the described biosocial system are of a stochastic nature. Genetic explanations of political attitudes and behaviours do not, therefore, assume biological determinism (de Jong, 2000). Genetic factors only make us susceptible to a certain type of behaviour, but how we actually behave in a given situation depends on non-genetic factors. The extensive range of influences does not only concern complex networks of social relationships specific to our species. The phenomena and processes occurring both in social groups formed by representatives of other species, as well as in inorganic systems, are characterised by an equally high degree of complexity. A good example is climate change, which results from a combination of natural and anthropogenic factors, and the consequences of which are difficult to predict but are visible in many areas of social life and the environment.

The high degree of complexity in the interrelationship among biological factors or between biological and environmental factors is shown in studies of very simple organisms, such as the *Caenorhabditis elegans* nematode worms. The formation process of any neuron in the *C. elegans* can be influenced by different genes that interact with one another. The behavioural pattern itself is the result of the 'action' of many different neural systems. It should be noted that a single gene can affect many different neurons, and a single neuron can affect multiple behaviours. The situation becomes even more complicated when we consider the impact of the environment and random factors. Under the influence of different developmental environments, *C. elegans* develops different patterns of behaviour. This

[6] I have not found a single statement in the literature indicating that underlying the ontological assumptions of genopolitics is the possibility of a lossless reduction of entities from higher levels of organisation to entities from lower levels.

observation also applies to genetically identical individuals (phenotypic plasticity). In turn, different behavioural traits in genetically identical organisms, bred in the same environmental conditions, are the result of different synaptic connections created under the influence of developmental noise, among other factors. The image of complex relations between genes and the environment in *C. elegans* is complemented by the influence of epigenetic factors on gene expression (Schaffner, 1999). These findings are all the more interesting as they concern a model organism with a nervous system consisting of just 302 neurons.[7] The number of nerve cells in the brain of an adult representative of our species is estimated at 86.060.000.000 ± 8.120.000.000 (Herculano-Houzel, Catania, Manger, & Kaas, 2015). The comparison of a nematode worm's brain with a human being's brain is a far-reaching simplification. Nevertheless, it shows researchers' enormous difficulties in examining the biological foundations of political attitudes and behaviours.

Epistemological reductionism

Oppenheim and Putnam assumed the existence of a hierarchical organisation defined by the metaphysical dependence of higher-level entities on lower-level entities. Their conception envisages the adoption of an analogous system of connections in the sphere of epistemic relations occurring between fields of science that study phenomena from different levels of the hierarchy. It is, therefore, to be expected that, after sufficient cognitive progress has been made, all science will be reduced to its most elementary level—that is, to the laws of microphysics. Such a strict dependence of epistemic assumptions on otherwise highly debatable metaphysical assumptions raises many questions and doubts. Suppes (1978), for instance, noted that unifying tendencies are hindered by the pluralistic nature of science and the ever-increasing complexity of different fields of knowledge. Dupré (1983) pointed out the

[7] This concerns an adult hermaphrodite.

existence of intermediate levels of organisation and emphasised the importance of theories that describe and explain phenomena occurring not at one but several levels. Potochnik (2021), in turn, has cast doubt not only on claims that assume the present or future epistemic privilege of particular scientific explanations but on any conception that assumes a hierarchically structured world when considering the relations between scientific explanations. In her view, entities or properties that are key to different explanations of the same phenomena are not, as a rule, related by part-whole composition, mechanistic composition, realisation, or supervenience.

Philosophers who formulated or developed and commented on non-reductionist conceptions of the unity of science (e.g. Carrier & Mittelstrass, 1990; Craver, 2005; Darden & Maull, 1977; Grantham, 2004; Kincaid, 1990; Kitcher, 1984; Mitchell & Dietrich, 2006; Nathan, 2017; Potochnik, 2011) were equally critical towards the notion of reducing scientific knowledge to an epistemologically certain basis. The difficulties that epistemological reductionism has encountered, in their view, stem from incorrect assumptions about the nature of the world, mainly from underestimating the complexity and variability of natural and social processes and phenomena, while overestimating the present and future theoretical and methodological possibilities of science. The unity of science, understood as a reduction to physics, may thus appear as an extreme manifestation of the tendency to categorise the world in order to make it more transparent and comprehensible. The result, however, is a high risk of overlooking characteristics and relationships of core importance to our understanding of reality.

The foundation of Oppenheim and Putnam's reductionist program stems from physicalist conceptions developed on the basis of logical empiricism (Carnap, 1932; Neurath, 1931). The strong emphasis on logical analysis of the language of science and inter-theoretic reduction are postulates of logical empiricists, suggesting that science contains unchanging

elements, that scientific knowledge arises through simple increments of knowledge, and that some final state of science is possible. It turns out, however, that this vision is far from the nature of actual knowledge-generating processes, as noted already in the first half of the twentieth century by Fleck (1981 [1935]), the creator of the theory of thought styles and thought collectives. According to him, scientific knowledge is not based on some absolute foundation, and its development is possible only through constant variability and a high level of dynamics of mutual interaction. For this very reason,

> […] there does not exist, beyond dreams, only one kind of science; there are at present only some specific sciences which, in many instances, lack any connection among themselves, and which are sometimes divergent in their basic features. We can discuss science only in the same way in which we use the word 'art' to document the common nature of trends in music, painting, poetry, etc. Similarly all sciences possess a common trend towards an ideal end-state which is known as true knowledge. But just as art is not the sum total of music, painting, poetry, etc, so also sciences do not add up to form a consistent homogeneous whole (Fleck, 1986 [1946], p. 113).

Fleck turned against traditional conceptions focusing on the individual 'epistemological subject'. According to his notion, scientific discovery has a collective basis. In other words, it is the thought collective, the community of people within which ideas are exchanged, that influences what and how an individual comes to know. The exchange of thoughts between members of the collective leads to the development of a specific thought style, the essence of which is readiness for directed perception. The constraint exerted by the collective on the individual's perception of the world is the factor that ensures harmony (including a harmony of illusions) and tenacity of the system of held beliefs. According to

Fleck, a scientific fact is, above all, a cultural construct that contains the collective imagery characteristic of a given period and a given society.

Significant consequences of the socio-cultural conditioning of scientific cognition are: considerable diversity of scientific knowledge and moments of inconsistency and incompatibility between explanations of the same phenomena, belonging not only to different, but often to the same thought styles (research fields or research approaches). The formal-logical reconstruction of scientific knowledge is hindered even just by the evolution of the meaning of words. This is why, as Fleck noted (1981 [1935], pp. 53–54), it would be extremely difficult (if possible at all) to represent the outcome of the evolution of concepts such as, for example, weight or organism in terms of a "logical conclusion from past premises." Without knowing the socio-cultural context, it is difficult to relate in any meaningful way, for example, to the claims of eighteenth-century physiologists who believed that a person is heavier on an empty stomach than after eating or that the body weight increases at death.

It is not only the changing meaning of scientific terms that makes it impossible to analyse different theories related to the same phenomenon in terms of a logical continuum. The derivation of higher-level theories from lower-level theories may also be hindered by researchers' focus on different causal patterns (Potochnik, 2017). For example, the research on political attitudes and behaviour discussed in this text is conducted by representatives of various scientific disciplines (political scientists, sociologists, psychologists, neurobiologists, geneticists, etc.) using theoretical and methodological approaches that often differ radically. None of the approaches is able to provide a comprehensive picture of the phenomenon under investigation, so the explanations formulated on their basis are fragmentary and, in many cases, not related to each other in any particular way.

Lack of relations can also occur, as I have already mentioned, between explanations or, referring to the terminology of Potochnik and de Oliveira (2020), between explanatory styles, within a single research field. The genetic explanations of political attitudes and behaviour, which are the subject of my inquiry, are a good example of such a situation. Roughly speaking, these can be divided into explanations formulated as a result of classical heritability studies and explanations formulated as a result of molecular studies. Classical genetic explanations show the magnitude of the contribution of genetic and environmental factors to the variance of a measured political trait. They do not identify specific alleles or loci correlated with the analysed trait, which is, in turn, one of the goals of molecular explanations, achieved extremely rarely, probably due to methodological limitations (see section 3). The differences described result from different research goals and assumptions, resulting in two distinct ways of explaining the same phenomenon within a single research field. Given the current state of knowledge, it is difficult to identify a type of relationship between entities or traits central to the discussed explanatory styles that could form the basis for reducing classical genetic explanations to molecular explanations.

Awareness of the lack of coherence between conceptions from different levels of the quasi-hierarchical world structure is evident in the work of genopolitics researchers. They do not deny the pluralism of explanatory styles[8]; in their opinion, genopolitical explanations should complement the political science explanatory chain with new elements, thus broadening and enriching our knowledge of the political aspects of human functioning in complex societies. This goal was clearly emphasised by Ksiazkiewicz and Friesen (2017, p. 99):

[8] I use the concept of 'pluralism of explanatory styles' in the sense proposed by Potochnik and de Oliveira (2020).

> […] there is a bright future for the field of genopolitics, with a plethora of new methodologies and technologies that are only now being applied to political phenomena for the first time. When informed by insights generated from decades of rigorous political science research, these new approaches have the potential to dramatically broaden the horizons of the discipline and contribute to our understanding of the nature of political life.

The problem of the relationship between traditional political science research and genetic research was approached in a similar way by Hatemi et al. (2011, p. 81):

> Only by considering both the environmental and genetic sources of individual differences can we gain a deep understanding of behavior. The more we learn about how genes lead us into environments, affect our interpretations of the exogenous environments we encounter, and how our social environments may change our genetic expression, the more we can contribute to the discipline at large about which environments matter and why.

The goal of genopolitical explanations is not for genetic conceptions to replace any of the traditional links in the political science explanatory chain in the present or future. Genopolitics thus implies neither epistemological reductionism nor other related conceptions implying the reduction of political science to biology.

Methodological reductionism

Due to the limited computational capabilities of human brains and their supporting non-biological systems, researchers are unable to record, assimilate, and process information

about all aspects of objects, processes, or phenomena of interest to them. Therefore, they focus their attention on elements and characteristics that they consider relevant, from the point of view of the adopted theoretical perspective, counterfactually omitting elements and characteristics less relevant at a given stage of research, whether permanently or only temporarily. A good illustration of the implementation of the research strategy of introducing idealising assumptions into a representation and then eliminating them is Rosenstone and Hansen's mobilisation model (1993). According to its assumptions, the reasons for political participation should be found in citizens' individual characteristics and in political leaders' mobilisation efforts. Therefore, people participate in politics when the anticipated benefits are worth the participation costs and when political leaders convince them to do so. The mobilisation model involves a two-stage evaluation of factors influencing political participation. As a first step, the personal characteristics of the individuals are taken into account while the social influence is counterfactually ignored, then the idealising assumption is eliminated and social determinants are also analysed. More recent examples of the application of the idealisation method related to a radically different research area are reflected in the SARS-CoV-2 study with the use of organoids (see Han, Yang, Lacko, & Chen, 2022). It turns out that organoids can be used as cognitively valuable models that provide information about multiple infections that occur in both humans and other animals. The parameters of living organ models provide information, for instance, about the mechanisms of viral replication and immune responses. Virologists realized very quickly that a good understanding of SARS-CoV-2 would require the construction of systems containing, in addition to the organoids themselves, other components of the organism that condition life processes. It became urgent to concretise simple initial models and include, for example, immune cells, blood-vessel cells, or other organoids as well as the relationships between them. To date, however, these concretisations have not yielded the expected results.

Cognitive and technical limitations force the division of the studied phenomena into small parts and the analysis of only those parts that are relevant from the point of view of the adopted theoretical perspective. As a result, more or less idealised representations are created, serving to perform various cognitive functions. They provide information both about themselves (structure, how they are built) and about the target systems. Some enable understanding and/or explanation of the studied phenomena, while others provide high heuristic and/or pedagogical values (Frigg & Hartmann, 2020; Weisberg, 2015). One factor determining the functions performed in complex knowledge-generating processes is the degree of idealisation. A high explanatory potential can hardly be expected from representations with little correspondence to the represented system or from targetless representations, which does not mean that they cannot be helpful in teaching endeavours or constitute a good starting point for further research.

It is common practice in the genopolitical field to use highly idealised representations of the studied phenomena. Such constructs are formed when the complexity of the empirical systems is simplified. They consider the factors and relationships that are principal to the adopted research objectives and assumptions, while neglecting those factors and relationships considered less relevant by researchers at the particular stage of the study. According to the ITS (Nowak, 2000), the process leading from establishing pre-theoretical goals to formulating a genetic explanation of the studied political behaviour consists of several stages. First, based on the adopted ontological perspective, the researcher establishes a set of essential factors for the studied behaviour (irrelevant factors are reduced). In addition to genetic factors, it also includes physiological, neurobiological, psychological, cultural, social, historical and other factors. Then, within the set of essential factors, the researcher distinguishes principal and secondary factors, based on the adopted theoretical perspective. Then, the researcher goes on to introduce idealising assumptions that ignore secondary influences and formulates a

hypothesis to explain how the studied behaviour depends on principal factors. According to the ITS model, the researcher can finally modify the initial hypothesis by making it more specific. In the case of genopolitics, this stage is not usually reached. A probable reason for this is methodological limitations related to the researchers' focus on specific causal patterns (Wajzer, 2021).

In genopolitical research, the principal factors are genes. The omission of non-genetic influences is not, by any means, tantamount to negating them or deeming them not to be relevant, and it simply results from focusing on certain specific causal patterns and not on others. The use of a research strategy that consists in introducing various types of simplifications into the representations is characteristic not only of genopolitics but also of research using other methodologies, as pointed out by Hatemi et al. (2012, pp. 309–310):

> […] scientists familiar with genetics understand that gene–environment relationships are much more complex, and that we remain limited by our statistical tools to adequately capture these complex dynamics. This level of sophistication is rarely communicated to the public or even to the social sciences. Much in the same way that social science research relies on regression models to predict behavior, and depends on the critical assumptions inherent in such models which assume that everything else not measured in the model stays constant, genetic analyses make similar assumptions regarding other parts of the genome.

Genopolitics thus assumes methodological reductionism. The goal of genopolitics researchers is to focus on a well-defined aspect of political attitudes and behaviours, namely, their dependence on genetic factors. This does not mean, however, that genopolitics researchers deny the relevancy of the influence of non-genetic factors on the intellectual and

emotional states induced by politics and the behavioural responses to which those states lead. Non-genetic influences are studied through other approaches that take on their own idealising assumptions. Perhaps, with the emergence of new cognitive needs and methodological developments, an opportunity to build a unified approach will present itself. This will be very difficult, however, if only because researchers focus on often radically different causal influences, which I have emphasised several times.

Conclusion

Contemporary political scientists, depending on their research goals and assumptions, apply in their research the theories and/or methods and techniques of various biological and medical disciplines and sub-disciplines, ranging from molecular genetics, through physiology and neurobiology, to toxicology and epidemiology. There are several reasons for the increased interest of political scientists in biological approaches. The most important seems to include: the high explanatory potential of life sciences research and its solid methodological basis (Mansell, 2020). Among the benefits that political science can gain from the effective application of the achievements of the life sciences are the integration of detailed theories by indicating ultimate explanatory mechanisms, the formation of theories with a good grounding in empirical material, the possibility of indicating the practical consequences of the theories, or the increase in the explanatory potential of the theories. On the other hand, the dangers of combining political science approaches and biological approaches usually include violation of the autonomy of political science, geneticisation of politics (appropriation of political science discourse by biological discourse) or referring to biological justifications in engineering and implementing antidemocratic solutions in the areas of social and educational policies.

Attempts to use the methodology of life sciences in studying political predispositions suffer from several limitations. They result mainly from the complexity of the studied system

in which: there are numerous feedbacks; there is a lack of symmetry of interactions, emergent properties appear, random events play an important role, and multiple and complex realisation of a specific behavioural pattern is possible. These complications make discovering the biological components of political behaviours much more difficult, often rendering research efforts fruitless. However, this type of research delineates a relatively young and dynamic field of research in political science, so one should leave an unambiguous assessment of its usefulness in explaining political phenomena later. The cognitive values of modern bio-political approaches are closely related to the level of methodological and theoretical development of life sciences. In other words, the development of the research methods and techniques of molecular genetics, physiology, and neurobiology, as well as the accompanying progress in the knowledge of the genetic, physiological, and neural foundations of the behavioural phenotype of *H. sapiens* should be seen as the main factors determining the utility of biological explanations of political attitudes and behaviours formulated in various bio-political fields.

The example of the connections between biology and political science I am considering is genopolitics—an approach that provides knowledge about the genetic foundations of political attitudes and behaviours. I made the reductionism of genopolitics the object of my investigations because its characteristics indicate a type of inter-field connections. I have left other, equally important, philosophical, methodological, and social issues outside the scope of my considerations. Some of them have already been discussed in the literature in more or less detail; others are just waiting for the interest of researchers. The results of my investigations show that genopolitics assumes methodological reductionism, i.e., a standard research procedure that involves dividing the studied entities into small component parts. The assumptions of genopolitical research, however, do not imply an ontological reductionism, which predicts that higher-level entities can be reduced to lower-level entities

without loss. The findings that can be considered to be the most important from the point of view of the goal of the study are the findings concerning epistemological reductionism. Genopolitics rejects the assumption of the reduction of theory from higher system levels to theory from lower levels without loss. It does not, therefore, repeat the error of Wilson's sociobiology. The epistemological ambitions of genopolitics are very limited. The sole goal of genopolitical research is to supplement the explanatory chain of political science with hitherto unknown conditions and properties and not to reduce the explanations of political science based on culturalism to strictly genopolitical explanations. If proven to be correct, the results of my research provide the basis for a hypothesis regarding the anti-reductionist orientation of the contemporary links between biology and political science. One important step towards confirming or falsifying such a hypothesis would be to explore the reductionism of other contemporary biopolitical approaches, such as neuropolitics or evolutionary political psychology.

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