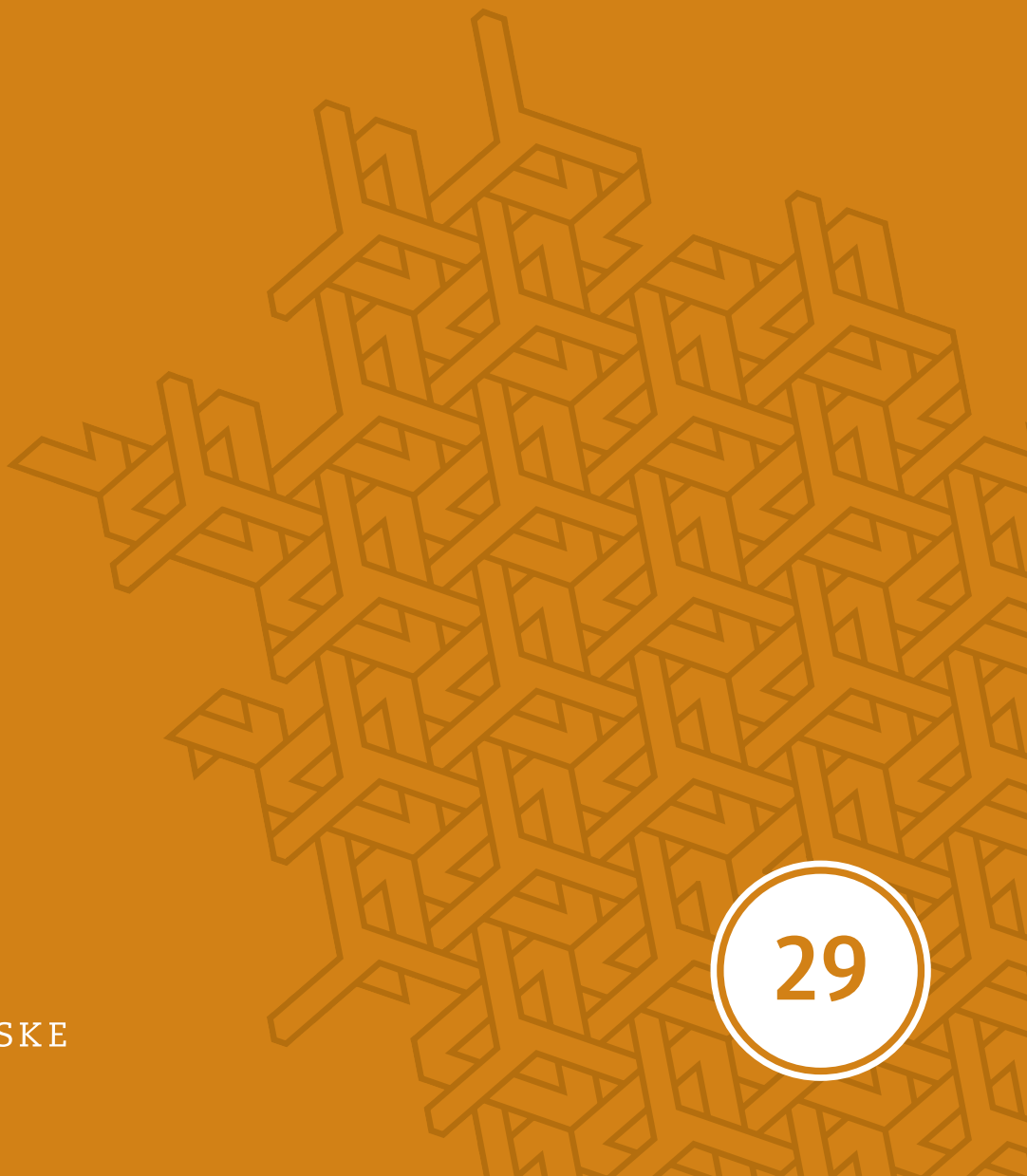
# Proceedings of the 29th Annual UCLA Indo-European Conference

November 3rd and 4th, 2017




BUSKE

Goldstein, Jamison, Vine (eds.)
29th UCLA Conference



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# Proceedings of the 29th Annual UCLA Indo-European Conference

Los Angeles
November 3rd and 4th, 2017

*Edited by*

David M. Goldstein
Stephanie W. Jamison
Brent Vine

*with the assistance of*

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# Preface

As always, it gives us great pleasure to thank all those who contributed to the success of the conference reflected in these *Proceedings*, the Twenty-Ninth Annual UCLA Indo-European Conference (November 3rd and 4th, 2017). First and foremost, we owe special thanks to the graduate students comprising the Indo-European Conference Student Organizing Committee: Milena Anfosso (Visiting Graduate Researcher), John Clayton, Maggie Eismeier, Ian Hollenbaugh, Anahita Hoose, Thomas Motter, Teigo Onishi, and Chengzhi Zhang. We are also grateful for significant help from members of the Dodd Humanities Group: Bret Nighman, Margaret Griffin, Paul Gass—and above all Klancy Maples, who has gone on to pursue graduate studies away from UCLA, and whom we will miss very much. We also gratefully acknowledge the critical financial support furnished by the A. Richard Diebold, Jr. Endowment in Indo-European Studies, the Friends and Alumni of Indo-European Studies, and the UCLA Graduate Student Association.

We are especially indebted to the presenters whose papers appear below, for their cooperation and patience throughout the editing process; and we offer special thanks to our two featured speakers Daniel Petit and Petra Goedegebuure.[1] As usual, not all papers presented at the conference appear here, for a variety of reasons, including publication or planned publication elsewhere. This volume does, however, contain lightly edited versions of remarks delivered at the conference in memory of Vyacheslav Ivanov and Hanns-Peter Schmidt, two great scholars and teachers who contributed so much to the UCLA Program in Indo-European Studies.

We are also happy to repeat our annual praise of Dr. Ute Hempen for her continuing support of our project and of Angelo Mercado for his consummate skill and professionalism in the preparation of the camera-ready copy. Finally, having inaugurated (we think successfully) the incorporation of a word index in

1 We take this opportunity to correct a grievous faux pas committed in the "Preface" to the previous volume of *Proceedings* (p.vii of the *Proceedings of the 28th Annual UCLA Indo-European Conference*, recently published): looking ahead with excitement to the following year's conference, we misidentified the featured speakers as Daniel Petit and Petra Goedegebuure, rather than Melanie Malzahn and Donca Steriade. Our most sincere apologies to Professors Malzahn and Steriade!

the preceding volume, we continue this enhancement here, thanks to the meticulous work of Teigo Onishi.

David M. Goldstein, Stephanie W. Jamison, and Brent Vine
September, 2018

# Remembrance: Vyacheslav Ivanov*

BRENT VINE AND H. CRAIG MELCHERT

*University of California, Los Angeles*

BRENT VINE

Vyacheslav Vsevolodovich Ivanov was such a towering figure in the scholarship of our time that there would be no way, in the time available to me, to give some sense of his contributions, even if I had the skill and the knowledge to do so. To give you a sense of this, let me begin by quoting part of a memorial note that was written by my colleague Ronald Vroon, Chair of the UCLA Department of Slavic, East European and Eurasian Languages and Cultures; he wrote that Professor Ivanov "established himself as an authority in fields as diverse as Indo-European studies, Balto-Slavic linguistics, machine translation, psycholinguistics, cultural anthropology, mathematical linguistics, semiotics and literary studies." And yet Professor Vroon failed to mention "cinema studies"! This was yet another area to which Vyacheslav Ivanov was passionately devoted and to which he made signal contributions. So instead of a scholarly biography, or an enumeration of all the professional awards and accolades he received over the course of his long career, I'd like to share with you some more personal memories of my own acquaintance with this great man, and what he meant to us here in the Program in Indo-European Studies.

My first encounter with Vyacheslav Ivanov was not in person. As I've often told my students, it was my own teacher Calvert Watkins who used to tell *his* students that a sufficient reason to learn to read Russian was to be able to read the work of Vyacheslav Ivanov. Who cared about Chekhov and Dostoyevsky! No, it was the work of Vyacheslav Ivanov that was important—and one could see this all over Watkins's famous 1969 book on Indo-European verbal morphology, which we used to call (and some of us still call) "The Blue Book" (because of its cover): one need only flip through this book (which in the early '70s, when I began graduate school, I did a lot) in order to see plenty of references to the work of

* The following is a lightly edited version of remarks presented at the 29th Annual UCLA Indo-European Conference (Saturday, November 4th, 2017).

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*Proceedings of the 29th Annual UCLA Indo-European Conference*. Bremen: Hempen. 1–5.

Ivanov, such as his 1965 book, of course in Russian, with the title (in translation) *Indo-European, Proto-Slavic, and Anatolian Linguistic Systems: Comparative and Typological Studies*. I actually remember going to Widener Library just to have a look at this book (and this was before I learned any Russian): I knew of course about Indo-European scholarship in French and German, and I could even imagine that there was useful work on Indo-European published in other European languages, maybe Italian or Spanish; but could it really be true that there was important work in *Russian*? I found these books in the stacks, and sure enough, nestled among all the Cyrillic (which at that time would have been almost as indecipherable to me as pre-Ventris Linear B), there it was: the books were chock full not only of Greek and Latin and Germanic and Slavic forms, but *full of Hittite*! This was incredible. Not long after that, when Cal Watkins told me I should go to the Slavic Department and take their course on Old Church Slavic, the Slavic Department refused to allow it, unless I simultaneously took their course on intensive Russian. It was, of course, a stupid requirement for students of Indo-European; but I did it, and I've never regretted it. And yes, by now I've read much more Ivanov than Chekhov or Dostoyevsky.

It was still some years in the future before I was to meet Vyacheslav Ivanov in person. But before that time, I had learned enough Russian to be asked, by the journal *Language*, to write a review of his massive two-volume work, co-authored with the Georgian scholar Gamkrelidze and published in 1984, called *Indo-European and the Indo-Europeans*. This was the heyday of the glottalic theory, which was a big part of the phonological portion of the book; and I was not a fan. Little did I know, after writing my rather negative review, that about ten years later I would be applying for a job at UCLA, where Ivanov had already been teaching for several years. I assumed that the review would kill my chances; but no, I was hired—and when I finally met Vyacheslav for the first time, he couldn't have been more gracious. He clearly saw how nervous I was, and even mentioned the review, saying something like, "Actually, in that review you made some good points."

This was typical of his kindness. I'd like to share a reminiscence about Vyacheslav that was recently conveyed to me by a graduate of our program. He wrote to me in an email:

> As for Prof. Ivanov, I took quite a few of his classes, including one individual study class, in which we read a number of Hittite texts. Working with Prof. Ivanov one on one was very pleasant, and it was amazing how he never needed to consult the dictionary—even when he was dealing with non-Indo-European languages (like Akkadian!). Prof. Ivanov was always very kind to me …—I can-

> not forget one time we met, and even though he looked rather tired himself, he smiled to me, and asked: "everything good for you? …."

Reading Hittite one-on-one was something Vyacheslav never refused to do; and in fact, he never refused *any* teaching assignment we asked him to undertake. He taught everything: besides Hittite, he also taught Tocharian, Indo-European phonology and morphology, and our course on Indo-European mythology and poetics, which is a doctoral requirement for our students. As a matter of fact, he was scheduled to teach this course for us this coming winter quarter. We'll postpone it until next year, probably in a team-taught version—which is telling: it will take three or four of us to offer a course that he easily managed to teach single-handed. And there were *new* courses: with Robert Englund of Near Eastern Languages, he developed a successful course on writing systems; and long before "diversity" became a buzzword at UCLA (and long before the "diversity requirement" and "diversity courses"), he devised a course he was passionate about, called "Languages of Los Angeles"—a way of showcasing probably the most linguistically diverse part of the country, where (according to Vyacheslav) about 200 languages are represented in the area.

I regret that one type of teaching he did for us will never be repeated, as it cannot be replicated by any of us: this involved his contribution to our team-taught "proseminar" course. This is a sort of professional training course that's required for our first- and second-year students; and we used to include some coverage of the history of Indo-European studies. Vyacheslav brought in photocopies of selections to read from the earliest work of Franz Bopp, which suddenly, as we listened to him speaking about these old texts, seemed fascinating, and he then went on to convey the excitement of the neogrammarian period. It always seemed that Vyacheslav personally knew everyone worth knowing, and one had the feeling that any moment he might say something like, "You know, when I was having coffee one day with Karl Verner, …." And he had this habit of introducing topics by saying, "You know, …"—which was a sort of kindness to his interlocutor or to the class, since in fact, nine times out of ten, we *didn't* know; and instead it was a signal that if we listened carefully, we were about to learn something interesting.

He was also, despite his immense gifts, a man of great modesty. True, he published more than a dozen books and something like 1,000 articles. Yet more than once, I heard him joke self-deprecatingly about his scholarly output by talking about what he called his "graphomania."

One type of output that I suspect is less well known to Indo-Europeanists is his poetry. He was an accomplished poet and a first-rate scholar of Russian literature, well-known for his work on the great Russian poet and prose author Boris Pasternak. Vyacheslav, like many Russians, admired Pasternak's translations of Shakespeare. So I'd like to close with two lines from *Hamlet*, when Hamlet speaks about his father:

*On čelovek byl v polnym smysle slova.*
*Už mne takovo bol'še ne vidat'.*

He was a man. Take him for all in all.
I shall not look upon his like again.

---

H. CRAIG MELCHERT

My recollections of Vyacheslev Vsevolodovich Ivanov inevitably combine the personal and professional. I had previously met Vyacheslav briefly several times at conferences, but only came to know him well after I joined the UCLA Program in Indo-European Studies in 2007. Like Brent Vine's review of the Russian original, my own of the English translation of Gamkrelidze and Ivanov's *Indo-European and the Indo-Europeans* was decidedly mixed, and Vyacheslav and I had also crossed swords over several issues involving the Indo-European Anatolian languages. I could not imagine that I would have been his first choice as the new Diebold Chair. But he could not have been more gracious in welcoming me to PIES and UCLA. Furthermore, while expressing the preference—after many years of heavy teaching for both PIES and Slavic Languages—to focus his teaching in Slavic, he also stressed that he was prepared to continue to teach for PIES whatever I and colleagues felt was needed by the students. As Brent has indicated, Vyacheslav continued, in the event, to offer regularly the required course in Indo-European myth and poetics that no one could teach as he could and was willing to offer upon student request a seminar in any language or topic that was not covered in our regular courses. He also continued to serve on dissertation committees and took an active part in program governance, the annual fall conference, block seminars, and visiting lectures. As program chair, I was and remain immensely grateful to him for his unusual flexibility and for all his contributions to the continued vitality of PIES.

Given my own area of specialization, I naturally tend to recall Vyacheslav's scholarship with Hittite implications. Brent has called attention to Calvert Watkins' great respect for Vyacheslav and Cal's admonition that all of us students

needed to learn Russian in order to read his work. Alas, my own Russian reading skills never quite reached the level that I could read more than articles and some excerpts of *Khettskij jazyk*, but the basis for Cal's admiration was clear enough. Effectively contemporaries, both were among the very first scholars after WWII, in the late fifties and early sixties, who began to bring to bear—without preconceptions—the facts of Hittite and its immediate relatives on the reconstruction of Proto-Indo-European. Both did so from a fully informed pan-Indo-European perspective. It is not accidental that both independently saw that the rare orthographic indications of interrogative intonation in Old Hittite recall Sanskrit "pluti" and have implications for PIE sentence prosody. Nor that they both returned more than once to the Old Hittite "Song of Nesa" and its place in Indo-European poetics. Because Vyacheslav emphatically did not regard the study of language—its structure, history, use, social and cultural aspects—as an isolated discipline, but rather as an integral part of the broad study of everything that defines humankind, encompassing virtually all fields now classified as belonging to the humanities or the social sciences.

This breadth of vision is manifest in the outsized portion occupied by the lexicon in *Indo-European and the Indo-Europeans* and in its conception and organization. I have no hesitation in saying publicly that I am confident that we owe most of this part of the work to Vyacheslav and that it will prove in years to come to constitute its most enduring and valuable contribution to Indo-European studies. The breadth of Vyacheslav's staggering erudition and his unbounded intellectual interests bring me back to the personal. I will forever recall with pleasure his always apposite remarks on a wide range of topics offered at the "Anatolian Club" and the accompanying dinners at the home of Jaan and Madli Puhvel. Vyacheslav Ivanov was one of the last of a type of European, and Russian, intellectual whose like we truly shall not see again.

# Remembrance: Hanns-Peter Schmidt*

STEPHANIE W. JAMISON

*University of California, Los Angeles*

Hanns-Peter Schmidt, emeritus professor of Indo-Iranian and Indo-European Studies at UCLA, a specialist in Avestan and Vedic Sanskrit language and philology and ancient Iranian and Indic religion, died on July 31, 2017 at Dana Point, California. He was born in Berlin in 1930 and in many ways remained a Berliner for life, despite living for half a century in Southern California. He received his PhD in Indo-Iranian Studies from the University of Hamburg in 1957, where he worked under the direction of the great Indologist Ludwig Alsdorf. But his greatest influence came from Wolfgang Lentz, professor of Iranian at Hamburg and a lifelong friend of Hanns-Peter's. Lentz's work on the structure of the Avestan Gāthās stimulated Hanns-Peter's own. From 1959 to 1964 he worked in India, first as a Research Fellow at Deccan College in Poona (1959–61), then teaching at the University of Sagar (1961–64). He then spent two years as an Assistant at the University of Tübingen (1965–67), with Paul Thieme, another crucial influence on his scholarship. He joined UCLA as Professor of Indo-Iranian, serving in the Program in Indo-European Studies and in the Department of Near Eastern Languages and Cultures (NELC). He remained at UCLA till his retirement in 2000—though there was a hiatus, or flirtation, of two years (1974–76), when he was Visiting Professor of Sanskrit and Old and Middle Iranian at the University of Leiden. Happily he returned to UCLA, and he of course stayed in Southern California after his retirement.

Hanns-Peter was a philologist's philologist, combining fanatically close attention to the texts in all their aspects with a larger vision of what it all added up to. All of this—both the detailed philology and the big picture—was already clear in his dissertation, published in 1958, on the Vedic and Avestan words *vrata* /

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* The following is based on brief oral remarks given at the 29th Annual UCLA Indo-European Conference.

See Touraj Daryaee, "SCHMIDT, HANNS-PETER," *Encyclopædia Iranica*, online edition, 2017, available at http://www.iranicaonline.org/articles/schmidt-hanns-peter (accessed on 16 August 2017).

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*urvāta* (*Vedisch* vratá und *awestisch* urvāta, Hamburg: Cram, de Gruyter, 1958). It continued through such highly influential works as *Bṛhaspati und Indra,* in which he demonstrated that the supposed Vedic "god" Bṛhaspati was originally merely an aspect of the god Indra as 'lord of the formulation' in the Vala myth—a book I have ever by my side (*Bṛhaspati und Indra: Untersuchungen zur vedischen Mythologie und Kulturgeschichte*, Wiesbaden: Harrassowitz, 1968). His writings are models of how to approach texts, paying due attention to the smallest details while situating the inquiry in the largest literary/religious/cultural context. His various illuminating works on the complexities of the structure and style of the daunting Avestan Gāthās, many of them written in conjunction with or in honor of Lentz (e.g., *Form and Meaning of Yasna 33* [with contributions by Wolfgang Lentz and Stanley Insler], New Haven: American Oriental Society, 1986), are exemplary, in the full sense of that term, and they are not only deeply insightful on their own but continue to inspire much work in this continuously burgeoning area of study. His small series of lectures on "Women's Rites and Rights in the Veda," delivered at the Bhandarkar Institute in 1984, exercised particular influence on my work, and every time I read them I learn something new (*Some Women's Rites and Rights in the Veda*, Poona: Bhandarkar Oriental Research Institute, 1987). Although Hanns-Peter's home department at UCLA was NELC, and so Old and Middle Iranian were technically his "patch," he was as well known and as influential in Vedic studies: he was one of a vanishing breed of scholars equally at home in both fields. I can't treat anything like his full bibliography—or even the high points thereof—but that doesn't seem to me to be the purpose here.

I personally think that remembrances like this are not primarily for rehearsing the details of scholarship but for capturing or attempting to capture something of the person. Hanns-Peter could be, on the one hand, an intimidating presence, and he did not suffer fools or flimsy scholarship gladly. Nor, I gather, the lapses of his students—I never took a class from him, but I understand that his Vedic students at UCLA approached every session with deep anxiety, not for fear of his bark or his bite but rather of disappointing him. Indeed I think one of the reasons people found him intimidating is, paradoxically, because he was so soft-spoken: he was both genuinely modest and non-assertive, and also physically *incapable* of speaking much above a whisper. Which quality of voice, combined with a fairly formidable German accent and the fact that the volume of his utterances tended to decrease towards sentence-end, made it often impossible to figure out what he'd just said. This was unfortunate when the utterance was scholarly—what gems of insight did we miss? He also had a remarkable memory and was a font of

knowledge about the scholarly tradition and the scholars in it, especially the German side of things. He could tell you who studied with whom, who was influenced by whom, and who couldn't stand whom—the last being usually the best part and again the part mostly likely to be swallowed by the gathering silence at the end of a sentence. But this trait of speech was particularly unfortunate because another often-unappreciated trait of his was that he had a highly developed sense of humor. And he tended to like his own jokes best, where the punch line almost always faded into insubstantiality, after which he would dissolve into a little bout of private chuckles, leaving his audience to try to reconstruct the funny part.

I was a happy recipient of one of his whimsical gestures many years ago when I gave a paper at the American Oriental Society that focused on copulating frogs—copulating *Vedic* frogs, I'd point out. And the next day Hanns-Peter, having somehow located a toy store in the conference city, presented me with a pair of stuffed frogs held together in copulating position by a rubber band: the last obviously was his addition. They are still in my office, though the rubber band long ago lost its elasticity. This demonstrates another of his traits: despite his high standards he was very generous to younger scholars, forgiving us our imperfections as long as he felt we were attempting to follow the right path, and the deep devotion of his UCLA students, up through to his death, is a particularly touching testimony to this.

I think most of this audience knows that Hanns-Peter managed to live in LA for approximately fifty years without ever learning to drive a car—a remarkable feat of endurance, one might say stubbornness. He must single-handedly have supported the Big Blue Bus in its formative years. But he did also rely on personal transport. When I first came here, he called soon after to say, "Stephanie, we must go to the Indian village!" He was not thinking of tepees and moccasins but of Artesia, "Little India." So I got out my newly purchased *Thomas Guide* and plotted a formidable route involving many freeways (most of which I have never been on since), in order to ferry him to Artesia, primarily to replenish his supply of Indian spices. He was quite an accomplished Indian cook, in fact a lover of good food in general and a patron of higher-end restaurants. Another, perhaps little-known aspect of his personality.

I will end with one of his jokes whose punchline *was* heard by all present and remembered both fondly and vividly by many of us though over thirty years have passed. It was at the World Sanskrit Conference in Philadelphia in 1984—a conference that even by the low standards of WSC's was chaotic and randomly organized. The week was nearing its end, and the hands-across-the-sea spirit of

international cooperation had badly frayed, with traditional, philologically minded Western Indologists and traditional, non-philologically minded Indian pundits squaring off. Hanns-Peter was chairing a session, in which such a pundit gave a paper insisting that in the famous Rigvedic dialogue between Indra's dog Saramā and the Pāṇis (RV X.108), Saramā wasn't a dog but an ambassadress; the claim presumably arose because her dog identity was considered too lowly. Hanns-Peter remarked—quite loudly for him—"well, if she wasn't a bitch, she must have been a witch [in his speech, 'vitch'], because she had puppies!" The room (or our side of it) lost it, someone (I don't think it was Hanns-Peter) made little dog ears on his head, and that was that for international cooperation.

# A Markedly Different Approach: An Experimental Look at the Rarity of PIE */b/*

PHILLIP BARNETT AND ANDREW MILES BYRD

*University of California, Los Angeles* *University of Kentucky*

## 1. The reconstruction of the PIE stop system

The most common reconstruction of the Proto-Indo-European (PIE) stop system assumes a three-way contrast at each place of articulation: voiceless unaspirated (*/t/), voiced unaspirated (*/d/), and voiced murmured stop (*/dʰ/).[1] However, this view (henceforth known as the standard model [SM]) has long been looked upon with a degree of skepticism. As most prominently pointed out by Jakobson (1957:528), there is no known attested language to possess these three specific distinctions in its stop inventory,[2] and relatively few have two types of voiced stop and only one type of voiceless stop concurrently. Moreover, there are a number of peculiarities in the distribution of PIE stops. Certain root combinations appear to have been banned, or, at the very least, highly restricted, most notably for our purposes ˣ/TeDʰ/, ˣ/DeD/, and ˣ/DʰeT/.[3] While voiceless stops and voiced aspirates are found commonly throughout the PIE inflectional system, voiced stops are curiously missing. And perhaps most strikingly, while the bilabial stops */p/ and */bʰ/ are very common in the PIE lexicon and morphology, its voiced unaspirated counterpart */b/ is rare by comparison (Fortson 2010:59),

* We thank Gašper Beguš, Joe Eska, David Goldstein, Taha Husain, Jamison Nielsen, Brent Vine, and Michael Weiss for their help on this paper. We are especially indebted to Kevin McGowan, without whose assistance this study could not have been made possible. All errors are our own.

1 Typically called a voiced aspirated stop, this series of stops may be more accurately described as breathy-voiced or murmured. To maintain the usual orthographic practices, superscript ⟨h⟩ (vs. ⟨ɦ⟩) will be used throughout.

2 It is unclear if Kelabit (Sarawak, northern Borneo; Blust 2006) and Lun Bawang (Sabah) provide direct parallels of the SM; see Hock 1986:625–6 and Elbourne 1998:2–5 for discussion, with references.

3 ⟨ˣ⟩ denotes an ungrammatical form. ⟨T⟩ represents any voiceless stop, ⟨D⟩ any voiced stop, and ⟨Dʰ⟩ any voiced aspirated stop. For a complete list of PIE root consonantal co-occurrence restrictions, see Cooper 2009:56.

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reconstructable for comparatively few roots in PIE,[4] most famously in the root **bel-* 'strength' and certain other non-IE-looking roots such as **ab(e)l-* 'apple' and **kannabi-* 'hemp'.[5]

Such facts led Gamkrelidze and Ivanov (1973) and Hopper (1973) to propose an alternative model of the PIE stop system, the Glottalic Theory (GT). According to the GT, voiceless ejectives replace the voiced stops of the SM, such that */tréi̯es/ 'three', */du̯oh$_1$/ 'two', */d$^{h}$eh$_1$/ 'put' become */t$^{(h)}$réi̯es/, */t'u̯oh$_1$/, */d$^{(h)}$eh$_1$/, respectively, resulting in a plosive system that is cross-linguistically much more common, illustrated in Table 1.[6]

Table 1. The Glottalic Theory

| Manner | Stop type | | Manner | Stop type |
|---|---|---|---|---|
| Voiceless | */t/ | → | voiceless | */t/ |
| Voiced | */d/ | → | voiceless ejective | */t'/ |
| Breathy | */d$^{h}$/ | → | voiced | */d/ |

In addition, advocates claim that the GT provides an explanation for the scarcity of */b/ in PIE, as the bilabial ejective stop */p'/ is less common than many other ejectives, */k'/ in particular,[7] and also addresses the absence of ×/DeD/ roots, as many languages with ejective phonemes ban roots of the shape /T'eT'/ (Gamkrelidze and Ivanov 1973:153). There are, however, a number of weakness-

4 As Brent Vine kindly points out to us, *LIV*$^{2}$ includes eleven roots with root-final **-b*, six of which are deemed questionable and five relatively secure (**ĥleub-* 'trip, jump', **seib-* 'make flow', **(s)kerb-* 'shrink', **(s)kreb-* 'scrape', and **u̯remb-* 'turn'). This is a relatively small number compared to the 89 roots ending in final **-d*, 25 in **-ĝ*, 28 in **-ĝ/g*, 44 in **-g*, and 16 in **-g$^{w}$*.

5 In addition, any underlying word-final */p/ would have automatically been realized as *[b] (see Byrd 2018; cf. Weiss 2009a:146 n.75).

6 See Vennemann 1989 for further discussion.

7 Gamkrelidze 1986:90. While the absence of /p'/ would not be surprising in a language with a series of ejective stops, it is by no means expected. According to Ladefoged and Disner (2012: 151), it is not necessarily the case that [p'] is more difficult to produce than other ejectives; rather, dorsal ejectives are "auditorily more distinct" than non-dorsal ejectives. Moreover, in a survey of PHOIBLE's database of 2,155 languages, while 183 contain ejective velar /k'/, there is a minimal difference between those that contain /t'/ (141) and /p'/ (135). Barrack (2002:81) has made a similar observation based on a much smaller sample of languages (UPSID). One should also note */k$^{w}$'/ is cross-linguistically even rarer, with only 49 languages containing such a phoneme in the PHOIBLE database, a surprising fact given the necessary reconstruction of PIE */k$^{w}$'/ (SM */g$^{w}$/) in the GT.

es to the GT, and for this reason, the majority of scholars today continue to follow the SM for their reconstructions.[8] We agree with these scholars that the SM provides the most succinct explanation for the correspondences among all of the daughter languages, with fewer assumptions being made in the evolution of each daughter language's phonemic inventory.

Of course, both Jakobson's objections to the SM and the aforementioned phonological peculiarities remain, though some have been addressed in recent decades. For instance, Iverson and Salmons (1992:295) and Barrack (2003:12) argue that the absence of *×*/DeD/ is to be expected, as double-stop roots of any shape are infrequent; in addition, stops occur more often in syllable onsets than in coda position (Barrack 2002:82–4). Cooper (2009:63) also points out that PIE tended to avoid roots beginning and ending with *any* segment of like manner, and therefore the absence of *×*/DeD/ should not come as a surprise.

But can we arrive at an explanation of the rarity of PIE */b/ within the SM? Does the near-absence of the typologically ubiquitous voiced labial stop make any sense in such a system? Hock (1986:625) points out that PIE is not unique in having a gap or near-gap in the voiced labial stops, with /b/ being absent in Dargwa (Northeast Caucasian) and being unexpectedly rare in Dehu (Southern Oceanic). Be that as it may, it would still be preferable to identify a reason for the rarity of */b/ in PIE, if at all possible. Joseph (1985:5) proposes that PIE */b/ (along with other phonemes such as voiceless aspirates) was utilized primarily "in expressive forms, affective usages and onomatopoetic words," such as PIE **baba-*, **barbar-*, **balbal-* 'gibberish'. Joseph is indeed correct that certain phonemes and phonemic sequences may be sequestered for affective usage, but this seems to push the mystery back to an earlier period of time. If */b/ had been relegated to affective usage, we still need to address what */b/ was doing there in the first place.

In this paper, we focus solely on the problem of the rarity of */b/ in PIE. Is it possible to arrive at an explanation within the SM, or must we assume alternative consonantisms to come up with a sensible solution? What follows is a preliminary study that is part of a larger project, which investigates the nature of the PIE stop system through experimental and computational analysis. In this study, we discuss the use of perceptual experiments on living speakers to test two hypotheses of the PIE language.

8 See Byrd 2018 with references.

## 2. Hypothesis I: PIE */b/ merged with PIE */bʰ/

It is widely believed that */b/ was a rare phoneme in late PIE.[9] This does not mean, however, that such was the case at earlier stages of the proto-language. In fact, one may reasonably conclude that the rarity of */b/ in late PIE derives from the fact that it was completely absent at an earlier stage (which for the moment we will call "Middle PIE"), a sound that was slowly reintroduced to the phonemic inventory through borrowings (**bak-* 'staff'),[10] onomatopoeia (**baba-* 'gibberish'), and phonologically derived segments (*/pd-/ > **-bd-* 'foot', in Ved. *upa-bd-á-*, Gk. ἔπι-βδ-ᾱ, etc.).[11] And if */b/ were completely absent in Middle PIE, it is not unreasonable to assume that it was present at an even earlier stage of PIE ("Early PIE"), having undergone a phonetic shift to an entirely different sound or having merged with another phoneme in the language. The evolution of /p/ in the history of Proto-Celtic (Russell 1995:11–2) provides us with a good comparison of the proposed sequence of events. The phoneme */p/ was of course present in PIE and was inherited by Proto-Celtic, at which stage the phoneme itself was not lost, but rather shifted to an alternate pronunciation (likely */φ/). It was then lost entirely as a phoneme in Celtic, with only minor traces in certain environments.[12] The phoneme /p/ was eventually reintroduced into the Celtic languages through loanwords (e.g., Mod.Ir. *póg* 'kiss' < Lat. *(osculum) pacis*, onomatopoeia (Mod.Ir. *plimp* 'boom'), and later sound laws (e.g., **penkʷe* > **kʷenkʷe* > W. *pimp* 'five'). Thus, it is entirely possible that */b/ had existed as a phoneme in Early PIE and then either (a) shifted to an alternate pronunciation or (b) merged together with an already existing phoneme in Middle PIE.[13] To our knowledge, there is no evidence of a shift from */b/ to an alternate yet still contrastive sound in PIE—i.e., there is no reason to assume that */h$_1$/, for example, derives from */b/. However, there are hints that */b/ merged with another segment in PIE. It

9 The reader should note that our use of the terms "early," "middle," and "late" is not intended to suggest a period of PIE after which Anatolian, Tocharian, or any other sub-branch had split off. That said, it is curious that none of the securely reconstructable roots in *LIV*[2] (see n.4 above) are continued within Anatolian or Tocharian.

10 Weiss 2009a:74.

11 *NIL* 527.

12 For instance, PIE */p/ > PCelt. */x/ / __ */t/: **sept-* 'seven' > Ir. *secht,* W *saith*, Gaul. *sextamenos*.

13 In Uradhi, an Australian language spoken in northern Queensland, the segment /p/ did not mutate into another segment in word-initial position, but rather merged with /w/: **pinta* > *winta* 'arm', **wapun* > *wapun* 'head' (Crowley and Bowern 2010:71).

has been suggested that */b/ merged with */u̯/ (Sihler 1995:146–7, Barrack 2006:238) or perhaps even */m/ (or both; see Sihler 1995:147), producing unexpected root onsets such as */u̯l-, u̯r-, u̯i̯-/ or */mn-, ml-, mr-/, respectively. While an intriguing idea, there is no real evidence of such mergers outside of distributional facts. Moreover, PIE was extremely tolerant of onsets that violate the Sonority Sequencing Principle (see Byrd 2015, Chapter 3 for further discussion), and so we do not view said onsets as being suggestive of anything in particular (other than the licitness of onsets containing labial + dental sonorants). But are there other segments for which a merger was possible? As first noted by Barrack (2006:238–9), an examination of Jucquois' famous 1966 study on the distribution of phonemes within the PIE root presents one such possibility, namely that early PIE */b/ merged with */bʰ/ in root-initial position.

Table 2. PIE stops in root-initial position (taken from Jucquois 1966:59)

| Voiced | | | Murmured | | |
|---|---|---|---|---|---|
| *b* | 25 | (1.2%) | *bʰ* | 129 | (6.4%) |
| *d* | 53 | (2.7%) | *dʰ* | 67 | (3.3%) |
| *ĝ* | 22 | (1.1%) | *ĝʰ* | 52 | (2.3%) |
| *g* | 50 | (2.5%) | *gʰ* | 47 | (2.6%) |
| *gʷ* | 37 | (1.8%) | *gʷʰ* | 12 | (0.6%) |

As seen in Table 2, the number of */bʰ/ tokens in root-initial position is quite striking, with nearly double the number of dental roots, and more than twice as many as the dorsal roots combined. The merger of plain voiced and voiced murmured stops is widespread, being the most common outcome of the two series within the Indo-European daughter languages, occurring in Albanian, Anatolian, Balto-Slavic, Celtic, Iranian, and in many dialects of Indic (Stuart-Smith 2004:175), though the merger is always in the direction of a voiced stop, and not a murmured one.[14] Moreover, the mergers are never restricted to a specific place of articulation, and certainly do not seem to target the labial node alone.[15] It is

14 Though note Skt. *bisa-* 'lotus stem' > Middle Indic *bhisa-*, an example of sporadic aspiration in the Apabhraṃśa language (Stuart-Smith 2004:187).

15 A possible partial parallel to the merger investigated for PIE may be seen in the Southern Khoisan language !Xõo (also known as Taa), which contains four distinctions in its stop system: voiceless unaspirated, voiceless aspirated, voiced unaspirated, and voiced aspirated. Curiously, the system lacks aspirated /bʰ/ (Traill 1994) while other Khoisan languages maintain a four-way contrast at the labial place node (König and Heine 2008). Because of the cross-linguistic rarity of voiced aspirated stops, it is unlikely that they each developed these systems

thus incumbent upon us to find additional evidence that such a diachronic development is a possible one. As existing cross-linguistic and philological evidence falls short of accomplishing this goal, we may turn to experimental phonology for answers. Scholars in nearly all subfields of linguistics are increasingly using experimentation to investigate theoretical claims; for the use of experimentation in historical phonology, see Yu 2015.

### *2.1. Methods*

In 1955, Miller and Nicely conducted an experiment to determine which English consonants were most easily confusable to an English-speaking listener. Their experiment involved playing for participants pairs of nonce[16] words of the shape *CV* and then asking the participants to identify whether the two words were the same or different. As all of the consonants used in their experiment were phonemic in English, and were therefore naturally easy for listeners to distinguish, the researchers added varying amounts of noise to the audio recordings to increase confusability across the board. While the findings of that investigation themselves are not immediately relevant to the present study, their methodology was used as a model for the perceptual confusability experiments contained herein.

In Experiment I, we investigate the perceptual confusability of voiced murmured stops and their modal[17] counterparts. Participants ($n$ = 23) were young adults enrolled at the University of Kentucky, a mid-sized university located in Lexington, Kentucky, at the boundary between the Midwestern United States and the Southern United States. All participants were natively fluent in English.[18] Participants were asked to sit in a sound-attenuated booth while wearing noise-canceling over-the-ear headphones. All of the nonce words followed a consonant-

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independently. Thus, it is perhaps possible that !Xõo previously contained */bʰ/ and eventually merged the segment with /b/, though at this point we are unable to evaluate this proposal to any degree of certainty.

16 "Nonce" here indicates that the words do not hold any semantic or pragmatic value in the listener's language.

17 Modal voicing, most often used with vowels to describe optimal vocal fold tension and airflow creating maximal vibration, is also used to describe "standard" pulmonic egressive vocal register used for obstruents. For a full treatment of laryngeal setting, see Ladefoged and Maddieson 1996:47–77.

18 One participant was a heritage speaker of Spanish. This participant's results were not exceptional, and so their responses were included in the data.

vowel pattern. Each consonant used for the experiment appeared with each of five vowels. The critical sounds used in the experiment were as follows:

Table 3. Experiment I critical sound matrix

| | | | | | |
|---|---|---|---|---|---|
| Unaspirated stops | b | d | ɟ | g | $g^w$ |
| Aspirated stops | $b^h$ | $d^h$ | $ɟ^h$ | $g^h$ | $g^{wh}$ |
| Vowels | æ | e | i | o | u |

Through the headphones, participants heard pairs of nonce words with a one second interstimulus interval.[19] As voiced aspirates are non-phonemic in English, we did not include noise as a variable in these experiments as Miller and Nicely (1955) did; as we suspected, English speakers found the task sufficiently difficult without the complication of adding noise to the stimuli. The experiment also featured a series of filler pairs, which consisted of non-plosive consonant-vowel pairings, replacing stops here with fricatives to avoid extraneous variables caused by similarity to critical pairs. The consultant who recorded the nonce words used in the experiment is a young adult male and a fluent heritage speaker of Urdu, which features a set of murmured stops. The consultant was instructed to aim for Urdu consonant and vowel targets when recording the stimuli. See Table 4 for examples of nonce words used in the experiment as derived from the critical sound matrix in Table 3.

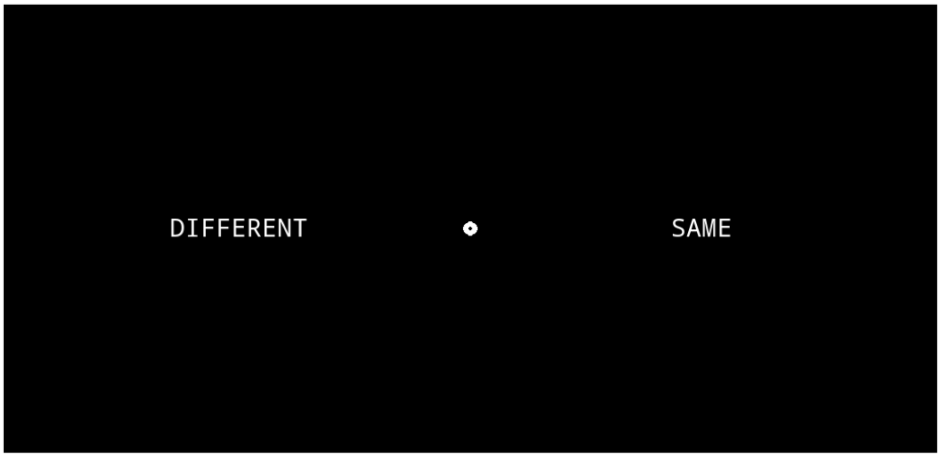
Table 4. Illustration of the creation of nonce word pairs for Experiment I

| Consonant 1 | Consonant 2 | Vowel | Word pair |
|---|---|---|---|
| /b/ | /b/ | /u/ | /bu/ – /bu/ |
| /ɟ/ | /$ɟ^h$/ | /æ/ | /ɟæ/ – /$ɟ^h$æ/ |
| /$g^w$/ | /$g^{wh}$/ | /o/ | /$g^w$o/ – /$g^{wh}$o/ |

Notice that pairs were constructed that were the same nonce word spoken twice, hereafter referred to as homophonous, alongside pairs that contained two different laryngeal settings for the consonants, hereafter referred to as heterophonous. The place of articulation and vowel, however, were kept constant within each critical pair.

19 The interstimulus interval is the time between the beginning of a stimulus, here the first word, and the beginning of the next stimulus, the second word.

We used the *OpenSesame*[20] experiment creation software package to construct and execute the experiment, which enabled the logging of response accuracy and precise response time. As they listened to these pairs, using a Black Box Toolkit response box,[21] the participants indicated whether the two words in each pair were homophonous or heterophonous, or "SAME" and "DIFFERENT," respectively, as they were instructed (see Figure 1).




Participants were asked to press the response box's rightmost button when the sounds were the same and the box's leftmost button when the sounds were different. The words "DIFFERENT" and "SAME" were left on the screen as seen here as a reminder of which side was which.

Fig. 1. Screenshot of *OpenSesame* during experiment

Given that our study investigates the perceptual confusability of */b/ and */bʰ/ in comparison to other homorganic modal-murmur pairs, we were most interested in the accuracy of participants when given a heterophonous pair. When a

20 *OpenSesame* is a drag-and-drop interactive experiment creation application that allows the experimenter to create, from scratch or using a template, a fully automated behavioral experiment using audio and visual stimuli on a standard computer. For more information on *OpenSesame*, see the software's website and official documentation at ⟨http://osdoc.cogsci.nl/⟩.

21 A response box is a handheld plastic box that has multiple buttons and connects to a computer, usually via USB port. The box functions in much the same way as a computer keyboard while making the buttons larger and fewer, making them the perfect tool for collecting quick responses from participants. Furthermore, the Black Box Toolkit Response Box is able to measure reaction time to the nearest millisecond, unlike most computer keyboards.

participant rates two different sounds as the same, it indicates the participant had trouble distinguishing between the sounds. Pairs were played in semi-random order.[22] If neither button was pressed within two seconds of the beginning of the second word in a pair, the program went on to the next pair. This measure was put in place in order to ensure that participants reacted as quickly as possible. Recording reaction time in an experiment such as this is important, as the time it takes a respondent to react may be more crucial to understanding the underlying linguistic and psychological processes than the actual response of the participant to the stimuli. In other words, if a participant takes a long time to respond, this indicates that they have trouble differentiating the two sounds.

### *2.2. Results*

In this experiment, we were investigating the relationship of place of articulation and confusability of homorganic consonants with a murmur distinction, which we will term here as "modal-murmur confusability." As such, this relationship may be represented with the following formula, given in R-typical notation, which will serve as our model:[23]

$$\text{modal-murmur confusability} \sim \text{place node} + \varepsilon \,^{24}$$

In essence, modal-murmur confusability is a function of place of articulation and random variability between participants. In other words, place node is an independent variable that, when changed, predicts the dependent variable, how confusable a modal-murmur pair is. Thus, we use a linear effects model. A linear effects model enables us to assess the relationship between a numerical dependent variable (in this case, modal-murmur confusability) and one or more independent variables (here, place node). $R^2$ measures the amount of variance in a dependent variable that is predictable from an independent variable. So in our model $R^2$ indicates how much of the variance in modal-murmur confusability is

22 After randomly sorting the list of pairs, we ensured that any given critical sound did not occur in two pairs in a row to prevent confounding recognition variables.

23 A model such as this is a mathematical representation of the phenomena being studied. Models are useful to the researcher as they allow a clear path toward understanding the situation via determining the values of the variables contained within the model. Here the formulas are given in R-typical notation, which can be run directly in R, once variables are connected to datasets, to perform statistical analysis.

24 Epsilon here represents "error," that is, the difference between the value of the dependent variable estimated by the model and the actual value.