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Secret Science Before Bletchley Park: The France-Poland Cryptologic Programme and the Epistemology of Secrecy

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Abstract

Objectives: The article examines the concept of secret science as a distinct epistemic regime that emerges when secrecy is not merely an external administrative limitation imposed on scientific activity, but a constitutive and structural condition of knowledge production itself. The main objective is to conceptualise secrecy as an organising principle of scientific practice and to distinguish secret science from both conventional academic science and applied intelligence work. To achieve this, the article combines conceptual analysis with a historically grounded case study.

Results The analysis identifies four necessary conditions of secret science: epistemic sealing, method under constraint, structural secrecy, and existential necessity. It demonstrates that the Franco-Polish cryptologic collaboration of the 1930s fulfils all four conditions and therefore constitutes a fully articulated instance of this epistemic regime rather than a transitional or auxiliary form of scientific activity.

Conclusions: The findings support the reclassification of early cryptology as part of the history of science, not solely as an object of intelligence studies. More broadly, the article shows that under conditions where openness is epistemically impossible, secrecy can function as a productive and coherent foundation for scientific knowledge-making.

1. Introduction

This article proposes a formal definition of secret science as a scientific regime arising when secrecy is a structural condition of knowledge production (Lie *et al.*, 2025; Mackintosh *et al.*, 2022) rather than an external administrative constraint. Although secrecy in science has been widely discussed in the literature (Broeders, 2016; Ma, 2025), no prior work has defined secret science as a coherent analytical category. This absence reflects the nature of the phenomenon itself: secret science is not named or theorised by its practitioners, but emerges pragmatically under conditions of existential necessity (Anwar, 2025).

The historical case examined is the Franco-Polish cryptologic collaboration of the 1930s, involving the Polish Cipher Bureau and Gustave Bertrand of the French “Deuxième Bureau” (Murphy, 2022). This programme is commonly treated as a precursor to British work at Bletchley Park. The argument advanced here is more precise: the Polish-French phase constitutes a fully articulated instance of secret science, providing the epistemic foundations later expanded in Britain.

The article contributes in three ways. First, it formalises secret science as an epistemic regime using tools from science and technology studies (STS). Second, it applies this framework to the France-Poland programme. Third, it demonstrates the methodological value of private archival materials that were consulted from October 2024 onward, even in cases where technical content is absent. Together, these elements support a reclassification of early cryptology within the history of science rather than intelligence studies.

2. Methods

This article adopts a qualitative, interpretive research design grounded in the history and sociology of science, as well as science and technology studies (STS). The study does not seek to reconstruct operational details of cryptographic techniques, but rather to analyse secrecy as a constitutive epistemic condition shaping the production, circulation, and validation of knowledge within the France–Poland cryptologic programme of the 1930s.

The primary method employed is conceptual and historical analysis. Historical sources are examined along the grain of secrecy, following an approach that treats silences, fragmentations, and gaps in archival material not as deficiencies, but as analytically meaningful features of secret scientific practice. Rather than attempting to eliminate uncertainty, the analysis treats restricted documentation, compartmentalisation of knowledge, and uneven evidentiary density as structural elements of the epistemic regime under study. The empirical basis of the analysis consists of published historical studies, declassified materials, and secondary literature on cryptology, intelligence cooperation, and secrecy in science. These sources are analysed comparatively and interpretively, with particular attention paid to how organisational arrangements, institutional constraints, and security imperatives shaped both methodological choices and epistemic outcomes.

Analytically, the article proceeds through the construction of an ideal-typical model of “secret science”, defined by a set of necessary conditions identified inductively from the case material. This model is then applied to the France–Poland cryptologic collaboration

as a historical case study, allowing for the examination of how secrecy functioned not merely as an external limitation, but as a productive force in scientific knowledge-making. The methodological focus on epistemic conditions, rather than on technical reconstruction or operational effectiveness, allows the study to bridge historical inquiry with theoretical reflection, situating early cryptology within broader debates on secrecy, knowledge production, and the boundaries of science.

3. Results

3.1. Secret Science as an Epistemic Regime

Secret science does not constitute a distinct scientific method, discipline, or field. It is best understood as a *regime of practice* in which scientific inquiry becomes inseparable from structural secrecy. Unlike classified research, where secrecy is often contingent or administrative, secret science arises only where disclosure would destroy the scientific value of the work itself. This regime can be defined through four necessary and jointly sufficient conditions, but its deeper significance lies in how it reshapes the normative structure of scientific activity.

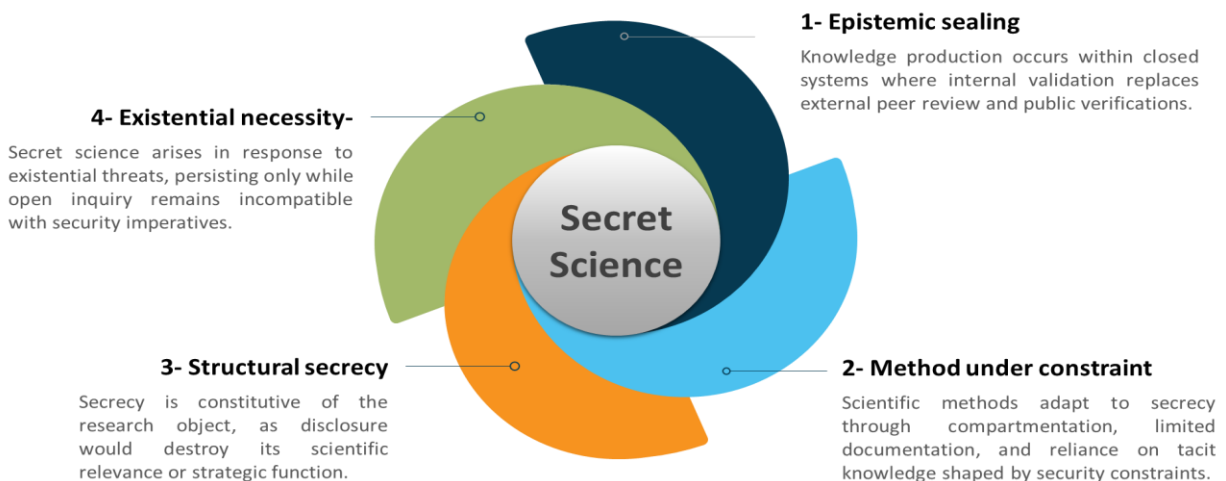


Fig. 1: Four conditions to ensure Secret Science

Source: authors of the article

First, epistemic sealing: scientific communication and validation occur exclusively within a closed environment. External peer review is impossible; instead, internal verification substitutes for open critique. This sealing alters not only who may participate in knowledge production, but also how claims are evaluated. Validity is established pragmatically through internal coherence and operational success rather than through public scrutiny.

Second, method under constraint: documentation is deliberately limited, partitioned, or coded. Scientific reasoning adapts to compartmentation. Mathematical or technical arguments may be distributed across teams without any single actor possessing the complete formal picture. As Vogel and Dennis note, secrecy amplifies tacit knowledge: procedures are not left unwritten because they are obvious, but because recording them would violate security constraints (Vogel, Dennis, 2018).

Third, structural secrecy: the research object depends on secrecy for its existence as a scientific object. In cryptanalysis, public disclosure of method renders the object obsolete; in weapons physics, disclosure undermines deterrence. Secrecy is therefore constitutive rather than incidental. This distinguishes secret science sharply from classified but otherwise conventional research programmes.

Fourth, existential necessity: secret science emerges only in response to a perceived existential or vital threat. The scientific programme exists because open inquiry is impossible under the conditions of risk. This explains the episodic nature of secret science: it appears, intensifies, and often dissolves once the threat environment changes.

Beyond these criteria, secret science can be characterised as a regime of norm substitution. Core norms of modern science are not abandoned but replaced by operational equivalents. Open publication is replaced by restricted circulation; peer review by internal validation; priority disputes by enforced discretion; disciplinary membership by security clearance. These substitutions allow scientific reasoning to continue under conditions where classical scientific norms would be untenable. Its functioning relies on limiting exchanges to the minimum necessary and ensuring secure communication channels, whether face to face or through strongly protected classified systems.

This perspective clarifies why secret science has not been defined as such in the philosophical literature. Studies of secrecy in science treat secrecy as a constraint acting upon otherwise familiar practices (Vermeir, Margocsy, 2012, pp. 154-156). The present approach differs by treating secrecy as an organising principle that stabilises a distinct regime of knowledge production. Comparable regimes can be identified in wartime cryptanalysis, the Manhattan Project, Cold War reconnaissance engineering, and certain contemporary cyber-security research programmes.

Two adjacent categories require exclusion. Intelligence studies examine organisational, political, and analytical processes related to information use; they are meta-analytical and do not address scientific method under secrecy (Lowenthal, 2025). Innovation confidentielle (or confidential innovation in English), a managerial term in business literature (Wintrebert, 2024), refers to routine research under temporary confidentiality and lacks epistemic substance. Neither captures the regime formalised here.

3.2. The France-Poland Cryptologic Programme

The Polish Cipher Bureau's work in the 1930s represents a decisive shift in cryptanalysis from heuristic codebreaking to formal scientific modelling. Marian Rejewski's application of permutation theory treated the Enigma machine as an abstract mathematical object rather than as a collection of intercepted messages. This distinction is epistemically crucial: the scientific object was the cipher system itself, independent of the semantic content of communications. Such abstraction aligns cryptanalysis more closely with mathematics and theoretical engineering than with intelligence analysis.

Scientific practice within the Bureau followed recognisable methodological steps. Hypotheses concerning rotor wiring and permutation cycles were formulated, tested against empirical data, and iteratively refined. Internal reproducibility was achieved through repeated operational success rather than external replication. As Rejewski (Rejewski, 1981) and Kozaczuk and Straszak (Kozaczuk, Straszak, 2004) demonstrate, this work produced cumulative knowledge under conditions that prevented public dissemination, satisfying core criteria of scientific inquiry.

This scientific activity operated within a sealed institutional environment. Gustave Bertrand's role was infrastructural rather than mathematical, but epistemically significant. Acting as an intermediary between Polish and French institutions, Bertrand facilitated access to material resources, ensured funding continuity, and maintained channels of cooperation while preserving compartmentation. His function was not to generate knowledge but to sustain the regime within which knowledge could be generated.

The institutional configuration enforced strict boundaries. Information circulated selectively; documentation was restricted; and validation occurred internally. These constraints were not accidental but rational adaptations to the threat environment. They exemplify how secrecy shaped scientific workflow and method rather than merely limiting communication.

The programme emerged under existential pressure. For Poland in the 1930s, cryptanalysis was not an optional enhancement but a strategic necessity. Open scientific collaboration would have rendered the work ineffective. Structural secrecy was therefore a precondition for the existence of the scientific programme itself.

In July 1939, Polish and French authorities transferred their methods to Britain. Bletchley Park inherited a functioning epistemic framework, which it expanded through mechanisation, statistics, and scale. British contributions were decisive, but epistemically downstream. Recognising this continuity corrects narratives that locate the origin of Enigma decryption exclusively in the British phase and reinforces the classification of the Polish–French collaboration as the originating moment of a secret-scientific regime.

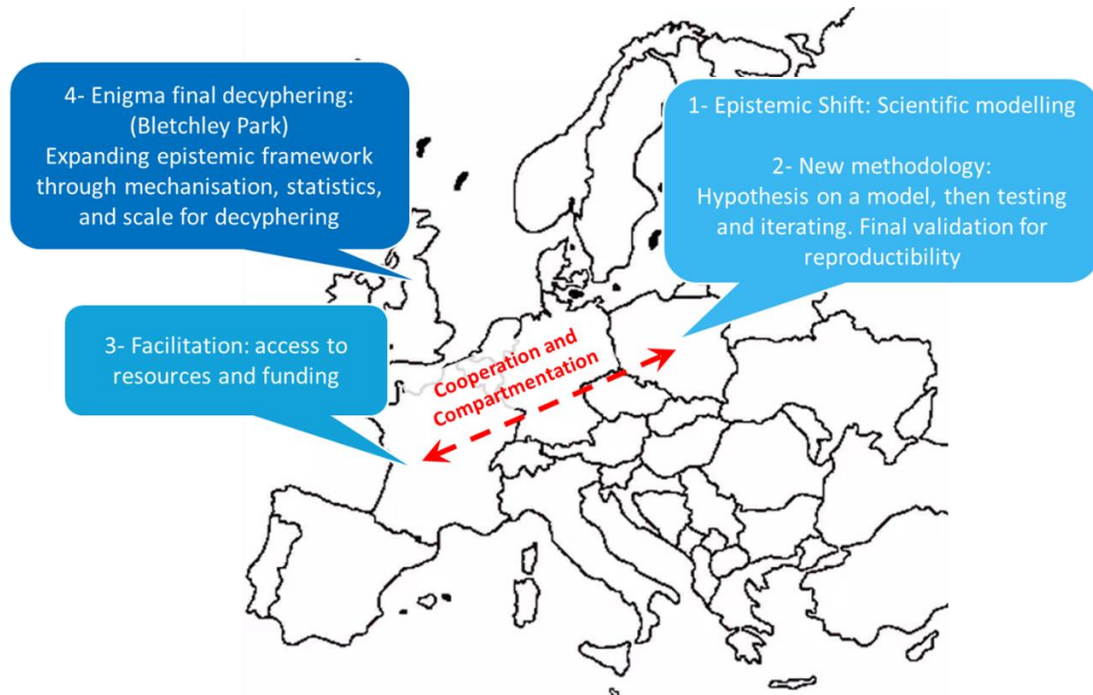


Fig. 2. Successive steps of the France-Poland Programme to decipher Enigma|
 Source: authors of the article

3.3. Archives, Epistemic Silence, and Formalisation

The private archival materials discussed in this article were made accessible through Stéphane Chanut, a descendant of Gustave Bertrand. These materials were not collected through an institutional archival transfer but through a voluntary exchange initiated by Mr. Chanut, who expressed a willingness to engage in dialogue and seek expert assessment regarding their historical and epistemic significance. Contact between Mr. Chanut and the first author was established following recommendations from institutional referees familiar with the scholarly field.

This provenance is methodologically important. It situates the archive at the intersection of private custody and scholarly inquiry, without implying the existence of undisclosed technical content. The role of the first author should be considered here strictly that of historical and epistemic expertise: no curatorial claim, ownership transfer, or technical re-evaluation of cryptologic material is asserted. The archive is treated as a private collection whose analytical value derives from contextual interpretation rather than informational novelty.

Secret science rarely leaves complete archival traces. Technical documentation is confined to secure institutional repositories, while private papers preserve only peripheral material. The Bertrand family archives – personal correspondence, administrative notes, and logistical documents consulted from October 2024 onward – contain little cryptologic content. This absence is not a deficiency but a predictable feature of secret-scientific regimes.

Historical method often assumes that private archives should illuminate the intellectual substance of scientific work. This assumption fails in contexts of structural secrecy. In such regimes, the absence of technical material is itself evidence of effective compartmentation.

As Stoler argues, archives must be read “along the grain”, attending to their silences and constraints (Stoler, 2009). Derrida (Derrida, 1995) similarly emphasises that prohibition is constitutive of archival form.

The Bertrand papers exhibit systematic avoidance of technical detail alongside abundant evidence of constraint: references to discretion, indications of logistical coordination, and traces of the difficulty of maintaining separation between personal and operational domains. These materials allow reconstruction of the conditions under which scientific work occurred, even where the work itself remains undocumented.

Such patterns are consistent with other secret-science contexts. Personal papers associated with the Manhattan Project or early reconnaissance engineering similarly preserve context rather than content. Comparative perspective reinforces the claim that archival silence is a structural feature of secret science, not an anomaly.

The archives do not contribute new cryptologic knowledge, and the article makes no such claim. Their value lies in corroborating the formalisation proposed here. They provide material evidence of epistemic sealing, method under constraint, and the lived experience of secrecy. Communications reflecting the difficulty of maintaining discretion demonstrate that secrecy was an active constraint shaping daily practice.

Because secret science is not conceptualised by its practitioners, it must be formalised retrospectively. This formalisation rests on comparative criteria rather than self-description. Applied to the Bertrand–Poland programme, it clarifies both the nature of the collaboration and its place within the broader history of science under secrecy. By defining secret science as a regime rather than a method, this article offers a tool for analysing other historical cases where scientific knowledge was produced under non-negotiable secrecy.

4. Discussion

The analysis presented in this article positions secret science not as a marginal or anomalous form of scientific activity, but as a distinct epistemic regime that emerges under conditions where secrecy is structurally non-negotiable. Unlike approaches that treat secrecy as an external constraint imposed on otherwise conventional scientific practices, the framework developed here shows that secrecy can operate as an organising principle that reshapes norms of validation, communication, and methodological transparency. In this sense, the absence of an explicit theoretical vocabulary among historical actors does not indicate the absence of an underlying epistemic order, but rather reflects the practical conditions under which such knowledge was produced.

The France–Poland cryptologic collaboration illustrates this regime with particular clarity. Scientific reasoning within the Polish Cipher Bureau was neither informal nor ad hoc; it followed recognisable patterns of hypothesis formation, testing, and cumulative refinement. What distinguished this work from open scientific research was not a lack of rigour, but the substitution of public scrutiny with internal validation and operational success. The effectiveness of cryptanalytic outcomes functioned as a pragmatic criterion of truth,

compensating for the impossibility of external peer review. This confirms that secrecy did not suspend scientific rationality, but reconfigured its modes of operation.

From an epistemic perspective, the regime of secret science challenges standard assumptions about documentation and reproducibility. Compartmentation, restricted circulation of information, and reliance on tacit knowledge were not secondary effects of security policy, but integral features of the research process. As shown in the case analysed, no single actor possessed a complete formal representation of the system under study, yet scientific progress was nonetheless achieved through coordinated, internally coherent practices. This distributed form of reasoning complicates retrospective historical reconstruction, but it does not undermine the scientific status of the work itself.

The discussion of archival materials further reinforces this point. The absence of technical documentation in private archives should not be interpreted as evidentiary failure. On the contrary, such silences are consistent with the structural conditions of secret science. When secrecy is constitutive, the archival record preserves context rather than content. Personal correspondence, administrative traces, and logistical notes provide insight into the constraints under which knowledge was produced, even when the knowledge itself remains inaccessible. Reading these materials along the grain allows the historian to reconstruct epistemic conditions without violating the logic of secrecy that governed the original research.

Situating early cryptology within the history of science rather than exclusively within intelligence studies has broader implications. It shifts analytical attention away from organisational narratives and towards questions of knowledge production under extreme constraint. The case examined here suggests that secret science should be treated as a recurring, though episodic, feature of modern scientific activity, appearing wherever existential threats render openness incompatible with epistemic survival. Comparable dynamics can be observed in other domains where disclosure would neutralise the object of study or undermine strategic effectiveness.

Finally, the concept of secret science offers a tool for analysing contemporary forms of research conducted under conditions of enduring secrecy. While technological contexts have changed, the fundamental tension between scientific inquiry and the impossibility of openness persists in areas such as cyber-security, defence research, and certain forms of intelligence-related science. Recognising secret science as a regime rather than an exception allows for a more precise understanding of how scientific knowledge can be produced, stabilised, and transmitted when transparency is structurally foreclosed.

5. Conclusions

This study shows that science can operate outside the classical norms of openness and public communication. The France–Poland cryptologic programme of the 1930s demonstrates that secrecy can be a constitutive element of knowledge production rather than a mere constraint.

By defining secret science as a distinct epistemic regime, this paper explains how scientific reasoning can function without public validation or open peer review. In this context, secrecy reshapes scientific practice instead of preventing it.

The Polish Cipher Bureau, with the support of Gustave Bertrand's organisational role, developed the method that made the deciphering of Enigma possible. This result highlights the value of an epistemic approach focused on conditions of knowledge production rather than disciplinary or national boundaries.

Private archives also contribute to this analysis. Even without technical content, they provide insight into the everyday constraints of secrecy and the practices that sustained this scientific work.

More broadly, the concept of secret science offers a useful framework for analysing other historical and contemporary cases in which scientific knowledge depends on secrecy.

References

- Anwar, T. (2025). Spooky secrets: Analysing the temporality and materiality of secrecy in critical security studies. *Security Dialogue*, 56(4), 396–413. <https://doi.org/10.1177/09670106251318174>
- Broeders, D. (2016). The secret in the information society. *Philosophy & Technology*, 29, 293–305. <https://doi.org/10.1007/s13347-016-0217-3>
- Derrida, J. (1995). *Archive fever*. University of Chicago Press.
- Kozaczuk, W., & Straszak, J. (2004). *Enigma: How the Poles broke the Nazi code*. Hippocrene Books.
- Lie, H. T., et al. (2025). The fine print of collaboration: How contractual provisions govern IP and disclosure in publicly funded research. *Research Policy*, 54(10), 1–16. <https://doi.org/10.1016/j.respol.2025.105336>
- Lowenthal, M. M. (2025). *Intelligence: From secrets to policy*. SAGE Publishing.
- Ma, L. (2025). The limits of openness: Global knowledge production and its boundaries. *Journal of Informetrics*, 81(7), 121–134. <https://doi.org/10.1108/JD-09-2024-0237>
- Mackintosh, N., et al. (2022). Curating the digital space: Structural gate-keeping and boundary work in maternity care. *SSM—Qualitative Research in Health*, 2, 1–9. <https://doi.org/10.1016/j.ssmqr.2022.100145>
- Murphy, W. T. (2022). French military intelligence on the brink of war, 1939–1940. *International Journal of Intelligence and CounterIntelligence*, 35(4), 755–783. <https://doi.org/10.1080/08850607.2021.1961454>
- Rejewski, M. (1981). How Polish mathematicians deciphered the Enigma. *Annals of the History of Computing*, 3(3), 213–234.
- Stoler, A. L. (2009). *Along the archival grain: Epistemic anxieties and colonial common sense*. Princeton University Press.

- Vermeir, K., & Margócsy, D. (2012). States of secrecy: An introduction. *The British Journal for the History of Science*, 45(2), 153–164. <https://doi.org/10.1017/S0007087412000052>
- Vogel, K. M., & Dennis, M. A. (2018). Tacit knowledge, secrecy, and intelligence assessments: STS interventions by two participant observers. *Science, Technology, & Human Values*, 43(5), 834–863. <https://doi.org/10.1177/0162243918754673>
- Wintrebert, B. (2024). *Innovation confidentielle: L'avantage secret*. Éditions EMS.