Studies in History and Philosophy of Biological and Biomedical Sciences 53 (2015) 1–15

Contents lists available at ScienceDirect

Studies in History and Philosophy of Biological and Biomedical Sciences

journal homepage: www.elsevier.com/locate/shpsc

The diversification of developmental biology

Nathan Crowe [a,*], Michael R. Dietrich [b,1], Beverly S. Alomepe [b], Amelia F. Antrim [b], Bay Lauris ByrneSim [b], Yi He [b]

[a] Department of History, University of North Carolina Wilmington, Wilmington, NC 28403, United States
[b] Department of Biological Sciences, Dartmouth College, Hanover, NH 03755, United States

ARTICLE INFO

Article history:
Received 20 June 2014
Received in revised form
14 April 2015
Available online 5 June 2015

Keywords:
Embryology
Developmental biology
Discipline formation
Nuclear transplantation
Developmental genetics
Research diversification

ABSTRACT

In the 1960s, "developmental biology" became the dominant term to describe some of the research that had previously been included under the rubrics of embryology, growth, morphology, and physiology. As scientific societies formed under this new label, a new discipline took shape. Historians, however, have a number of different perspectives on what changes led to this new field of developmental biology and how the field itself was constituted during this period. Using the *General Embryological Information Service*, a global index of post-World War II development-related research, we have documented and visualized significant changes in the kinds of research that occurred as this new field formed. In particular, our analysis supports the claim that the transition toward developmental biology was marked by a growth in new topics and forms of research. Although many historians privilege the role of molecular biology and/or the molecularization of biology in general during this formative period, we have found that the influence of molecular biology is not sufficient to account for the wide range of new research that constituted developmental biology at the time. Overall, our work creates a robust characterization of the changes that occurred with regard to research on growth and development in the decades following World War II and provides a context for future work on the specific drivers of those changes.

© 2015 Elsevier Ltd. All rights reserved.

When citing this paper, please use the full journal title *Studies in History and Philosophy of Biological and Biomedical Sciences*

1. Introduction[2]

In 1959, the United States-based Growth Society published the first issue of the journal *Developmental Biology*. Its publication marked a growing trend in which the label 'developmental biology' became the common descriptor for societies, departments, and publications that had previously described themselves using monikers such as 'embryology' and 'growth'.[3] For example, in England, the London Embryologists' Club changed their name in 1964 to the 'Society for Developmental Biology' and added 'British' to the beginning once the Growth Society in the United States changed their name to the Society for Developmental biology in 1965 (Slack, 2000).[4] In the east, the U.S.S.R. Academy of Sciences formed the Institute for Developmental Biology in 1967 (Dettlaff & Vassetzsky, 1997; Korochkin, Konyukhov, & Mikhailov, 1997), and in Japan, the

* Corresponding author. Tel.: +1 011 910 962 0099.
E-mail addresses: crowen@uncw.edu (N. Crowe), Michael.Dietrich@dartmouth.edu (M.R. Dietrich), Beverly.S.Alomepe.17@dartmouth.edu (B.S. Alomepe), Amelia.F.Antrim.14@dartmouth.edu (A.F. Antrim), Bay.Lauris.ByrneSim.15@dartmouth.edu (B.L. ByrneSim), Yi.He.17@dartmouth.edu (Y. He).
[1] Tel.: +1 011 413 330 6463.

[2] In this article, we will abbreviate the *General Embryological Information Service* as *GEIS*.

[3] We do not mean to imply that this is the first time that the name 'developmental biology' or a similar variant was used to describe the field. We merely point out that it was not until the late 1950s that the label became a more prominent descriptor of the discipline.

[4] Though they had precedence, the British biologists modified their society name because the American society was both bigger and was already publishing *Developmental Biology* (Slack, 2000).

http://dx.doi.org/10.1016/j.shpsc.2015.04.004
1369-8486/© 2015 Elsevier Ltd. All rights reserved.

Japan Society for Experimental Morphology (1942) and the Embryologia Society (1950) merged in 1968 to become the Japan Society of Developmental Biologists (Okada, 1994). During that same year, the longest standing international organization for the field, the Institut International d'Embryologie (IIE), renamed itself the International Society of Developmental Biologists (ISDB) (Palmeirim & Aréchaga, 2009; Slack, 2000). By the end of the 1960s, 'developmental biology' had become the term *du jour* for the sciences dedicated to understanding growth and development.

In the inaugural issue of *Developmental Biology* in 1959, the founding editor Paul Weiss claimed that the journal title highlighted the universality of growth and development throughout biology. "In the past, development and growth have been dealt with mostly in separate and relatively isolated compartments, such as embryology, or plant physiology, or nutrition, or oncology," Weiss wrote (Weiss, 1959, p. ii). "Yet in reality, all of these are isolated aspects of one continuous spectrum of phenomena, varied manifestations of the same basic principles and elementary processes." The term *developmental biology*, Weiss claimed, "promoted the confluence and integration of related, but formerly isolated, lines" (Weiss, 1959, p. ii). Weiss' 1959 introduction puts forward two different arguments for the adoption of this new label. First, that the term 'developmental biology' lays claim to a broader swath of topics than the more narrow labels of 'embryology' or 'growth'. Secondly, that these previously disparate topics are interrelated at a more fundamental level, meaning that the study of any of these broader concerns of development should theoretically help in understanding all aspects of the field.

Clement Markert, who was President of the Society for the Study of Growth and Development when it changed to the Society for the Study of Developmental Biology in 1964, recalled slightly different reasons for the change in a letter to Evelyn Fox Keller. According to Markert, the name change "was motivated by two reasons: (1) the Growth Society had declined somewhat so that it did not have a very good image; and (2) and more important, the term 'growth' was not descriptive of the Society. The term [developmental biology] was much more descriptive than any previously used term, such as growth or embryology, and did, in fact, enhance the scientific image of the Society in an appropriate fashion" (Keller, 1995, p. 25). In 1961, Peter Nieuwkoop also noted the increasing "specialization with the field of embryology, especially where it borders upon genetics, biochemistry, and biophysics." For Nieuwkoop the shift from the Section of Embryology to the Section of Developmental Biology in the International Union of Biological Science represented "a change indicating an extension of its activities to the entire field of biology" (Nieuwkoop, 1961, 269). Significantly, Weiss, Markert, and Nieuwkoop all had a sense that developmental research had out grown earlier labels.

Since that period, historians and biologists have debated how the study of development—however it was labeled—actually transformed during this period. Was this simply a semantic change or did diversification and growth of research support a broader label? If there were substantive changes in the fields of growth and development, how can historians best describe them? Were there major intellectual changes at the time? Or were these label changes motivated by new social, institutional, or cultural needs?

To the authors of this paper, the increased use of the moniker "developmental biology" coincides with a period of transformative change in research related to growth and development. As our survey of historical interpretations in the next section shows, many scholars have put forward explanations for the changes that have taken place between World War II and the 1980s in these fields. However, the types of evidence that historians have used to support their explanations has been limited; these explanations have often been predicated upon studies that involved too narrow a view of topics, people, or geographic areas. Given that some sort of significant change in the study of development occurred during this period of time—which is signaled by the rebranding of the field around the world—our goal in this paper is to try to characterize what changed in the study of growth and development in the years immediately preceding the widespread adoption of the disciplinary label of developmental biology.

Using a much more extensive data set than has previously been applied, we find patterns of change in research growth and diversification of research topics that preceded the nomenclatural turn toward developmental biology. We are not claiming that that these changes caused biologists to adopt the term "developmental biology" for their discipline, or that most biologists would have been fully aware of these global patterns of change and research diversification. Instead, we claim that global patterns of growth and diversification in developmental research characterize this period of discipline re-formation, and that these patterns set a new challenge for historians to explain the drivers of this growth and diversification—whether those drivers turn out to be semantic, intellectual, economic, institutional, social, or cultural. In the secondary literature, the most prevalent explanation for this change in the name of the field focuses on the impact of molecularization as a potential driver of change, but given our data and analysis, we find this explanation to be insufficient.

For our broader perspective, we analyze a robust set of post-World War II research data preceding the period in which the term 'developmental biology' increased in popularity. Specifically, we analyzed the *General Embryological Information Service* (*GEIS*), an international periodical published from 1949 to 1980, that indexed not only scientists working on topics related to embryology, but also described what research they were conducting. From this data, we can begin to delineate the broader field that the new term 'developmental biology' supposedly encompassed. What we have found in our broad analysis is that there was substantial and increasing research diversification, both in the number and type of research projects before and during the period in which developmental biology became the dominant label for the field. Our goal in this paper is to articulate these patterns of diversification.

For historians, *GEIS* offers a remarkable amount of data about the field focused on growth and development during the middle of the twentieth century. The first issue collated nearly 700 names from scientists at 245 institutions, and by 1980 the editors published the names of over 3400 biologists at 1,200 institutions throughout fifty countries (Palmeirim & Aréchaga, 2009). The figures collected in these volumes represent the majority of practicing scientists focused on biological growth and development during this period, making the topical data that the *GEIS* editors assembled highly indicative of the state of the science during any given volume.

One of the most distinctive and useful aspects of *GEIS* is not the list of names, but rather the catalog of research projects. Specifically, *GEIS* editors required that scientists report *what they were actually doing in the lab* and specifically asked them not to provide bibliographic data of recent publications. As scientists are well aware, not all research conducted in the laboratory gets published. Some projects never succeed, or lead the researcher down dead-ends. Though the scientists may have spent countless hours working in a particular area, the fact that they never published anything from the work means that their efforts are often lost to the historical record. The requirement of *GEIS* editors to report research rather than publication data provides insight into what scientists actually spent time investigating during our period of interest.

Download English Version:

https://daneshyari.com/en/article/1162171

Download Persian Version:

https://daneshyari.com/article/1162171

Daneshyari.com