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Natural Sciences in Academic Vienna in the 1990s: From "[Peripheral] Outpost Near the Iron Curtain" to "Central Hub"

Abstract

In 1999, four editorials in the journal Biological Chemistry commemorate how, since the 1980s, Vienna has transformed from a "[peripheral] outpost near the Iron Curtain" to a "central hub" for life science research.

A closer look at these texts reveals the explicit and implicit role of drawing maps for and within science, depicting centers, peripheries and – in this case – geopolitically real and allegorical "iron curtains".

Based on this observation and the issues it raises, I reexamine the pertinent empirical material covering relevant times, places,

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(sub-) disciplines and institutions, as well as the period after 2000. I deal with "molecularization" in biology, (sub)disciplinary differentiation, internationalization, as well as changes in public-private relations and a pair of complementary concepts of innovation and tradition. Thus, I retrace the establishment of a techno-epistemic culture in a local, disciplinary context.

I conclude that guiding principles such as excellence and internationality are understood and implemented in academia in locally and historically bounded ways, and I argue that a critical re-examination of empirical material can substantially enrich our approach to such topics.

***Keywords**: history of biology, University of Vienna, scientific persona, generations in academia, contemporary history of science, molecular revolution, techno-epistemic culture*

Nauki przyrodnicze w akademickim Wiedniu w latach 90. XX w.: od „[peryferyjnej] placówki przy żelaznej kurtynie" do „centralnego ośrodka"

Abstrakt

Cztery artykuły redakcyjne w czasopiśmie „Biological Chemistry" z 1999 r. upamiętniają, jak od lat 80. XX w. Wiedeń przekształcił się z „[peryferyjnej] placówki w pobliżu żelaznej kurtyny" w „centralny ośrodek" badań nauk przyrodniczych.

Bliższe przyjrzenie się tym tekstom pokazuje jawną i niejawną rolę rysowania map naukowych, przedstawiających centra, peryferia i – w tym przypadku – dosłowne i alegoryczne „żelazne kurtyny".

W oparciu o te spostrzeżenie i związane z nimi zagadnienia ponownie badam dostępny materiał empiryczny obejmujący odpowiednie czasy, miejsca, (sub-)dyscypliny i instytucje oraz okres po 2000 roku. Zajmuję się „molekularyzacją" w biologii, zróżnicowaniem (sub-)dyscyplinarnym, internacjonalizacją, parą komplementarnych koncepcji innowacji i tradycji, a także zmianami w stosunkach społeczno-prywatnych.

Dochodzę do wniosku, że zasady przewodnie, takie jak „doskonałość" i „międzynarodowość" są rozumiane i wdrażane

w środowisku akademickim w sposób ograniczony lokalnie i historycznie, i twierdzę, że ponowne krytyczne zbadanie materiału empirycznego może wzbogacić nasze podejście do takich tematów w fundamentalny sposób.

Słowa kluczowe: *historia biologii*, *Uniwersytet Wiedeński*, *pracownik naukowy*, *pokolenia w środowisku akademickim*, *współczesna historia nauki*, *rewolucja molekularna*; *kultura techno-epistemiczna*

1. Science at large in two fin-de-siècle Viennas: "Putting academic Vienna back on the map"

When looking back at his scientific career and especially at his decision in 1985 to move from the University of Zurich to Vienna to establish a new, industry funded biomedical research laboratory, the renowned molecular biologist Max Birnstiel pondered whether this had been a move "up or down"[1] – a question deemed warranted because, according to his depiction, Vienna "was then still a European outpost near the border of the Iron Curtain" and it would be up to him "to help put Vienna on the scientific map". Birnstiel's historical reflection was published in 1999 in the journal *Biological Chemistry* as part of four editorial texts on the occasion of his retirement and in celebration of his past success as the first director of the Vienna-based Institute of Molecular Pathology (IMP). The three accompanying *laudationes* were compiled by his former colleague, Alexander von Gabain, his acting successor, Kim Nasmyth, and his former employee, Walter Schaffner.

Von Gabain[2] echoes Birnstiel's sentiment, but also directly links the events in 1985 to the Habsburg monarchy. He notes that the House of Habsburg and Birnstiel were both of Swiss origin and thereby invokes a great – if distant – local past, reminding his audience of the monarchy's "outstanding cultural heritage including Mozart, Schiele, Freud, Boltzmann and Landsteiner". Vienna has thus been put *back* "on the world map of outstanding scientific institutions". In Nasmyth's description,[3] Vienna lies "roughly between Prague and Budapest (…) in the heart of Central Europe"; the Second World War having "turned

[1] Birnstiel 1999.
[2] von Gabain 1999.
[3] Nasmyth 1999

Vienna into a backwater at the easternmost extremity of a Europe culturally and intellectually dominated by states in the West". Thus, the "first and foremost problem was finding group leaders who were willing to move so far east". The successful establishment of the laboratory and the entire BioCenter in close collaboration of the University of Vienna, Boehringer Ingelheim[4] and Genentech[5] resulted in "the center" (at least of molecular biomedicine, if not of intellectual life more generally) finally move "eastwards".[6] The dynamics of yet another schism of that period – not between "East" and "West", but between "organismic biology" and "molecular biology" – become pertinent in the fourth editorial: Schaffner[7] addresses his own transition from zoology to molecular biology as a student. After his studies in zoology and two unsuccessful thesis projects, he "felt so low that [he] seriously started wondering why the automatic doors at the [cafeteria] would still open for [him]". A further project he engaged in resulted in the determination of a distinct molecular structure and finally "helped to alert Max Birnstiel to [his] existence". But "[o]nce in molecular biology, it soon dawned on [him] that just about everything was going to be different".

From the perspective of a critical history of science, a few peculiarities of these storylines emerge as especially interesting: all articles refer frequently to the idea of a map of the scientific landscape at a given time. In so doing, the texts invoke three different historic times: the Habsburg monarchy as a distant, but relevant past, the 1980s as a period of transition, and 1999 as the year the texts were written and published – as such, another fin-de-siècle moment. The map for the Vienna of the House of Habsburg is separated by a century from the 1980s Vienna. It conflates roughly one hundred years of history and diverse fields of excellence such as music (Mozart), painting (Schiele), psychotherapy (Freud), physics (Boltzmann), and medicine (Landsteiner). Beyond this list of eminent figures, its relevance stays somewhat elusive. While only one text places the great historical past center stage, the map of the

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[4] Boehringer Ingelheim is one of the world's largest pharmaceutical companies. It operates globally and is in private ownership of the families Boehringer, Liebrecht and von Baumbach.

[5] An American biotechnology corporation, subsidiary of Roche since 2009.

[6] Nasmyth 1999.

[7] Schaffner 1999.

1980s and its gradual transformation until 1999 play a central role in all four articles. The paradigmatic map featured for the early 1980s refers to the foundational years of Birnstiel's laboratory. It consists of a center in the West, an iron curtain, and a no-where-land hinterland "behind" or east of it. The curtain itself thus signifies the apparent end of the scientific map.

The 1980s map is linked to the 1990s map by descriptions of Birnstiel's successful recruitment of personnel from 'the West' (mostly, the United Kingdom) and establishment of international standards in an internationally recognized institute. Somewhat in line with the "moving eastwards" narrative, Nasmyth remembers "a sense of adventure that enticed most of us".[8] A third map is drawn in more implicit terms for 1999, when the texts were written and published. This final map does not really feature the fate of the Iron Curtain and its hinterland but assures us that Vienna is "back on the map". It nevertheless plays a distinct role as it serves as the celebrated climax and dominant ontology from which all editorials are written. This climax is characterized by the focus on distinct interpretations of "excellence" and "internationality". The list of later employees and board members of the laboratory helps reveal the premises behind the assertion of internationality: presentable centers of molecular biomedicine during this last decade of the 20th century include the Institute for Genomic Research and Columbia University in the U.S.A., Sweden's Karolinska Institute, the University of Zurich, and Cambridge University as "the birthplace of molecular biology"[9] in Europe.

Moreover, the 1999 map does not refer to the wider epistemic territory of 'biology at large' or to other fields of research beyond molecular biology. The university institutes that joined later were dedicated to biochemistry, microbiology and genetics.[10] Later on, the Campus Vienna BioCenter will also be called a "hot spot" in the realm of the life sciences.[11] As with the geographic map, the disciplinary map depicted has its 'iron curtains' and its hinterlands. Schaffner's account is in this respect reminiscent of the "molecular wars"[12] raging

[8] Nasmyth 1999.
[9] Nasmyth 1999.
[10] Cf. Wirth 2013.
[11] See for instance LISAVienna News 2013 (accessed on 22 February 2021).
[12] Wilson 2006, pp. 218–237.

at Harvard University in the 1950s and 60s, albeit in a much more adversarial manner and heated atmosphere. These "wars" raged along a redefinition of what excellent science was meant to look like. Beyond new scientific personae, research themes, and epistemic approaches, the mapped territory of 1999 Viennese molecular biology included private-public partnership (between the Boehringer Ingelheim and University of Vienna), hybrid institutions, spin-offs, start-ups, and the expectations related to temporary contracts that "kept everyone permanently on their toes" and "perpetual change is therefore a key aspect".[13] It prepared for a new entrepreneurial culture, university managerialism, and a new economic regime within academia (to be partly normalized with the 2002 Austrian University Act). This territory was apparently (still) not populated by women scientists: the total list of women mentioned in the four texts comprises Margaret Thatcher (driving scientists out of United Kingdom), Snow White (as an allegory for Vienna, "ready to be woken from a deep sleep"[14]), and Denise Barlow as the only woman scientist, besides a plethora of male colleagues.

2. A theoretical and empirical revisit of academic Vienna's transition

The depiction of how Viennese academia was "put back on the map" in the four editorial texts is obviously a circumstantial (hi)story written from a distinct position on a distinct occasion. It can provide us with a valuable glimpse at the prevalent discourse about modernization and traditionalism and its role at a given time (1999), at a given location (Vienna) within a distinct academic collective (biochemistry / molecular biology). Moreover, the texts can inspire a reconsideration of inherent statements from some distance – starting with a close re-reading that builds on insights and approaches from history, sociology, and anthropology of science, and mobilizes further data on the historical context. On a more general account, two narrative motifs stand out as particularly interesting: the scientific grandeur and the mapped scientific landscapes of the two different fin-de-siècle Viennas.

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[13] Nasmyth 1999.
[14] Nasmyth 1999.

As to the first motif, historical studies of science suggest that the Viennese fin-de-siècle establishment did not welcome without any hesitation or reservation 'biology's first revolution' when originally launched in the 19th century by Darwin's evolutionary theory; or at least not as emphatically and unequivocally as contemporaneous Germany.[15] Enthusiasm seems to have differed between liberal scientists and conservative elites as well as among disciplines or thought collectives;[16] the central tenets of Darwin's work – species variability and the central role of natural selection – were assessed quite differently; scholarly and public media opted for different framings, emphasizing a strict separation of science and religion or staging the two spheres as fiercely competing ontological authorities; and the various protagonists' translation of evolutionary theory into bio-policies also varied in quantity and quality.[17] Opposition between Darwinian and Lamarckian views on the main mechanism of biological evolution (natural selection or hereditary traits acquired during life time in reaction to the direct environment) would persist for decades to come, with its own fluctuating geopolitical momentum.[18] Thus, an 'iron curtain' found its way also into the republic of science and the history of ideas.[19]

As to the second motif, references to maps in the four texts roughly fall into four categories: firstly, something can be either on the map or off the map; secondly, if on the map, something can be part of centers or peripheries; thirdly, maps are referred to in a (more or less) literal sense, depicting west and east, England or Austria. And finally, maps can include historic and local or (allegedly) timeless and generally valid parameters. In any account, none of the previously mentioned editorials tells us much about how the maps they refer to had been drawn, on which bases, by which actors, or for which purposes. The reader is left with the impression that the maps mostly exemplify some internal

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[15] See for instance the introductory sentence in Engels 2018, p. 127: "Darwin treasured German scientists and German scientists treasured him." (trans. KK).

[16] Fleck 1994[1935].

[17] For these arguments, cf. Celenza 2010, Matis 2018, Feichtinger 2018, and Klemun 2018.

[18] Rossianov 1993.

[19] It is a curious historical coincidence that Lamarckism lost its taboo status in Western science with the emergence of the epigenetic paradigm only after the removal of the geopolitical Iron Curtain.

compass that molecular biologists – or more generally scientists[20] – acquire, live by, and act upon. The only active re-drawing of a map is undertaken by Birnstiel, an accomplishment celebrated in all texts as unequivocal success (as is to be expected in this specific laudatory genre).

Geographic (or geography-like) stratification of the republic of science has been addressed by historians and sociologists of science, culminating in a 'spatial turn' in these fields. An ideal of a global scientific community without borders, differentiated solely by topics of research and scholarly merits, has been drawn into question by various accounts of stratification, boundary work, exclusion, and ignorance. Spatial differentiation has been researched as (bounded) patterns of scholarly communication, collaboration, travelling, and mobility, as enacted by individuals, communities, and organizations, institutionalized as scientific personae,[21] epistemic cultures,[22] formal rules, and infrastructures.[23] Post-colonial perspectives have drawn established conceptions of internationality[24] or of center-periphery dichotomies[25] into question, problematizing the very categories that re-actualize such dichotomies, such as discovery and innovation or transfer and adaptation.[26] Beyond the history of science, some historians have started re-writing European history by a "recentering decentering" ("rezentrierende Dezentrierung"), a perspective that focuses on processes and contextualities which acknowledges marginalization, heterogeneity, and ambivalence.[27] Transfer of post- and anti-colonialist thinking to the realm of interdisciplinary dynamics, has resulted studying "scientific imperialism" and scrutinizing "a type of interdisciplinary

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[20] That major research institutions like the International Institute for Applied Systems Analysis (IIASA, founded in 1972 and located close to Vienna) and major hubs of science diplomacy like the International Atomic Energy Agency (IAEA, created in 1957 with its headquarters in Vienna and laboratories nearby) already existed in Austria when Vienna was to be 'put back on the world map of outstanding scientific institutions' reinforces the impression that the molecular biologists' map might be rather field specific.

[21] Daston 2003; Paul 2014.

[22] Knorr-Cetina 1999.

[23] Livingstone 2003; Meusburger et al. 2010; Merz, Sormani 2016.

[24] Somsen 2008 for the period "from the enlightenment to the cold war".

[25] For a recent treatise, see Barahona 2021.

[26] Patiniotis 2013.

[27] Adam et al. 2017.

relation in which one scientific discipline occupies or enters into another discipline's domain".[28]

The following empirical analysis draws upon these historical insights, theoretical conceptions, and alternative ontologies. It aims at nurturing a broader perspective on Viennese biology's maps in the last decade of the 20th century by focusing on a few influential aspects. I propose to take into account the simultaneous presence of multiple maps, the multiple practices of localization and translocalization (for want of better words), and the changing patterns of tradition and innovation in Viennese academic life sciences. In search of explanatory factors for heterogeneities and changes over time I discuss field-specific, paradigmatic ('molecularization'), organizational (university expansion, university reforms), and sociocultural aspects (shifting inter-generational relations, shifting views on tradition and innovation, shifting conceptions of science-in-society). Methodologically, I draw on various data gathered when becoming an observing participant of this historic period and location and when researching it as a participant observer.

To contextualize my own analysis, it is necessary to – at least briefly – declare my own relation to the researched field and questions. I studied biology at the University of Vienna in the 1990s (1992–2000), starting off with the very general biological curriculum of that time and place and then focusing on vegetation ecology. Around 1998, I started to work (at first in parallel to my biological work, later exclusively) as a sociologist/ethnographer of science. My first such project reconstructed the epistemic culture of biology via the socialization of biology students at the University of Vienna 1999/2000.[29] From 2010 to 2013 and from 2014 to 2019, a transnational collaborative project and a national habilitation award with the Austrian Science Fund (FWF) enabled me to return to the topic of the epistemic culture of biology in Vienna, targeting technoscientific aspects within newly emerging fields of life science. Again, I performed participatory observations at university courses and undertook semi-structured interviews with biology students and biologists – this time in Austria as well as in the United Kingdom.[30] I also started collecting historical data. An additional project allowed me

[28] Mäki et al. 2018, p. 1.
[29] Kastenhofer 2004.
[30] Kastenhofer 2013a; 2013b.

to add a few biographical interviews with life scientists from different generations.[31] The resulting material is drawn together here for the first time with a view to readdress the development of the life sciences at the University of Vienna around the turn of the 20th century. The analysis of the material follows a Grounded Theory[32] rationale.

Besides methodological considerations (or, as ethnography would have it, as an essential part of methodological considerations), I also have to declare my own standpoint.[33] Writing about this topic comes with implicit and explicit narrative standpoints and it is certainly necessary to consider my (sub)disciplinary affiliations (with a rather organismic take on biology), as well as my geographic and generational ones. These affiliations help to relativize some aspects of the stories presented in the editorials, but they certainly also blind me for other aspects. The reader will possibly note that the world of organismic biology is more familiar to me than the world of molecular biology – throughout my education and my short career as a biologist, I have certainly spent more time "in the field" in and beyond Austria than at laboratory benches. Only with my second career in science and technology studies did I focus on molecular biology and bioengineering. I can only alert the reader to this asymmetric constellation and the resulting epistemic benefits and hazards.

3. Vienna in transition: The 1990s between traditionalism and modernization

Building on my own empirical material, I concur with the general editorial narrative that Viennese biology underwent a major transition, starting from the 1980s and 1990s and culminating around the turn of the century. However, with a more comprehensive perspective, including not only the molecular life sciences, but also the organismic strands of biology, and with hindsight more than twenty years later, the picture

[31] Kastenhofer, Novy 2018.

[32] Corbin, Strauss 2008.

[33] The critical treatment of Ernst Mayr's historiography of biology in Milam (2010) specifically speaks to a call for such reflexivity on the part of (former) biologists writing their own histories. Within ethnography, this call for reflection is extended to 'outsiders'. Cf. the methodological sections on subjectivity and reflexivity in O'Reilly 2005, pp. 205–228, Hammersley, Atkinson 2007, pp. 14–19, or Hennink et al. 2011, pp. 19–23.

becomes more nuanced and further analytical questions come to the fore. In the following, I will start with the one dimension mostly identified with historical change in biology, namely the organismal vs molecular axis that serves as an arena for the discipline's 'molecularization'. I then go on to identify three essential factors enabling and driving change in the addressed period (academic generations, university reforms, and broader socio-cultural developments). The resulting broader conception of change allows me to quickly hint at a second dimension of change that comes to the fore in my empirically grounded approach (orientation towards tradition vs radical innovation) and to delineate a third dimension of change in more detail that is represented by the local vs global ('internationalization') axis. Specific attention is given to divergent modes of internationalization and innovation in organismic biology and molecular life science.

3.1 The 'molecularization' of biology as a central dimension of disciplinary change

At the level of epistemic and technoscientific innovation, the 1960s and 1970s have had a lasting impact on the way that scientists study and conceive of living systems all over the world (or, more specifically, in top-ranked scientific journals) by way of what has often been called the "molecular revolution" in biology[34] or the "molecularization" of life sciences.[35] During this phase in the history of molecular biology[36] the central dogma was coined and essential new techniques of intervention were developed at the molecular and genetic level. Scholars focusing on the history of scientific ideas are busy until today writing and rewriting the history of the resulting paradigmatic change. The U.S. American biologist John Tyler Bonner recalls the time period of 1960–1980 as

> a microcosm of a worldwide revolution [at Princeton]. Biochemistry and molecular biology were making an explosive impact on biology. The advances in those twin subjects were so rapid and dramatic that the very fabric of biology was being altered in fundamental ways. (…)

[34] Olby 1990.
[35] Chadarevian, Kamminga 1998.
[36] Cf. Rheinberger 2016.

> Many hailed these new developments as the important and exciting advances that they were, but many of the older biologists showed puzzlement at the incursion into the established ways.[37]

At the level of research institutions and everyday research practices, however, the revolution took place at different times and in different ways. Viennese biology is just one example of this pattern.[38] Based on my research findings, the molecular turn as a ubiquitous and unavoidable shift towards molecular research objects, techniques, programs, and institutes took place only around 2000 at the University of Vienna,[39] if certainly well preceded by parts of the Austrian research landscape and scientific community. Early institutionalizations of molecular biology research include the Austrian Academy of Sciences setting up an Institute for Molecular Biology in Salzburg (*1962); the University of Vienna's medical faculty (later: Medical University of Vienna) adding biochemistry (*1958), molecular biology and genetics departments (*1977);[40] the University of Vienna's science faculty creating a biochemistry department (*1972) and a microbiology and genetics department (1985);[41] and some departments founded at the

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[37] Bonner 2002, p. 143.

[38] See Strasser 2002 for various European countries and Rheinberger 2015 for Germany. Bonner 2002, p. 143, also notes for Princeton University that "[h]owever, there was no change until the early 1960s when the university finally decided to expand and set up a program in biochemistry that was to be joint venture of the biology and chemistry departments".

[39] Similarly, the University of Vienna with its traditional focus on morphology was relatively late in establishing its first chair in animal physiology.

[40] An eminent figure and leading force to be mentioned in this respect is certainly Hans Tuppy (born 1924 in Vienna), a former disciple of Ernst Späth in Vienna and Frederick Sanger in Cambridge. Tuppy was professor of biochemistry at the medical faculty of the University of Vienna and teacher of a generation of biochemists. He held several other influential positions throughout his career: dean and vice chancellor at the University of Vienna, president of the Austrian Science Fund, president of the Austrian Academy of Sciences and Austria's Minister for Science and Research during the late 1980s. His parents stemmed from Prague and Brno. His father was murdered in a German concentration camp after acting as chief prosecutor of illegal National Socialists who had assassinated Austria's Chancellor Dollfuss in 1934.

[41] The first department to move from "Biozentrum Althanstraße" to "Vienna BioCenter".

University of Natural Resources and Life Sciences Vienna (Universität für Bodenkultur) or the Technical University Vienna.

The pattern of the proliferation of molecular biology as well as the causes of its deferral within the faculty of sciences' biology departments deserve a closer look by using data on university research institutes, curricula, professorships, and physical infrastructure. This exercise comes with some risk of circular reasoning or relativity: only from a certain historical and local conception of what academic biology is and is not can one define which institution or institute is in or out. The longer the time-horizons and the broader the institutional scopes, the more difficult this exercise becomes. However, a long time-horizon and a wider disciplinary and institutional scope can help with understanding the bigger picture.

For the construct at hand – biology – a few general aspects can be noted: the emancipation of biology as an academic discipline, field of research, and field of study in its own right parallels the emancipation of the philosophy faculty from the medical faculty starting with the Thun-Hohenstein university reforms in the mid-19th century. Before that, biology was taught to medical students in a preparatory function and exercised by medical teachers mostly as a private hobby or as a paramedical science. Big parts of what has later been designated as biology were then still part of a research area denoted as natural history. The *establishment of the idea* of a distinct biological research realm in the scientific community saw its climax with the broad acceptance of unifying theories like Darwin's theory of the origin of species or with debates on unique traits of biotic systems around (very roughly) 1900. However, the *institutionalization of biology as a discipline* took place only much later with the establishment of biology curricula in Austrian secondary schools (in 1962) and at the University of Vienna (in 1982). This climax was preceded first by university professorships in botany and zoology[42] (1754 and 1849) and then in respective fields of study that were mostly taken in combination (as primary and secondary subjects).[43] It also coincides with the building of a dedicated "Biozentrum" in Vienna's 9th district (formally "Universitätszentrum Althanstraße I")

[42] The multiple meanings of zoology in the 19th century are delineated in Nyhart 1995.

[43] Again, varying uses of terms like 'zoology' render an ultimate determination challenging.

in 1982 (Figure 1), assembling four university institutes (zoology, plant physiology, genetics and microbiology, and human biology).[44]

Talking of a climax also entails the notion that biology as one coherent discipline has disintegrated ever since;[45] so much so, that it has once again become difficult to grasp as a research object. While the modern evolutionary synthesis provided ample potential for further integrating biological research fields, it also stirred considerable competition, culminating in the formation of two opposing camps – molecular biology versus organismic biology – caught up in the previously mentioned 'molecular wars'. The historian of science, Erika Lorraine Milam, summarizes the situation for the U.S. context:

> Biologists in the 1960s witnessed a period of intense intra-disciplinary negotiations, especially the positioning of organismic biologists relative to molecular biologists. The perceived valorization of the physical sciences by "molecular" biologists became a catalyst creating a unified front of "organismic" biology that incorporated not just evolutionary biologists, but also students of animal behavior, ecology, systematics, botany—in short, almost any biological community that predominantly conducted their research in the field or museum and whose practitioners felt the pinch of the prestige and funding accruing to molecular biologists and biochemists.[46]

For the context at hand, the rise of an 'organismic camp' in Vienna is best illustrated by the formation of a "Centre for Organismal Systems Biology" (COSB) in 2004.[47] It united seven departments (anthropology,

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[44] The initial plan to also include botany was eventually abandoned with a view to botany staying close to the botanical garden and glass houses.

[45] Cf. Stichweh 1992 on the temporary validity of disciplinary categories.

[46] Milam 2010, abstract.

[47] It is interesting to note how the rather late 'molecularization' at the biology departments of the University of Vienna, that coincided with the rise of data-centric science and modern systems biology in international molecular biology / biochemistry, left its traces in the self-identification of the two opposing camps. The labelling of COSB more or less coincides with the creation of a chair in "molecular systems biology" and one in "computational systems biology". For the new data-centric biology, see Leonelli (2016) and Strasser (2019).

behavioral biology, cognitive biology, integrative zoology, molecular evolution and development, neurobiology, and theoretical biology), but remained a rather informal construct. All other departments in the same building united under the label of "functional ecology", including microbiology and ecosystem science, ecogenomics and systems biology, limnology, and bio-oceanography. Animosities between organismic and molecular biologists were fueled by a competition for recognition and resources that was measured through publication output, funding, university positions, amount of space for offices and labs, and up-and-coming doctoral candidates. In interviews, the schism was symbolized by pipettes and test tubes on the one side, possibly corresponding to butterfly nets and Berlese funnels on the other. But this did not imply that organismic biologists abstained from adding molecular methods and data to their research routines or that molecular biologists would not also incorporate organismic data and expertise;[48] rather, the war was about each side's valuation of the other side of the same coin of modern biology, the authority it thus held, and the future it deserved.[49] Organismic biologists would complain about the lack of knowledge on distinct biological taxa (or, more generally, "non-model organisms"), their morphology, developmental stages, and living conditions and about the missing rigor in reviewing (and, thus, valuing) such aspects in scientific publication:

> We faced general difficulties in the contemporary American system and its strong focus on impact factors. I remember

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[48] See, for example, the self-presentation of the department of integrative zoology: "Teaching and research in our group spans across a wide range of animals including vertebrates, arthropods, and lophotrochozoans. These are analysed using various morphological and molecular methods, including immunolabeling, advanced light and confocal microscopy, 3D reconstruction, high speed video analysis, electron microscopy, and gene expression studies. The data generated are used in integrative and comparative approaches to elucidate body plan evolution, development, functional morphology, ecomorphology and phylogeny of non-model organisms." Retrieved from <https://zoology.univie.ac.at/>, last accessed 8 March 2022.

[49] Cf. Milam 2010, p. 291, on Dobzhansky's refutation of the argument "that organismic biology [was] largely a finished business". Contemporary organismic biologists would back this view with an estimation of species numbers that have not yet been discovered and described – a perspective that gains new relevance with an ongoing race for biotechnologically exploitable genetic resources.

> endless faculty discussions in 2001/2002 about these stupid impact factors, because they only consider physiology, genetics, molecular biology, and ecology, and only certain areas of these fields. You are already out if you work on ultrastructures as a morphologist or if you work as an ecologist at Lake Neusiedl or in the Alps. There are publications, but they are not registered. And if they are, they are ranked very badly. Which again bears on publication quality: if you look at the list of reviewers with prominent journals like *Science* or *Nature* – they all stem from physiology, genetics, and molecular biology. You will find none with expertise on [morphological] structure. And even if a paper eventually gets published on such a topic, it is lurid in style and wrong in the details, because the acting reviewers did not hold the relevant expertise. It is a disgrace![50]

The label "biology" has been preserved as a university graduate and master's curriculum, albeit with a competing curriculum in "molecular biology" between 2002 and 2007 and a post-graduate specialization option in "molecular biology" since 2008. At the institutional level, a competing label has been added by the term "life sciences" by ways of a new faculty ("Fakultät für Lebenswissenschaften") in 2004. This new term denotes a convergence between biology, chemistry, and medicine. It also resonates with the specific set-up of the new Vienna BioCenter campus in the 3rd district (Figures 2 and 3),[51] bringing together medical, biological and chemical institutes of the Medical University and the University of Vienna via the hybrid Max F. Perutz Laboratories (in 2005) and the Center for Molecular Biology (in 2007). The remaining institutes contributing to the biology curriculum (all except the departments of botany and biodiversity research) have finally been relocated in 2022 from their joint building in the 9th district to the 3rd district in close proximity to the Vienna BioCenter campus. Against the longer time-horizon and broader institutional scope, one might thus even consider biology's emancipation as a discipline in its own right a passing frenzy.

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[50] Interview 37, trans. KK.

[51] Initially "Wiener Biozentrum", but not to be confused with "Universitätszentrum Althanstraße I".

Figures 1 and 2: the former "Biozentrum Wien" in the ninth district (Universitätszentrum Althanstraße I) and the Vienna BioCenter (VBC) in the third district (© Karen Kastenhofer and VBC)

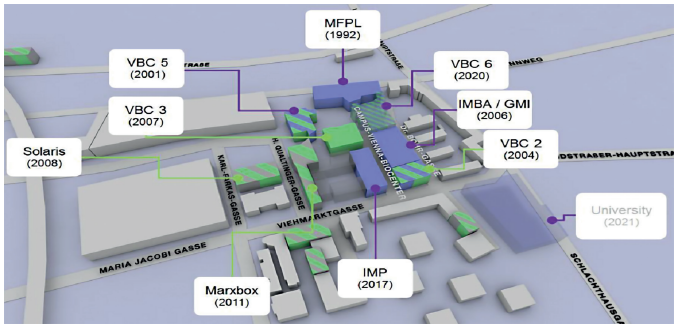

Figure 3: The Campus Vienna Biocenter assembles diverse institutions: IMP Research Institute of Molecular Pathology (Boehringer Ingelheim), MFPL Max F. Perutz Laboratories (University of Vienna and Medical University Vienna), IMBA Institute of Molecular Biotechnology and GMI Gregor Mendel Institute of Molecular Plant Biology (Austrian Academy of Sciences), VBC 2, 3 and 5 (Vienna BioCenter facilities), Marxbox and SOLARIS laboratories and office space for rent (© VBC)

3.2 Three essential external factors: Academic generations, university reforms and socio-cultural shifts

Concerning the development of the biology professoriate and institutes, three ("external") factors play a major role in the considerable shifts of the 1990s and 2000s (beyond the internalist observation of an ongoing 'molecularization' within biology): academic generations, university reforms, and more general socio-cultural shifts.[52]

The first factor, the sudden replacement of a distinct academic generation,[53] originated in the massive quantitative expansion of the University of Vienna (comparable to most other universities) at the level of students[54] and – consecutively – teachers, university scientists and built infrastructure (Universitätszentrum I / "Biozentrum Althanstraße" 1982, Wiener Biozentrum / Vienna BioCenter 1992). Hired at almost the same time in the 1970s and 1980s from a rather homogenous age cohort, this generation of teachers blocked the job-market for consecutive generations during the late 1980s and the 1990s; it also retired within a tight window between 2000 and 2010, leaving many chairs vacant for replacement and also reorientation in topic and approach.

The second factor is a series of university reforms that culminated in the Universities Act of 2002, granting "full autonomy" from the government to Austrian universities and restructuring the University of Vienna internally.[55] It also had a lasting impact on the internationality and diversity of university academics and on change patterns of university faculties and departments. In the wake of this legal reform, the appointment of local scientists (*Hausberufung*) to university chairs became

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[52] As for the particularly late establishment of molecular biology in Austria, a further factor deserves consideration: compared to Germany, extra-university academic institutions with a higher thematic flexibility were much scarcer when this field emerged. Rheinberger 2015 depicts Kaiser-Wilhelm institutes as well as Max Planck institutes as central locations of molecular biology's pre-history in the 1930s and post-war establishment in Germany. In Austria, the first major molecular biology institute was also founded outside universities, that is by the Austrian Academy of Sciences.

[53] The role of academic generations in change patterns of academic fields is seldomly researched methodically; for a noteworthy exception, see Nyhart 1995.

[54] Cf. Ehmer 2015.

[55] Cf. Reiter-Zatloukal 2015. Regarding the Austrian University Act, see Bundesgesetz über die Organisation der Universitäten und ihre Studien 2002.

less likely[56] and new regulations targeted gender equity and diversity. With a view to strengthen university autonomy, the reform stipulated frequent (sometimes annual) internal reorganization of the university at the level of faculties, departments, and centers. The former aspects resulted in a much higher rate of chairs being filled with professors with a PhD awarded in another country (details in next section) and the share of female professors increasing from 7% to 19% (one in fifteen in 1996, six in thirty-one in 2016), while the average age decreased by 3.5 years and the minimum age by 7 years (from 46 to 39). The second aspect added to furthering the potential for establishing locally new research approaches and abandoning existing local research traditions. It resulted in an observable high relabeling rate (see the institutes and departments listed in the legend to Figure 4), in intra-university mobility of university departments and in the emergence of (somewhat volatile) intra-departmental, intra-faculty, intra- and inter-university entities since 2004 (like the life sciences faculty "Center of Ecology" and "Center for Organismal Biology", the inter-faculty research network "Biology meets Chemistry" or the inter-university "Center for Molecular Biology").

Post-war university reforms also invigorate a third, independent factor: more general cultural shifts characteristic of the second half of the 20th century in society at large, pertaining to (distinct takes on) modernization and globalization, the treatment of the (local) past, to political participation, hierarchical structures, and management paradigms.

> The 1990s brought about a paradigm change in Austria, later than in other comparable countries. Modernization could be the motto of this phase of university development, economization should not be its motto. Universities ought to become more efficient, more effective, more entrepreneurial, move closer to the economy.[57]

Such shifts certainly also affected academic culture directly (adding to their indirect implementation via university reforms), especially regarding

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[56] Opposed to the then frequent habit of filling chairs with local scholars and thus with disciples of former local professors, universities started issuing regulations that complicated appeals procedures for local scientists after 2002.

[57] Titscher et al. 2000, p. 17, trans. KK.

the treatment of (local) research traditions, schools, and predecessors, or the relation between professors and students. This new zeitgeist conspicuously challenged traditional academic fields, while new scholarly disciplines fervently embraced the developments. The following subsection will describe the noteworthy change in relationships between professors and students. This relation is defined by hierarchy patterns, modes of interaction, and role expectations. It exemplifies different stances on communality and individuality, locality and internationality, broad education and specialization, teaching, and research. Changing relations between professors and students also exemplify different roles of local traditions and continuity on the one hand and local innovation and disruption on the other hand.

3.3 Tradition versus innovation as a second dimension of change

Max Weber noted as early as 1917 that in Germany all "big" lectures were held by full professors, leaving assistants with scarce opportunity to teach whereas in America the assistant had to shoulder most of the teaching load.[58] A shift towards the "American model" (already sensed by Weber) became manifest in Austria only during the 1980s and 1990s. In the 1990s, a professor could still give one of the "big" lectures (introductory lectures covering vast thematic areas, initiating first- and second-year students to the field), accompanied by an assistant with the sole duty to listen, learn, and – in the very rare case that the professor was not available – step in for one time. Currently, academics complain about an acute lack of colleagues who would be able to hold (or willing to prepare) one of these "big" lectures that are mostly held by assistants. Former students belonging to earlier academic generations will paint even more colorful and – from the present standpoint – exotic pictures: professors entering the lecture hall followed by a tail of assistants like a minister by his acolytes, awaited by the students with a mixture of admiration and fear. Every word would count, every glance and gesture would be noted, the professor holding seemingly absolute power over (and responsibility for) the student and his or her fate. One story from the highly authoritarian post-war period is provided in the autobiography of eminent Viennese professor of zoology:

[58] Weber 1994[1917/1919].

> The holy halls of Ferstel's magnificent building (of the University of Vienna) I first entered in September 1939, so as to make my way via Staircase 5 to the Institute of Zoology. I wanted to know whether I would be able to practice zoology with only one arm [one arm dysfunctional after a childhood polio infection]. A young, lanky university assistant opened the doors – of course I had no idea, then, what a university assistant stands for – and I formulated my question. He paused and then said: "I cannot answer this now. Come back in three days' time, then I will know." And indeed, three days later he said briefly and dryly: "Yes, it is possible, you may well register for zoology." What example of plain social attention this reaction displayed, I only came to understand many years later when he told me what he had been doing in the three days between question and answer: for all scientific performance he only used one arm so as to test whether he could still dissect, microscope, and the like that was necessary for the practice of zoology. [The assistant was] my later PhD supervisor [*Dr. Vater*] Wilhelm Kühnelt, who, as a typical, old-style academic teacher, had done for an anonymous greenhorn in a matter-of-course manner what was not at all to be expected.[59]

Schaller eventually became his disciple, harbouring deep respect for his teacher ever since. He applauds Kühnelt's[60] mastery of countless biological forms and species, his ability to tell a story about half of the 200 animal species that they came across during a one-day excursion, including life data, living conditions, and ecological networks: thus, preparing later conceptions of soil ecology and ecology. When Schaller decided he wanted to do research on dragonflies, a dry comment by Kühnelt that "everything was already known about dragonflies" sufficed

[59] Schaller 2000, p. 182, trans. KK.

[60] A group of Kühnelt's former employees commemorated his 100th birthday in 2005 (Schaller et al. 2005), the list of authors includes several who later became biology professors at the University of Vienna (Friedrich Schaller, Heinz Löffler, Herbert Nopp, Karl Sänger, Wolfgang Waitzbauer and Gerhard Spitzer), illustrating local career patterns in the second half of the 20th century.

to lure him into research on – the far less appealing – spring tails. Schaller focused on these hexapoda during important parts of his career and supervised more than twenty doctoral theses on this subject. In his memoires, he concludes that a 15-minute exchange thus determined the careers of two generations of Viennese zoologists.[61]

This description can only be understood in reference to a distinct emotional, epistemic, and organizational relation between the taken-for-granted general facts of a disciplinary field and its innovative, specialist areas as well as between professors and students specific to this time and place. It illustrates an academic era in which research schools built on strong social ties between teachers and students (in German depicted as a familial relation between a *Doktorvater* and *Doktorsohn*, allowing for even tracing a scholar's "grand children")[62] were a central element of the emergence of local thought collectives. This specific setting becomes most visible with generational breaks, triggered by external factors. An interviewee of the earlier generation of university teachers describes the generational break around 2000 from his own perspective:

> We are now facing a generational break due to two reasons: the first reason is that we – the generation born in the 1940s and 1950s, even a bit later for some fields – got hired practically straight from the lecture halls, because the demand for university personnel was that high at the time. Many new positions were created. And this 'age clot' [*Altersropfen*] has now retired almost completely: [university professors A, B, C, D, E, F and me], we were all born within five, six, ten years and we are all retired by now [in 2016]. New positions are very scarce today; of course, there are new people even today, but they are extremely specialized. When a new professor gets hired, he will demand a lot and he will get it, because he is THAT good. But he will demand specialist positions, not generalist ones. This relates to the second reason for the generational break: one age group retires and thus scientists with a very

[61] Schaller 2000, p. 46.

[62] Familial bonds in the strict sense of the word were still common, maybe even strategic factors in 19th century academia (e.g., Weber 1985).

> broad education are lost. They are succeeded by specialists, hired as suppliers for some new professorships. My own position had already been re-dedicated five years BEFORE my retirement, because some professor in another field was THAT good![63]

At other instances, the decline of faunistic-zoogeographic-systematic research and expertise is bemoaned, leaving proponents of the former generations with a feeling of obsolescence (*Auslaufmodell*), also from a sub-disciplinary perspective. Social ties between teachers and students have also decreased as universities diminish the importance of teaching and place ever-growing importance on research.[64] This shift from an ideal of *Bildung* to an ideal of research impact changes the quality criteria for university personnel[65] and viable models of institutionalization.[66] Overall, general socio-cultural shifts can thus be understood as not only inspiring influential university reforms, but also as directly affecting changes in academic culture.

3.4 Internationalization as a third dimension of change

The external factors delineated above also help to explain why and how the 1990s and early 2000s saw a dramatic shift at the epistemic as well as institutional level of life science research at the University of Vienna. Finally, during this time span, the molecular turn, already institutionalized in other – that is, western – countries like the UK and the US, became a ubiquitous phenomenon at biology departments. At

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[63] Interview 47, trans. KK.

[64] The shift of the primary orientation from understanding towards research and potential applications also has repercussions at (sub)disciplinary levels. It impacts on the authority of disciplines with closer ties to natural history and a descriptive paradigm compared to biotechnology and an engineering paradigm (see the seminal work of Wright 1986, but also Kastenhofer 2013a, 2013b). This issue can only be hinted at here. For the rise of the technoscientific paradigm, see Forman 2007, Nordmann et al. 2011 and Schauz 2020, for the science policy push towards applied research, see Kaldewey, Schauz 2018.

[65] For a pointed description of how this affects teaching at the University of Vienna 1848–1918, see Surman 2015.

[66] Triggering a trend towards private-public research institutions exemplified by the Vienna BioCenter.

the end of this period, the minority and majority positions had been exchanged: whereas molecular biology counted as a notable *Sonderweg* in its beginning (specifying molecular biology as one subfield within biology at large), it was necessary to denote organismic biology as a notable *Sonderweg* at its end.[67] Simultaneously, the largely local and formerly widespread career path, along which international experience was confined to one or two postdoc visits abroad (mostly in the US, but also in countries like Great Britain, France or Sweden) had also become the exception. A comparison of the professoriates in 1996 and in 2016 yields the following results (Figure 4): the 1996 sample features mostly local careers, whereas the 2016 sample is dominated by multinational careers. Members of the 2016 sample also voiced anti-local (smirking at local careers) or a-local sentiments.[68]

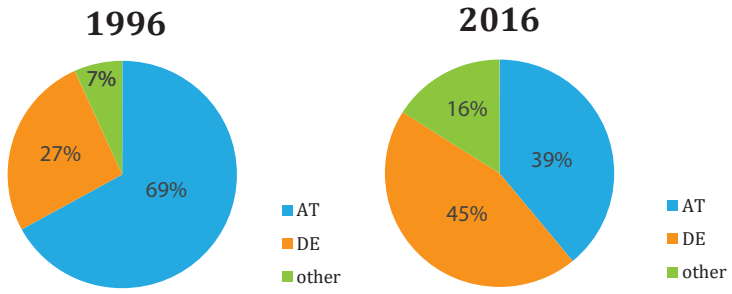

Figure 4: Nationality of biology professors at the University of Vienna in 1996 and 2016, © Karen Kastenhofer (as of country PhD; "other" 1996: CH, NL; "other" 2016: CH, IT, SI, US, UK); list of relevant full professors 1996 extracted from Barth (1996), comprising: Institut für Botanik, Institut für Pflanzenbiologie, Institut für Zoologie, Institut für Genetik und Mikrobiologie, Institut für Humanbiologie; full professors 2016 extracted from departmental internet pages of the Faculty of Life Sciences (last accessed 2 July 2016), comprising: Department of Anthropology, Department of Behavioural Biology, Department of Cognitive Biology, Department of Integrative Zoology, Department of Molecular Evolution and Development, Department for Neurobiology, Department of Theoretical Biology, Department of Limnology and Oceanography, Department of Ecogenomics and Systems Biology, Department of Botany and Biodiversity Research, Department of Biochemistry and Cell Biology, Department of Structural Biology and Computational Biology, Department of Chromosome Biology, Department of Microbiology, Immunobiology and Genetics, Department of Microbiology and Ecosystem Science.

[67] The Center for Organismic Biology (COSB) was established in 2004 as a mostly informal network of six biology departments in 2004.

[68] Denying any role of locality in contemporary science, Kastenhofer, Novy 2018.

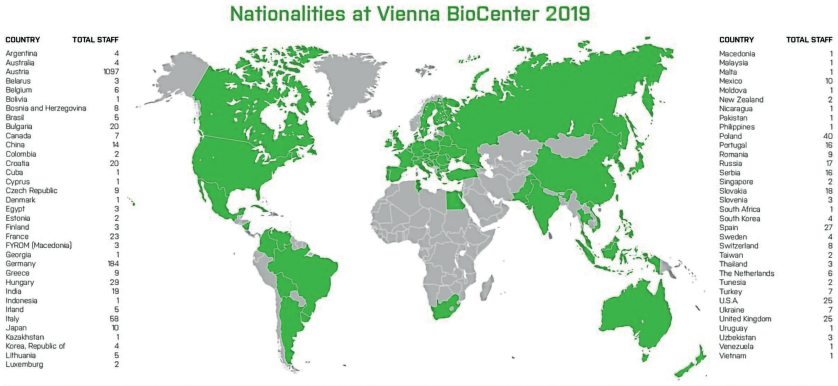

Figure 5: "Nationalities at Vienna BioCenter 2020", © VBC (Staff members: Austria 1083, Germany 190, Italy 43, Poland 36, Hungary 35, Spain 29, Croatia 27, France 26, Russia 22, U.S.A 23, UK 22, India 21, Slovakia 19, Japan 15, Portugal 14, China 14)

With the differentiation of biology in the late 20th century into an organismic and a molecular realm, it seems that molecular biologists tended to concentrate strongly on the "paradigmatic West" (affiliated with formative sites like Caltech, Cold Spring Harbor, Berkeley, Cambridge, the Pasteur Institute, Geneva, or Brussels) in a phase during which molecular biology still was mostly "glocal",[69] whereas organismic biologists were also interested in other territories (like South America, Africa, or Eastern Europe) – not so much as to learn new techniques at leading research laboratories, but as interesting research sites for PhD and postdoc projects.

Already before the World Wars, Viennese naturalists undertook expeditions, especially to tropical, arid, and arctic ecosystems, for which the Austro-Hungarian Novara expedition 1857–1859 as well as the expedition to the North Pole 1872–1874 served as prominent showcases. After the World Wars, this practice was resumed – albeit at an obviously much smaller scale. The list of expeditions undertaken by one professor of zoology between 1949 and 1985 for instance includes Iran, Afghanistan, Tyrrhenia, Iceland, Madagascar, New Caledonia, South India, Ceylon, South Pacific, Indian Ocean, Andaman Islands, Antilles,

[69] Hinting at the "persistence of certain local – even idiosyncratic – research features that did not act as obstacles to the progress of molecular biology, but rather served as particular triggers for the production of new knowledge." Rheinberger 2016, p. 197.

India, and Tonga/Samoa.[70] Organismal biologists also embarked in transnational networks so as to study ecosystems that spanned multiple national territories.[71]

A second source of international relations came from local field stations like the limnological stations in Lunz am See and Mondsee and thus also dates back to the pre-war period. Visitors came from many different countries (including Russia or Japan) and disciplinary backgrounds,[72] living very closely – and mostly amicably – together for a certain amount of time. Biological field stations were also tied to yet another source of internationalization that relates exclusively to the pre-war period, namely the international scope of a handful of influential families linked to names like Exner, Przibram, or Kupelwieser.[73] For

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[70] These field stations, excursions, and collection of species in ecosystems abroad were linked to the practice of sending, from all over the world, exemplars of species of a specific taxon to a specialist of this very taxon for identification or, possibly, new description. Especially in zoology, the number of taxa is vast enough to allow for and even require this kind of global division of labor and expertise. With some aquatic species, taxonomic identification required travelling to a suitable ecosystem to breed larvae and compare developmental stages. Once a new species is described, one specimen is usually sent back to its country of origin (see Interview 37). Thus, another kind of internationalization is realized via the exchange and transport of epistemic objects. of late, species identification and taxonomy also combine morphological and molecular approaches. For a systematic outline of field practices in modern biology, see Kohler 2002.

[71] The "Internationale Arbeitsgemeinschaft Donauforschung" (IAD), founded in 1956, "provided a basis for exchange between the East and the West in times of the Iron Curtain" (Schiemer 2014, p. 42, trans. KK).

[72] The limnologist Brehm notes for the pre-war period: "Lunz protected me from too much (disciplinary) one-sidedness. The numerous scholars from Austria, Europe, and even from other continents that made their way to the station were mostly hydrobiologists, but one could also come across morphologists, geneticists, physiologists, chemists, and physicists, often times resulting in a stimulating exchange of ideas." (Brehm 2012, p. 140). An exemplary analysis of station based international collaboration is to be found in Partsch's 1980 account of the marine biology station in Naples as a "permanent academic congress" before the First World War. An overview of international relations in science in this era has been provided by Schröder 1966, a discussion of ideals of internationality by Somsen 2008.

[73] In how far biological field stations can be understood as logical extensions of these families' summer retreats (*Sommerfrischen*, from Exner's and von Frisch's Brunnwinkl to Kupelwieser's Lunz am See) has to be left open here. They evidently borrowed not only from existing structures, but also from their social networks, openness, and hospitality.

example, Adamicka notes[74] that the relatively high frequency with which Russian naturalists showed up at the limnological field station in Lunz am See was linked to Hans Kupelwieser – the son of Carl Kupelwieser who had founded the station in 1905 – having married Polya Gorodetzki from Kishinev.[75] Almost all of these families fell victim not only to economic hardship resulting from financial crises, but also to the racist politics of the National-Socialist regime.[76]

Albeit distinct restrictions (the end of the Habsburg empire and its predilection for international expeditions, the loss of international families), post-war organismal biologists could thus build on earlier practices of internationalization (smaller scale expeditions) and sources of internationality (field stations). In the 1960s, 1970s, and 1980s two international programs also helped rekindle the battered internationalization of Austrian naturalists: the International Biological Program (IBP, 1964-1974) and the UNESCO Man and the Biosphere program (MAB, launched in 1971). The relating ecosystem research also led to collaborations beyond the Iron Curtain:

> His research in the Pannonia region brought [X][77] in closer and often amicable contact with colleagues from the neighboring Eastern countries [specified later as Slovakia, Hungary, and former Yugoslavia], a development not to be taken for granted during those times of the Iron Curtain.

With post-war molecular biology, the situation differed at least in one respect: building on a pre-war internationality was not an option because the field had only emerged from the 1930s onwards.[78] Internationalization in this period had been restricted to a unilateral brain-drain, with young Austrians like Max Perutz escaping from the National-Socialist regime to England or the U.S., gaining their academic

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[74] Adamicka 2012, p. 234.

[75] See Hübl, Punz 2005, p. 66, trans. KK. This circumstance combined well with the fact that Russians travelling to the Russian marine biology station in Villefranche-sur-Mer could use Lunz am See as a stopover between Russia and their own station in France (ibid.).

[76] For the Kupelwieser family, see for instance Friedrich 2000. For the at times internationalizing influence of family bonds, see also Coen 2006.

[77] Professor of botany at the University of Vienna 1972–1985.

[78] Rheinberger 2016.

training abroad, and not being convincingly re-invited to Austria after the end of the war. Building up a new research community practically from scratch in post-war Austria, however, took a very long time and relied heavily on international input.

Last but not least, internationalization in science is tied to languages, to internationally valid *linguae francae* among researchers[79] and to locally mastered languages for students and their teachers.[80] The faculty of 1996 still published both in German and in English language, targeting lay local as well as expert international audiences.[81] Members of the 1996 sample also report on initial language difficulties (see, for example, the autobiography of Rupert Riedl[82], professor of zoology and theoretical biology at the University of Vienna 1971-1995).[83] The faculty of 2016 published almost solely in English and ridiculed their predecessors' meager impact points.[84] Both samples – the professoriates 1996 and 2016

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[79] Gordin 2015 outlines the role of national languages throughout the history of science. Surman 2019 adds detailed analyses of the role of academic languages – from common *linguae francae* to the emergence of national languages – in the Habsburg empire.

[80] Surman 2019.

[81] For example, Salvini-Plawén 2006, p. 143 in his obituary of Ferdinand Starmühlner.

[82] Riedl 2004, pp. 232–235.

[83] While Viennese biologists struggled with mastering English in the 1970s and 1980s, an earlier generation of US biologists faced the opposite problem: especially in the field of morphology, mastery of German was mandatory before the two World Wars (see Gordin 2015). Bonner (2002, pp. 80–81) recalls the personal relief when German stopped to be counted as lingua franca after the wars: "The great difficulty for me was that all this splendid early work was written in German, and none of the classic papers were less than eighty pages. (…) I thought my struggles with Latin were bad, but German nearly did me in. I not only had to read those papers but present their results in front of fellow students in graduate courses. Worse, I could not get my doctorate degree unless I passed a German exam. (…) Soon after I went into the army and never saw a German scientific paper for four years; by the time I got back to developmental biology I had completely forgotten all my German except for the opening sentence of Genesis in the Bible, which was not terribly useful. One good thing for me came out of that horrible war – English became the universal language of science, and I did not have to start learning German all over again."

[84] For the dichotomy "slow, old fashioned organismic biology" versus "fast, innovative molecular biology" see also the introductory section of this paper and Milam 2010. An additional account of the adversarial situation in biology during the "molecular revolution" is provided by Bonner (2002, p. 144-145) who found himself

– were apparently still influenced by the requirement to speak German so as to be able to fulfil teaching tasks in this language: Germany was by far the most frequent origin of non-Austrian professors (Figure 4). Countries other than Austria and Germany were represented only by two professors (6%, CH, NL) in the earlier sample, augmenting to five professors (16%, CH, IT, SI, US, UK) in the later sample – including origins like the U.S.A. where German is not spoken at all.[85] A look at nationalities of all staff members (including all academic career levels as well as 22 % of the administrative staff) reveals a broad coverage of nationalities for the Vienna BioCenter in 2020, but still a strong surplus of Austrian citizens (N=1083), with German citizens representing by far the second largest group (N=190, Figure 5). Still, countries formerly "behind the Iron Curtain" like Poland, Hungary, or Russia featured strongly among the remaining nationalities.

4. Discussion: The iron curtains of biology in Vienna

Viennese university biology has undergone a major transition around the turn of the last century. The (comparatively late) timing of this transition was co-determined by two events: a drastic generational renewal around 2000 originating in the university expansion of the 1970s[86] and the university reform of 2002 concluding a reform cycle towards autonomy and managerial leadership.[87] The quality of this

somewhat between the two camps: "Biochemists and molecular biologists did not infiltrate quietly nor as missionaries; rather, they saw themselves as the ones who would provide all the answers, and as a tribe were exceedingly assertive about it. They had found the new Truth, and all the rest of biology was fossilized dry rot. This amazingly aggressive attitude has only in recent years [that would be around 2000] shrunk to more normal proportions, although it has not disappeared completely. (…) [T]hat 'take no prisoners' attitude (….) was an attitude that caused consternation and chaos in many institutions all over the world (…) such attitudes were the trappings of those who wanted to replace the old order, and felt the only way was to make a clean break for the future was to shoot the past."

[85] Since Figure 4 identifies academic nationalities as determined by the location of PhD award, these data not always relate to the professors' birth place or first language. As of birthplace, the data change only slightly: one PhD awarded in Vienna links to a biologist born in Brazil, another one to a biologist born in Czech Republic. The PhD awarded in the UK links to a biologist born in Italy.

[86] Cf. Ehmer 2015.

[87] Reiter-Zatloukal 2015.

transition was co-determined by further, closely related trends within academia: internationalization (or anti-localism), modernization (or anti-traditionalism), technoscientization,[88] and – specific to the life sciences – molecularization.[89] Moreover, the transition has to be understood against the background of preceding socio-political developments[90] and ongoing socio-cultural shifts.

In the editorial texts presented at the beginning of this article, the proximity of Vienna to the Iron Curtain seemed to almost completely define this academic location. Vienna lay "in the heart of Central Europe", but still at the peripheries of the academic landscape. To the four molecular biologists, 1980 Vienna still resembled Snow White in deep sleep in the forest. Kissing Vienna awake involved "moving the center eastwards" by introducing "international" standards. The implementation of these standards amounted to a "selective Westernization"[91] in the sense that the gravitational center of molecular biology's internationality lay in the West, represented by a handful of paradigmatic countries and research sites. However, a "selective traditionalism"[92] is not to be easily found in this empirical case. Instead, protagonists of the "molecular revolution" sought a "clear cut" with the past, an ambition that was furthered at the University of Vienna by generational patterns and the 2002 legal reform.

The development of biology at the University of Vienna from natural history via biology to life sciences, certainly hints at how scholarly virtues and forms of academic sociability changed over time,[93] resulting in the emergence (or, in this case, import) of a new scholarly persona.[94]

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[88] See footnote 56.

[89] Rheinberger (2015) stresses the conspicuous resonance of molecular biology with a growing self-conception as an atomic age since the 1930s and 1940s. "What the atom signified for the sciences of non-living nature, the molecule seemed to promise for the life sciences." (trans. KK)

[90] Most importantly of course the two World Wars, the preceding and consecutive discriminatory regimes (including antisemitism, anti-liberalism, and anticommunism), the temporary exclusion from global academic exchange and a long-lasting failure to reach out after the war, all of which culminated in what Fleck (1996) markedly described as an "autochthonous provincialization" for Austrian sociology.

[91] See Surman, Petushkova 2022.

[92] Ibid.

[93] See also Kastenhofer, Novy 2018.

[94] The 'imported' persona is delineated very well in Shapin 2008.

In Vienna, this process was accompanied not only by references to the historic Iron Curtain separating "Western Europe" from "Eastern Europe" and thus two geopolitical regimes, but also by the introduction of a plethora of figurative iron curtains, demarcating 'traditionalist' from 'modern' science, 'popular science publications' from 'serious, high impact publications', 'organismic biology' from 'molecular biology' or 'local schools' from 'international standards'. For a certain period, these figurative iron curtains became a defining part for identities at both sides, co-stabilizing the whole scenery.

With new generations of scientists, the figurative iron curtains seem to have lost significance. The contemporary situation 20 years later does not refer to either Habsburg or the Iron Curtain in any explicit terms, while still holding its own implicit maps, norms, and rites. The geopolitically and historically loaded academic personae operate in a seemingly radically non-local or even anti-local technoscientific pluriverse made up of amalgamating public and private, science and engineering, basic and applied research modules, located temporarily in open-for-rent office spaces like the Marxbox. The relating scientific personae are ridden by 'choreographed', 'provisional' and 'liquid' identities.[95] In 2008 and 2009, the University of Vienna devised an "internationalization strategy". Along its 2020 report,[96] it is now proudly "among the most international universities in the world", ranked 11th in the respective Times Higher Education world rankings. 52% percent of newly appointed professors now come from other countries (that is, mostly from Germany[97]). As for student mobility, it is interesting to note that among the ten most frequent countries of ERASMUS incoming students are two Eastern European countries (Poland, Czech Republic), whereas among the ten most frequent countries of ERASMUS outgoing students no Eastern European country is featured – a pattern reminiscent of the Habsburg 'job carousel' for university chairs in the 19th century.

As much as the 1999 editorials' selective view on the history of biology in Vienna can be put up for discussion, the editorial texts do draw our

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[95] Cf. Kastenhofer, Molyneux-Hodgson 2021.

[96] University of Vienna 2020.

[97] Of newly hired professors in 2019, 48% had previously been employed in Austria, 37% in Germany, 11% in other EU countries, 4% in non-European countries (ibid: 24).

attention to the analytical layer of geopolitics and to the territory east of Vienna and thus to additional terrains of investigation, descriptive resources, possible explanatory factors, and narrative standpoints. With my empirically grounded analysis from a different perspective, I have highlighted the multiplicity of (mostly implicit) maps in science as well as the multiplicity of practices of localization and translocalization in Viennese academic life sciences. I have also presented explanatory factors within and beyond local academia. To rewrite histories of science from such different standpoints will certainly be a rewarding task for future scholars, a task already being addressed within emerging post-colonial, de-colonial, and transnational historiographies of science.

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